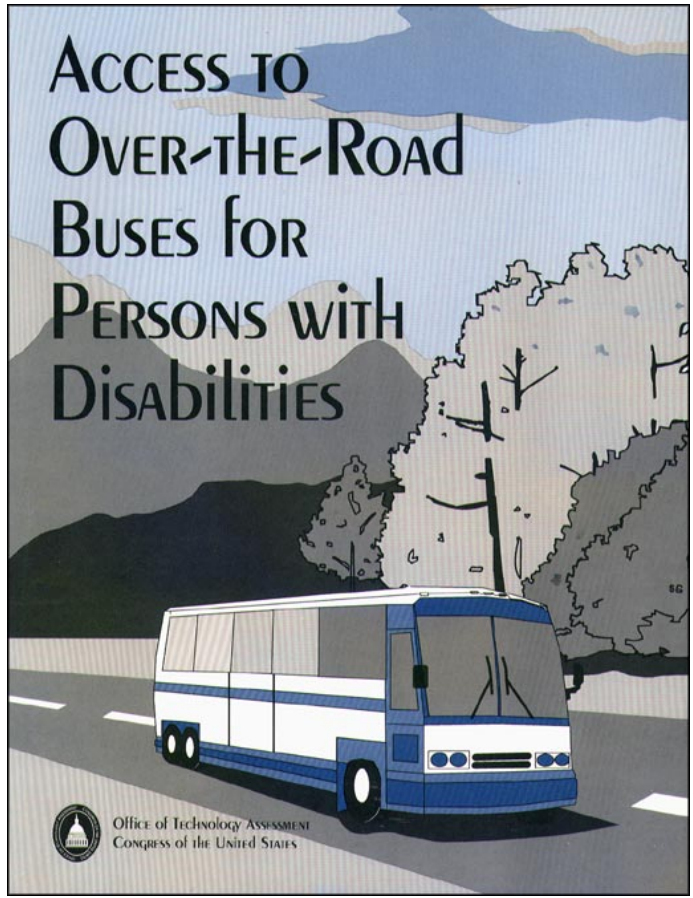
*Access to Over-the-Road Buses for Persons With Disabilities*

May 1993

OTA-SET-547
NTIS order #PB93-192912
GPO stock #052-003-01320-7



**Recommended Citation:**
U.S. Congress, Office of Technology Assessment, Access to *Over-the-Road Buses for Persons With Disabilities, OTA-SET-547* (Washington, DC: U.S. Government Printing Office, May 1993).

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1 For sale by the U.S. Government Printing Office
Superintendent of Documents Mail Stop: SSOP. Washington, DC 20402-9328
ISBN 0-16 -041734-1

# Foreword

As part of the Americans with Disabilities Act, Congress instructed the Office of Technology Assessment (OTA) to analyze the complex issues of access for all persons to over-the-road buses (OTRBs)-buses with a high passenger deck that are commonly used in fixed-route intercity service, as well as for charter and tour trips.

OTRB transportation is an important element of the U.S. transportation system. Companies offering regularly scheduled service with these vehicles serve a portion of the population—rural residents and people with low incomes-with few other travel choices. At present, very little of this service is accessible for persons with disabilities.

The issue of ensuring access to OTRBs by persons with disabilities while maintaining adequate service is complicated, in large part because of the generally difficult financial circumstances facing much of the OTRB industry. OTA finds, however, that there are encouraging reasons to believe that accessibility can be achieved with little degradation of service.

First, technologies to assist passengers with mobility impairments onto OTRBs are available, and OTA anticipates that improved, lower cost technology will enter the market. In addition, allowing a phased implementation over the replacement cycles of vehicles will enable thoughtful, company-specific decisions on technology choices. The phased implementation will also permit members of the disability community to become familiar with the new equipment and practices, and to develop trust that this service will be provided.

This report is part of a process leading to regulations to be issued by the U.S. Department of Transportation. This process has included a review of a draft of this study by the Architectural and Transportation Barriers Compliance Board (ATBCB). OTA thanks ATBCB for its prompt response, and thanks the members of the Advisory Panel as well as those who participated in study workshops, reviewed various drafts, or otherwise contributed. These groups provided valuable comments, suggestions, and information. However, their participation does not necessarily represent an endorsement of the contents of the report, for which OTA bears full responsibility.



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**NOTE:** OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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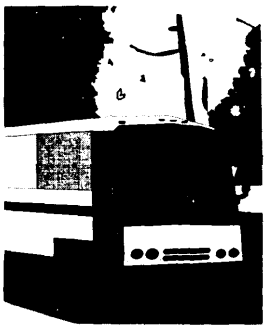
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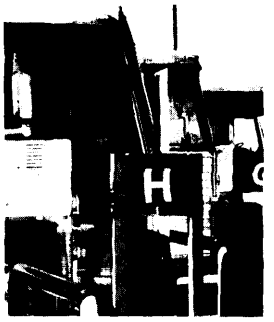
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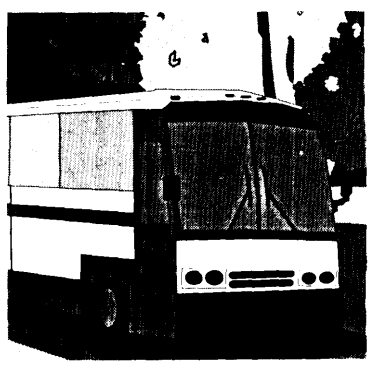
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# Executive Summary

A milestone for American society, the **1990 Americans** with Disabilities Act (ADA) responds to the needs of those with disabilities, and makes clear that inconvenience or uncertainty of demand for accessibility cannot obstruct rights of employment, commerce, and transportation. Although the act carries with it considerable costs of implementation, it reflects a national consensus that the benefits are worth the costs.

In congressional debate over the ADA, particular difficulty developed around the issue of access for individuals with disabilities to transportation on buses with a high passenger deck, otherwise known as over-the-road buses (OTRBs). OTRBs are most often used in scheduled service that takes passengers from city to city, or on local and regional tours and charter trips. Uncertain about the feasibility and cost of OTRB accessibility technologies, Congress was concerned that the burden of implementing the ADA might cripple an already struggling industry, and thus cause the loss of intercity, charter, and tour bus service for many citizens. To ensure that regulations issued by the U.S. Department of Transportation (DOT) would be based on accurate, objective information, and fully reflect the needs of both the bus industry and the disability community, Congress directed the Office of Technology Assessment (OTA) to study this issue, with emphasis on the demand for accessible OTRB service, current and potential technologies, costs of implementation, and impacts on the industry.



There are no simple answers to the issue of access to OTRBs. OTA identified a number of positive factors, however, that could lead to workable solutions. A variety of technologies are now available and more are under development. Even more important are the desire by the industry to provide accessible service, the

willingness by disability communities to be part of a good-faith process that may take years to reach full accessibility, and the growing understanding by all participants that implementation of the ADA will mean devising specific strategies over time to meet specific needs,

## HOW MIGHT ACCESSIBLE SERVICE BE IMPLEMENTED?

Within 1 year of the release of this study, DOT must issue regulations to inform OTRB operators of their compliance obligations under the ADA. These regulations take effect for large operators in July 1996 and for small operators in July 1997, although the President may delay implementation for up to 1 year. The conclusions of this OTA study, provided to Congress and DOT, can inform and support DOT in this regulatory process.

### What Is an Accessible OTRB?

OTA defines an accessible OTRB as one that allows persons with disabilities to board and, where applicable, remain with their wheelchair or other mobility aid while riding, with only minimal assistance from bus company personnel. Accessible OTRBs have:

- Access to level-change devices, including lifts or ramps. An OTRB without an onboard level-change device is accessible only if it operates primarily at stops equipped with level-change devices.
- A sufficiently wide door to accommodate persons with mobility impairments.
- Two wheelchair tie-downs to secure wheelchairs and their users.
- Movable arm rests on *some* aisle seats.
- A means to communicate with persons who have sensory and cognitive impairments, both on and off the bus.
- An accessible restroom or operational provisions for use of accessible restroom facilities.
- Personnel trained in both equipment use and people skills (already a requirement under DOT regulations).

The ADA specifies that accessibility is phased in as OTRBs are purchased or leased by private transportation providers; no retrofitting of vehicles is required. Since the lifetime of an OTRB can exceed 20 years, operators may take that long or longer to turn over their fleets and complete the phase in of accessible OTRBs. Several variables will affect the process:

- OTRB service providers may choose between vehicle-based and station-based level-change devices as best suits their service patterns. However, more complicated regulatory strategies will be required for the station-based lift approach, because a bus without a level-change device onboard is only accessible when it is at a station with a level-change device.
- Available technologies can provide reliable access. Over time, design and production will lead to technological improvements and reduced costs. New designs are under development.
- The area in which technology is least able to offer help at present is that of accessible onboard restrooms. However, access to restrooms is an important aspect of accessible service, and OTRB operators who choose not to equip vehicles with accessible restrooms must respond to this need in some way, presumably with suitably frequent stops at accessible facilities.
- The ADA imposes different standards on “freed-route” and ‘‘demand-responsive’ transportation services. OTRBs in fixed-route service follow set schedules; demand-responsive charter and tour services do not. All OTRBs purchased or leased for fixed-route service must be accessible, but demand-responsive OTRB systems can meet ADA standards by providing enough accessible OTRBs to accommodate the demand.
- Reservation systems can hasten the implementation of accessible service before OTRB systems are fully accessible, by allowing

passengers to notify companies of special needs and by providing advance notice to make accessible equipment available. However, the ADA forbids the use of reservation systems primarily for persons with disabilities; reservation systems must serve all riders.

- Companies without a reservation system can begin compliance by publishing schedules with designations of routes and times that are served by accessible vehicles, and, for the routes and times that are not accessible, the company can specify that persons call, for example, 24 hours in advance if, and only if, they need boarding assistance.

Persons with disabilities and other passengers face a phase in of full accessibility that could last as long as 20 years, Thus, for a number of years, carrying of riders with mobility impairments will still be used as a method of boarding assistance, creating problems for both the riders and OTRB personnel. Accessibility costs that are passed on through increased fares could marginally reduce ridership by those now using OTRBs. However, the demand for OTRB service by persons with disabilities will most likely increase as systems become truly accessible and the population ages.

## WHAT MIGHT THE IMPACTS BE?

The impacts of the ADA cannot be predicted with any certainty. OTA estimates the most likely impacts as follows:

OTRB **operators** providing fixed-route service will face capital and operating costs in implementing the ADA. Since many OTRB operators are experiencing financial difficulties, already they are concerned about these costs. Some fixed-route providers have said that they may reduce service, and it is conceivable that some companies already in financial trouble could choose to end service. Charter and tour operators of OTRBs have somewhat simpler requirements than fixed-route providers under the ADA, and, as their general financial situation is often stronger than that of fixed-route OTRB operators, the cost impact should be less.

Rural communities could experience reduction in service, but it is not possible to predict whether this will actually happen. Given the proprietary nature of company data and the decline of rural service over the decades before the passage of the ADA, it may be impossible to isolate the effect of ADA compliance on rural service-even after the fact—but OTA expects the effect to be marginal.

### How Much Will It Cost?

- OTA calculates that the additional cost for one new OTRB to be outfitted with accessibility technologies and operated over its entire lifetime (of roughly 20 years) ranges from $18,000 to $40,000, or approximately 1 percent of the total lifetime capital and operating costs. These estimates follow critical financial assumptions made by OTA and, as with all estimates of future cost, there is a high degree of uncertainty.
- Most operators will not purchase accessible vehicles until sometime after the ADA regulations go into effect in 1996-97, so they will not begin to incur these costs for some time. As operators turn over their fleet, the cost of implementing accessible service will rise and approach approximately 1 percent of the *total* operating costs only when the fleet becomes fully accessible.
- Choice in purchasing station-based or onboard level-change devices is an important factor in minimizing costs. For example, operators in urbanized areas with many express buses are likely to benefit from station-based technologies, whereas operators in rural areas with many stops will most likely prefer OTRBs with onboard level-change devices.

## WHAT CAN CONGRESS DO?

The language of the ADA does not open the door for additional financial assistance for implementation of the law, and implementation will proceed regardless of government financial assistance. OTA notes, however, that in the case of OTRB transportation operators, Congress may wish to consider four arguments for government assistance:

- First, the fixed-route bus industry has been operating under tough financial conditions for some time due to competition from other modes of transportation. Consequently, fixed-route service now covers a much smaller passenger base (shrinking from 130 million passengers in 1971 to 37 million in 1990) and decreasing numbers of points served (from 17,000 in 1968 to 5,700 in 1991). Thus, Congress may wish to subsidize this industry, not due to accessibility requirements imposed by the ADA, but from the larger perspective that OTRB transportation is an essential service for some segments of the U.S. population, especially those with low incomes and those living in rural areas.
- Second, carefully crafted financial incentives could encourage transportation providers to purchase accessible OTRBs earlier rather than later, thus hastening accessibility.
- Third, OTA estimates the implementation costs of the ADA for freed-route operators to be less than $10 million dollars annually.
- Finally, engineering and product development funding could make more cost-effective accessibility devices available at a much earlier date.

Presently, the Federal Government assists OTRB operators with limited funding under the Federal Transit Act FTA) and with several small tax breaks. Options for the support of accessibility technologies include augmenting FTA funding, authorizing a new financial assistance program specifically targeted to accessibility equipment, and supporting the development of new accessibility technologies.

# Summary and Conclusions 1

The 1990 Americans with Disabilities Act (ADA) seeks to "... provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities."[1] Describing persons with disabilities as having been isolated and segregated in many ways, the law sets a national goal of assuring persons with disabilities "... equality of opportunity, full participation, independent living, and economic self-sufficiency,"[2] The ADA specifically addresses discrimination in public accommodations and services, such as transportation, operated by private entities, including those that provide over-the-road bus (OTRB) service:

> No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of specified public transportation services provided by a private entity that is primarily engaged in the business of transporting people and whose operations affect commerce.[3]

However, while the ADA defines accessible service for other private providers of public transportation (railroads, for example) and instructs the U.S. Department of Transportation (DOT) to develop immediately regulations for these providers, it leaves open the definition of an accessible OTRB and accessible OTRB service.[4] (For further discussion of the Americans with Disabilities Act, see box l-A.)




[1] 42 USC 12101 (b).

[2] 42 USC 12101(a)(3) & (8).

[3] Sec. 304 of the Americans with Disabilities Act; 42 USC 12184 (a).

[4] Public Law 101-336, Sec. 305(a). The ADA defines an OTRB as a "... bus characterized by an elevated passenger deck located over a baggage compartment." Sec. 301(5).

## Box l-A—Accessibility for OTRBS: The Americans With Disabilities Act

The Americans with Disabilities Act (ADA) of 1990 seeks to ensure that persons with disabilities have full access to employment, public transportation, communications, facilities, and so forth. The ADA specifically addresses public accommodations and services operated by private entities, including those offering over-the-road bus (OTRB) service. The act states that failure to make reasonable modifications necessary to provide public transportation services to persons with disabilities is discrumination, unless making such modifications would fundamentally alter the nature of the specified public transportation services. Discrimination includes failure to provide the auxiliary aids and services necessary to ensure that no person with disabilities is denied transportation services, excluded, segregated, screened out, or otherwise treated differently. The ADA specifically prohibits discrimination in OTRB service.

Section 304(b)(3) of the ADA defines discrimination by a private entity providing specified public transportation, excluding OTRBs, as:

> . . . the purchase or lease by such entity of a new vehicle (other than an automobile, a van with a seating capacity of less than 8 passengers, including the driver, or an over-the-road bus) which is to be used to provide specified public transportation. . . that is not readily accessible to and usable by individuals with disabilities . . .; except that the new vehicle need not be readily accessible to and usable by such individuals if the new vehicle is to be used solely in a demand-responsive system and if the entity can demonstrate that such a system, when viewed in its entirety, provides a level of service to such individuals equivalent to the level of service provided to the general public. . .

However, Section 304(b)(4)(A) states that discrimination includes:

> . . . the purchase or lease by such an entity of an over-the-road bus which does not comply with the regulations issued under section 306(a)(2).

Section 304(b)(4)(A) clarifies that the exclusion of OTRBs from 304(b)(3) is with respect to the compliance date and specific standards, not from the requirement for accessibility.

Under the ADA, the U.S. Department of Transportation (DOT), in conjunction with the Architectural and Transportation Barriers Compliance Board (ATBCB), must issue interim regulations and, after review of this OTA study, issue final rules in 1994 (which take effect in 1996 for large carriers and 1997 for small ones) to provide accessible OTRB service to individuals with disabilities. DOT does not have the power to allow any OTRB company to operate an inaccessible system. *In Americans Disabled for Accessible Public Transportation (ADAPT) v. Skinner*,[1] which predates the ADA, the district court held that DOT could take costs into account but could not, because of cost considerations, abrogate the rights granted by the statutes. In addition, while the ADA applies the concept of 'undue burden" to existing buildings and infrastructure, new structures and transportation services must meet accessibility standards regardless of cost considerations.

OTA could find no language in the ADA stating or implying that OTRBs can be held to a lesser standard than other modes of transportation, nor does the ADA give guidance on promulgating such a lesser standard. The requirement of Section 305 of the ADA that OTA conduct a study is not an exemption or retreat from the policies and goals of the ADA. Section 305 is a practical attempt to resolve a hotly contested issue that arose during hearings on the ADA, The committee report said:

> During its hearings on the legislation, the Committee heard conflicting testimony on the cost and reliability of wheelchair lifts or other boarding assistance devices with regard to their use on over-the-road buses. Therefore, before mandating these or any other boarding options in this Act, a

[1] 881 F.2d 1184 (3rd Cir. 1989).

thorough study of the access needs of individuals with disabilities to these buses and the cost-effectiveness of different methods of providing such access is required by the Act.[2]

Section 306 further states that DOT's regulations must apply specified previous sections of the ADA to OTRBs and must require OTRB operators to provide accessible service. Finally, Section 308 affirms that in civil actions, the court shall consider whether the transportation provider could have reasonably anticipated the need for an accessibility aid, and whether a good faith effort was made to provide such an aid.

The ADA clearly states that full access for persons with disabilities, which is, in all respects, comparable to that for persons without disabilities, should eventually be the norm for private providers of other public transportation. Thus, OTA anticipates that the standards of accessibility applied to other privately owned public transportation providers apply to OTRB service, in keeping with the language and intent of the ADA.

### Comparison of Accessibility Standards for Air Carriers With Those for OTRBs

The ADA puts forward accessibility requirements for all modes of public transportation, except for aircraft, which are governed by the Air Carrier Access Act (ACM) of 1988. At first glance, the OTRB industry and the commuter air industry may seem to have a number of characteristics in common, as both transport paying passengers from one community to another. However, the mere physics of flight and the complex safety requirements that result are sufficient to require for air carriers a separate set of regulations such as those promulgated under the ACAA. For example, Federal air safety rules dictate that aircraft seats be capable of withstanding a forward force of at least 16 gs in a simulated dynamic crash,[3] while there are no comparable requirements for bus seats. This and various other aircraft requirements appear to preclude even the most earnest effort to allow persons to remain in their wheeled mobility aids onboard, while technology allowing wheelchairs and scooters on buses already exists.

In addition, air carriers provide onboard flight attendants to assist passengers on craft with 10 or more seats. On most OTRBs, drivers are the only company employees onboard, and the driver's primary responsibility is to drive the coach. Without attendants, many of the accessibility technologies used by airlines, including aisle chairs and other equipment, cannot be used, Thus, OTA concludes that the example of accessible airline service is not a suitable model for accessible OTRB service.[4]

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2 U.S. Congress, House Committee on Education and Labor, *Legislative History of Public Law* 101-336, *The Americans With Disabilities Act, Serial No.* 102-A, Committee Print, December 1990, p. 249.

3 ~@ Safety Foundation, *International Aircraft Occupant Safety Conference and Workshop Proceedings* (Arlington, VA: Oct. 31-Nov. 3, 1988).

4 One other crucial difference between the ACAA and the ADA exists for smaller aircraft, which have 30 or fewer seats and are commonly used for regional transportation and commuter runs. Regulations for these aircraft stipulate that once DOT has determined that level-change devices are commonly available and on the market, they must be implemented in carrier service that is not otherwise accessible-requiring retrofitting of the vehicles if necessary. The ADA requires no carrier to retrofit vehicles, except in the case of trains, where the lifetime of a railcar is quite long.

During the ADA debate, Congress was uncertain about the feasibility of accessibility technologies for OTRBs and concerned about inflicting significant costs for ADA compliance on OTRB freed-rate transportation providers, an industry that has been in decline for several decades. Nevertheless, Congress recognized that access to OTRB service is essential for all persons with disabilities, and the act reflects this decision. Because of these concerns, the Office of Technology Assessment (OTA) was directed to examine this complex question, so that final regulations could be as constructive and farsighted as possible.

Section 305 of the ADA instructs OTA to:

> . . . undertake a study to determine —
>
> (1) the **access** needs of individuals with disabilities to over-the-road buses and over-the-road bus service; and
>
> (2) the most cost-effective methods for providing access to over-the-road buses and over-the-road bus service to individuals with disabilities, particularly individuals who use wheelchair, through all forms of boarding options.[5]

In addition, OTA was directed to:

> . . . include, at a minimum, an analysis of the following:
>
> (1) The anticipated demand by individuals with disabilities for accessible over-the-road buses and over-the-road bus service.
>
> (2) The degree to which such buses and service . . . are readily accessible to and usable by individuals with disabilities.
>
> (3) The effectiveness of various methods of providing accessibility to such buses and service to individuals with disabilities,
>
> (4) The cost of providing accessible over-the-road buses and bus service to individuals with disabilities, including consideration of recent technological and cost saving developments in equipment and devices.
>
> (5) Possible design changes in over-the-road buses that could enhance accessibility, including the installation of accessible restrooms that do not result in the loss of seating capacity.
>
> (6) The impact of accessibility requirements on the continuation of over-the-road bus service, with particular consideration of the impact of such requirements on such service to rural communities.[6]

Within 1 year of the release of this study, the ADA requires DOT, in conjunction with the Architectural and Transportation Barriers Compliance Board, to issue regulations informing public transportation operators using OTRBs of their compliance obligations under the ADA:

> . . . taking into account the purposes of the IOTA] study , . . and any recommendations resulting from such study, each private entity which uses art over-the-road bus to provide transportation to individuals to provide accessibility to such bus to individuals with disabilities, including individuals who use wheelchairs.[7]

These regulations take effect for large operators in July 1996, and for small operators in July 1997.[8] The President can delay the implementation of these regulations by 1 year if he determines that they create an undue burden for OTRB transportation providers.

This chapter summarizes the results of the OTA assessment and highlights findings that can inform and support the DOT process. A number of references are made to later chapters, which explore aspects of the analysis in more detail.

## OVER-THE-ROAD BUS SERVICE IN THE UNITED STATES

Approximately 23,000 to 27,000 OTRBs currently operate in the United States. About 450 companies offering freed-route, regularly sched-

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[5] OTA considers the term "wheelchairs' in this context to include all wheelchairs, scooters, and similar devices, For the purposes of this report OTA uses the term ''wheeled mobility aids' to encompass all wheelchairs, scooters, and similar devices.

[6] Public Law 101-336, Sec. 305(b).

[7] Sec. 306(a) (2)(B)(ii) of the ADA. The Architectural and Transportation Barriers Compliance Board (ATBCB), established by Section 502 of the Rehabilitation Act of 1973, establishes minimum guidelines for accessibility standards pursuant to the Architectural Barriers Act of 1968 and Americans with Disabilities Act of 1990, ATBCB guidelines address only technical issues and specifications, and DOT must develop rules for any remaining operational issues.

[8] In the interim, before the final regulations wilt take effect, DOT has issued the following rule: "Private entities operating over-the-road buses. . . shall provide accessible service. . . shall provide assistance, as needed, to individuals with disabilities in boarding and disembarking . . . [and] shall ensure that personnel are trained to provide this assistance safely and appropriately. The entity may require up to 48 hours' advance notice only for providing boarding assistance . . .' *56 Federal Register 45641* (Sept. 6, 1991). The determinationof which companies are large or small is to be made by the Secretary of Transportation. Sec. 306(a)(2) (B)(iii).

uled service use 10,000 to 11,000 OTRBs on intercity routes or on local routes for airport, sightseeing, and other services.[9] Greyhound Lines, Inc., is by far the largest of these providers with roughly 2,300 OTRBs in 1992.[10] Another 3,000 companies use over 12,000 OTRBs for demand-responsive charter and tour operations.[11] In addition, a small number of OTRBs are owned by nonprofit organizations such as churches or community centers.[12] In 1992, a new, nonaccessible OTRB (with few optional features) typically cost $225,000 to $250,000. Optional features include restrooms, video equipment, audio systems, fold-out steps to reduce the first step height of the boarding stairs, and movable arm rests.




Elizabeth Robinson

*OTRB scheduled, intercity service linked roughly 6,000 communities in 1992, down from 17,000 in 1968.*

## Fixed-Route Service

Many OTRB transportation providers, especially fixed-route operators, face formidable financial circumstances. Since the 1950s, the numbers of passengers and stops served by fixed-route bus service have declined steadily (see figure l-l). The number of passengers riding on Class I intercity carriers fell from nearly 130 million in 1971 to 37 million in 1990.[13] The primary cause for this decline was direct competition with other transportation modes, especially the automobile, but also trains and airlines.

Typical intercity bus passengers differ in several ways from passengers on other intercity public transportation systems. They are more likely to be under the age of 18 or over the age of 65, to have family incomes of less than $10,000 (1977 dollars, $22,500 in 1991 dollars), and to live in either large metropolitan areas or rural areas than riders of other forms of public transportation.[14] Slightly fewer than one-half of the passengers on intercity coaches do not own an automobile capable of a 500-mile trip.[15] According to one survey, 33 percent of all bus passengers take 1 to 3 trips per year, 36 percent take 4 to 10 trips per year, and approximately 20 percent take

[9] Current estimates are that less than 5,000 OTRBs are used in fixed-route *intercity service.* Frederic Fravel, Ecosometrics Inc., personal communication, Sept. 29, 1992.

[10] Gamble Rudd, Customer Relations, Greyhound Lines, Inc., personal communication, Feb. 11, 1993.

[11] The ADA defines a fixed-route system as ". . . a system of transportation of individuals (other than by aircraft) on which a vehicle is operated along a prescribed route according to a fixed schedule. ' Sec. 301(4). Regular-route intercity OTRB service is considered fixed-route service, and OTA uscs the term fixed-route throughout this report. A demand-responsive system is defined as any public transportation system that is not a fixed-route system. Sec. 301(3). OTA concludes that charter and tour services are demand-responsive.

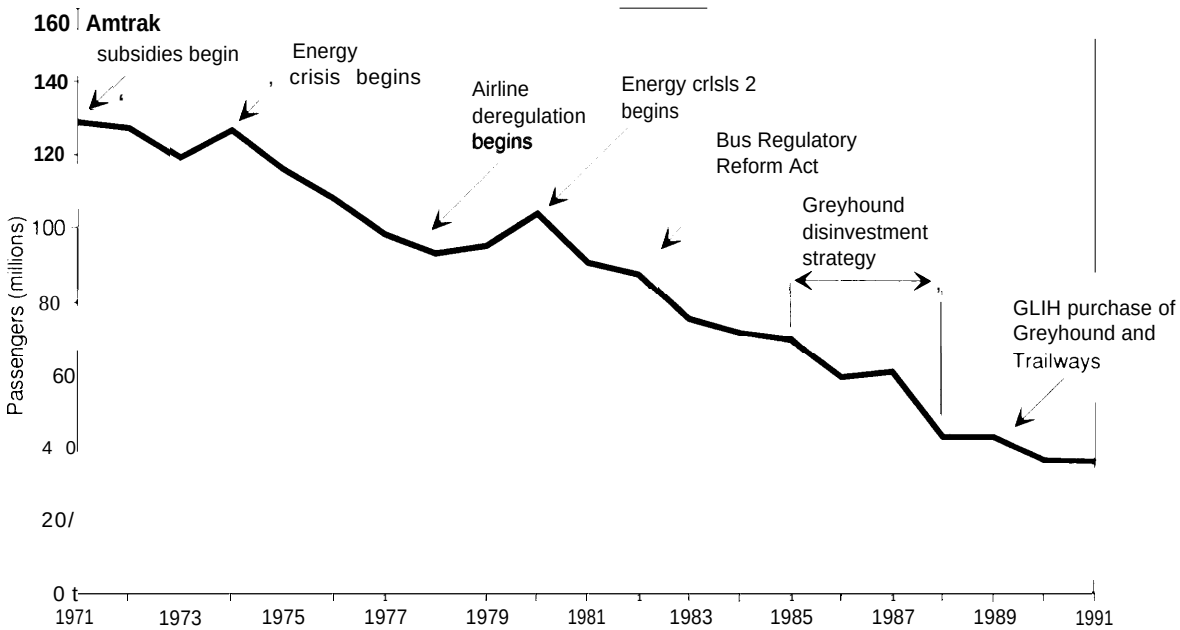
[12] Ecosometrics, Inc., ''Potential Demand for Accessible Over-the-Road Buses," OTA contractor report, August 1992.

[13] Interstate Commerce Commission (ICC) measurement of the activity of Class I carriers has varied considerably over the years. The ICC definition of Class I carriers since 1938 has been based on adjusted annual gross operating revenue in excess of a certain threshold. This threshold, initially established at $100,000, was raised to $200,000 in 1950, to $1 million in 1969, to $3 million in 1977, and to the current level of $5 million in 1988.

14 While these data date back to 1977, they are the most comprehensive data collected to date. More recent surveys, conducted by Greyhound in 1989 and 1991, show similar results.

[15] Greyhound Lines, In C., "Greyhound On Board Passenger Profile Survey, " unpublished document, 1989.

**Figure 1-1—Intercity Bus Ridership: Class 1 Carriers, Regular Route Service, 1971-91**




SOURCE: Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Second and Final Release, Passenger Carriers," unpublished reports, issued annually for the years 1970-91.

11 to 30 trips per year. Less than 10 percent take more than 30 trips per year.[16]

Until 1982, OTRB fixed-route service was regulated at both the Federal and State levels. The Bus Regulatory Reform Act (BRRA) of 1982 repealed many Federal Government restrictions on intercity bus service and preempted State regulation of service abandonment and fares. This allowed freed-route bus companies greater freedom to restructure their services and routes to maximize profits, Consequently, although intercity bus carriers had already dropped many rural points of service before the BRRA, the trend continued in the years after its enactment. In 1968, regularly scheduled intercity bus service covered approximately 17,000 points, but by 1991 the General Accounting Office estimated fewer than 6,000 points of service remained.[17]

The impact of service abandonment on rural communities is difficult to determine. Residents of many communities were able to substitute other transportation modes (primarily automobiles) and package express services (e.g., Federal Express or United Parcel Service) for intercity service and, consequently, do not report significant detrimental effects due to the loss of service. However, some individuals without access to other forms of transportation undoubtedly suffer from diminished bus service.[18]

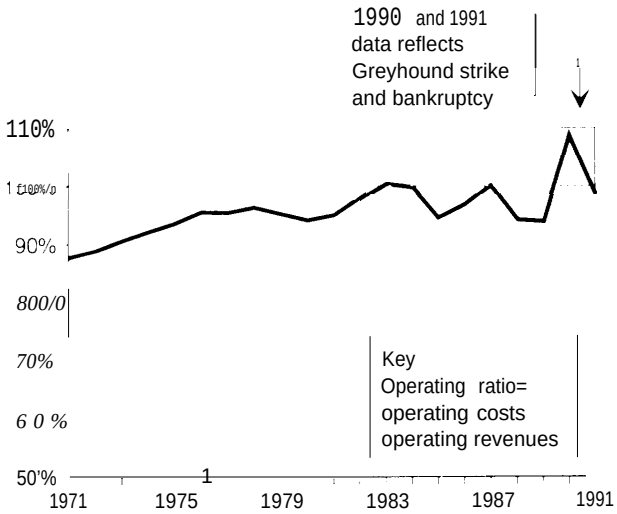
Although operators of OTRBs have restructured their service for greater profitability, companies offering fixed-route service still face

16 Greyhound Lines, Inc., "Greyhound On Board Passenger Profile Survey, " unpublished document, 1991.

17 U.S. General Accounting Office, *Availability of Intercity Bus Service Continues to Decline* (Washington DC: June 1992), P. 2. While not all of the points dropped were rural, OTRB operators indicate that most were. Remarks at Office of Technology Assessment Workshop, "Building an Accessible Intercity Bus System, " July 15, 1992.

18 Ecosometrics, Inc., "*Background* Paper on Accessibility for the Disabled and the Intercity Bus Industry, ' OTA contractor report, Mar. 31, 1991.

**Figure 1-2—Intercity Bus Industry: Class I Carriers, Operating Ratios, 1971-91**




SOURCE: Interstate Commerce Commission, Office of Economics, 'Transport Statistics in the United States: Second Release, Passenger Carriers," issued annually for the years 1971-91.

financial hardships. Figure 1-2 presents the operating ratios (i.e., the operating costs divided by operating revenues) for the Class I carriers. In 1971, their collective operating ratio was 88 percent, but it rose to a high of nearly 109 percent in 1990 and then down to a ratio of 98.7 percent in 1991. In practical terms, this means that a company with an operating ratio of 98.7 percent and revenues of $5 million would have $65,000, after deducting operating expenses.[19]

These aggregate figures obscure the fact that many individual fixed-route companies operate with deficits for extended periods. Indeed, some of these companies find it difficult to finance the purchase of even one new coach. OTA has confined its analysis to the impacts of the ADA on the future of OTRB companies, as an analysis of the overall future of the bus industry is beyond the scope of this report. It is clear that many OTRB operators are concerned that the implementation of the ADA will jeopardize their ability to continue service (see box l-B).

## Demand-Responsive Service

By reducing restrictions on charter and tour operators, considered demand-responsive operators under the ADA, passage of the BRRA in 1982 cleared the way for more companies to enter the market. The number of firms operating exclusively charter and tour services grew from fewer than 1,000 in 1982 to over 3,000 in 1990. Many fixed-route carriers also offer charter and tour services.

Charters and tours are generally arranged far in advance of the date of travel. *Charter transportation* provides group travel where the schedule, origin, and destination are set by the members of the group. A *charter tour* includes additional services, such as meals, lodging, or attractions, again at the group's request. A *retail tour* includes the same services as a charter tour but is sold directly to the public on an individual basis by the tour operator.



Elizabeth Robinson

*OTRBs in charter and tour service visit a variety of destinations, from tourist sites to baseball games.*

19 These operating ratio data are from reports made to the Interstate Commerce Commission by the carriers with operating revenues greater than $5 million (see ch. 2).

## Box l-B—An OTRB Operator Views the Future of Intercity Bus Service

In 1981, Ray Brown[1] purchased several midwestern routes from the National Trailways Bus System; the new company was called Pomona Trailways. Ray had grown up in the bus industry, working in various positions in his father's bus business before becoming president of his own.

In the past few years, Pomona Trailways has been a break-even operation, struggling to compete against airfare wars, the subsidization of Amtrak, the Greyhound reorganization and strike, and the recession. Pomona Trailways owns 11 buses, dating in age from 16 years to one brand new coach. The service runs 1,900 miles per day in regular freed-route service and also offers charter and package express services. None of the buses are accessible, although the newer coaches have an extra step for easier boarding.

Pomona serves approximately 45,000 passengers a year. Ray says in the 11 years he has been fully operational he has only had six requests for special access from individuals who use wheeled mobility aids. In two of those cases the individual had to be carried on and off the bus; the others were able to walk on and off and had their mobility aids stowed below. In addition, Pomona personnel routinely assist individuals with hearing and visual impairments in boarding and disembarking. Like other over-the-road bus operators, Pomona offers a "Helping Hand" program that allows attendants to ride at no extra charge. In one case, Ray paid his son to accompany a person with a disability for 16 hours, serving as an attendant.

Some operators believe that bus service is the last resort for travelers, whether they have disabilities or not. ''People travel by bus when there is no other way,' Ray says. "Either they don't like to fly and there is no train, they don't have a car or a license, or they can't afford any other alternative. The bus is the cheapest way to go and still people will make it their last choice. " For this reason, some operators do not believe that outfitting every bus for accessibility makes sense, because in most cases, persons with disabilities will choose the bus as a last resort. These operators doubt that making all buses accessible would ever generate enough demand to justify the cost.[2] Ray claims there is demand for accessible service within the communities in his area, but mostly in the form of vans or small buses to assist individuals in getting to work, stores, or medical appointments.

Although some operators oppose subsidies to the industry, some believe that if small operators like Pomona Trailways are forced to comply with all provisions of the Americans with Disabilities Act, the Federal Government should assist in the purchase of one or more accessible buses per operator.[3] If ridership increases as a result, and the route or service becomes profitable because of the accessibility, the subsidy could be repaid. Ray sympathizes with the need for accessible service but believes that full accessibility requirements, layered on top of already tough economic conditions, would force businesses like his under, ultimately resulting in a loss of service for everyone.

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1 "Ray Brown" and "Pomona Trailways" are fictitious names; the person and the company are real.

2 Remarks at Office of Technology Assessment Workshop, "Building an Accessible Intercity Bus System,'' July 15, 1992.

3 Ibid.

Little nonproprietary information about charter and tour passengers is available. A 1986 market research effort by one firm shows that bus retail tour patrons have a mean age of 60 and take an average of five l-day trips, 4.1 overnight trips, and 2.3 extended trips annually, primarily to socialize, attend sporting and cultural events, or go sightseeing. They have a household income of over $34,000 (1985 dollars, over $43,000 in 1991 dollars) and an average auto ownership of 1.8 autos per household.[20] This limited statistical information indicate that the median income of

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20 Lawrence F. Cunningham, ''Profiling Tour Patrons and Non-Patrons in Intercity Bus Passenger Markets," paper presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 1986.

tour patrons is much higher than that of fixed-route passengers. Both tour and fixed-route passengers are more likely to be over 65 years of age than travelers on other transportation modes.

No comprehensive data exists on the financial condition of the charter and tour industry. Anecdotal data from charter and tour companies indicate that the service is, in general, more profitable than freed-route service, but this conclusion cannot be quantified,

### Current Accessible Service

The Urban Mass Transportation Assistance Act of 1970 states that persons who are elderly or who have disabilities have the same rights as others to use mass transportation services. Despite this legislation, many publicly funded transit authorities did not purchase buses that were accessible for persons with mobility impairments.[21] In 1973, Section 504 of the Rehabilitation Act declared that:

> [N]o otherwise qualified individual with handicaps in the United States . . . shall, solely by reason of his or her 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.[22]

Under this act and Section 16 of the Urban Mass Transportation Act, the Urban Mass Transportation Administration adopted regulations in 1976 requiring federally funded transit agencies to make special accommodations for persons with disabilities. Many public transit authorities subsequently purchased new buses with lifts and other assistive technologies. As of early 1993, roughly 350 OTRBs equipped with vehicle-based lifts were operated by or under contract to publicly funded transportation systems. Government funds helped to purchase the accessibility technologies in most of these cases, Until the passage of the ADA, however, public transportation services using privately owned and operated OTRBs were not required to be accessible. (For an account of an incident that would be prohibited now under the ADA, in which OTRB service was denied to a person with a disability, see box 1-C.)

Few operators run charters and tours for individuals with disabilities. As of January 1993, Evergreen Travel Service, Inc. (Lynnwood, Washington) and Sunrise Plaza, Inc. (Los Angeles, California) were the only charter and tour operators to have purchased OTRBs with accessibility equipment for persons with mobility impairments without government funding. Evergreen, using an OTRB capable of securing 12 wheeled mobility aids and with room for attendants, runs tours all over the United States, Sunrise Plaza recently bought an OTRB with a lift, two tie-downs, and an accessible restroom. This OTRB was financed in part by a Japanese tour operator who was previously unable to include persons with disabilities in Japanese groups touring the United States. In addition, several OTRB operators provide charter and tour service with accessible vans.

Some tour operators also specialize in arranging accessible tours. For example, for the past 20 years or more, Flying Wheels Travel Service in Minnesota has acted as a travel agent and tour operator for accessible tours, mostly overseas because of the difficulty in locating accessible buses in the United States. Maryanke Tours, a tour operator in Central Michigan, began offering tours for persons with hearing impairments in 1991. These companies have identified a new market niche, responding to existing demand.

## THE DEMAND FOR ACCESSIBLE SERVICE

OTA was explicitly asked to study ". . . the anticipated demand by individuals with disabilities for accessible over-the-road buses and accessible over-the-road bus service. ' The law directs

21 Paul S. Dempsey, "The Civil Rights of the Handicapped in Transportation: The Americans With Disabilities Act and Related Legislation,'' *Transportation Law Journal*, vol. 19, No. 2, 1991, pp. 309-333.

22 Public Law 93-112, 29 USC 794(a) (1973).

### Box l-C-Raymond Smith and Janet Smith v. Greyhound Lines, Inc., 1982

Raymond and Janet Smith both have cerebral palsy. Raymond Smith uses a wheelchair; his wife Janet, although physically limited, does not. In November 1982, Raymond Smith purchased a ticket from Greyhound Lines, Inc. for bus transportation from Pittsburgh to Philadelphia, a trip of over 300 miles. Greyhound policy allows riders with disabilities to be accompanied by an attendant at no extra cost. The Smiths had previously traveled together on Greyhound under this arrangement between Pittsburgh and State College, Pennsylvania (a trip of about 140 miles). Janet Smith is able to help her husband with personal needs, such as purchasing food at rest stops, but she cannot lift him onto or off the bus without the assistance of others.

In advance of the November 1982 trip to Philadelphia, the Smiths had made arrangements for two additional people to be present to assist in boarding in Pittsburgh, and for friends to meet them on arrival to assist Raymond in leaving the bus. On arriving at the bus terminal in Pittsburgh for boarding, however, the bus driver refused to transport the Smiths and they were unable to depart for Philadelphia. In a later statement, a Greyhound official defended the driver's decision, citing the risks of road failure or accident en route that would require alighting and reboarding another bus. Greyhound reiterated its policy that, because of these possibilities, they require an attendant, at no extra charge, who can help the individual with disabilities should either of these situations arise. According to Greyhound, Janet Smith did not qualify as an able attendant.

The Smiths-denied transportation under these conditions on Greyhound buses since the November 1982 incident-filed a complaint in 1986 with the Interstate Commerce Commission(ICC), alleging that Greyhound had not complied with ICC's regulations concerning the transportation of persons with disabilities.[1] Specifically, the Smiths asked ICC to review Greyhound's actions in light of the regulations, as well as its policies and practices with regard to travelers with disabilities. Furthermore, the complaint asked ICC to order Greyhound to revise its policies with input from groups familiar with the needs of those with disabilities and to compensate the Smiths for their inconvenience, humiliation, expenses, and legal fees.

ICC ruled that Greyhound's actions in the Smith case did not violate the regulations because: 1) Greyhound did not deny transportation to Smith solely because of his disability (he had access with free passage provided to an attendant); 2) Greyhound policy expressly provides for advanced boarding and seating to accommodate persons with disabilities; and 3) it was not unreasonable for Greyhound to assume that the attendant should be capable of providing all necessary assistance to a person with disabilities en route. The decision stated that ICC rules require that carriers provide assistance "when ever possible." In addition, ICC noted that brochures provided by Greyhound clearly state that the bus driver's only job is to drive the bus and that it is reasonable for the company to want to avoid the situation where a driver alone would be forced to help a passenger with disabilities board and disembark en route, particularly in an emergency situation. Finally, the decision stated: ". . despite complainant's assurances, Greyhound had no guarantee that Mr. Smith's friends would be in Philadelphia to help him disembark. " The complaint was dismissed by ICC with one dissenting view that the Smiths had presented sufficient evidence to support a course of action.

[1] 49 CFR 1063.8.

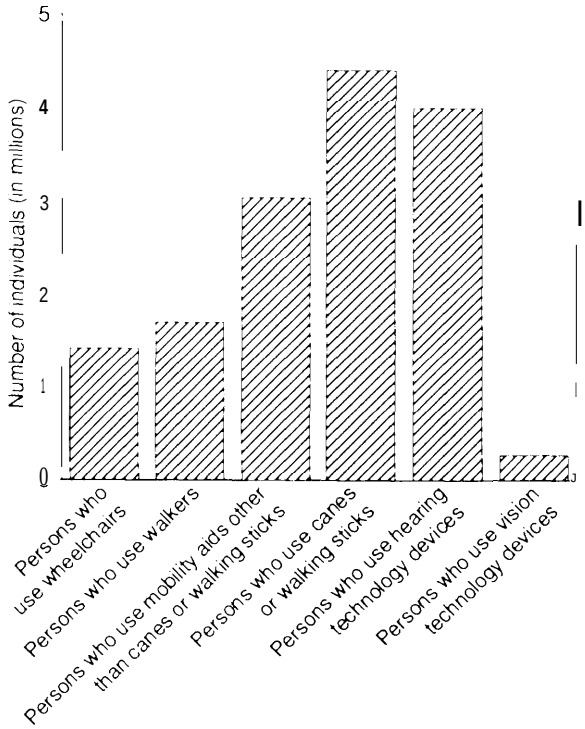
OTA to estimate how many persons with disabilities will ride accessible OTRBs; however, OTRB transportation systems must be made accessible under the law, regardless of OTA's findings about demand.

According to the 1990 National Health Interview Survey, of the total 1990 U.S. population of 249 million (figure 1-3):[23]

. 1.4 million people use wheelchairs;
• 1.7 million people use walkers;

23 These groups may overlap, because persons with disabilities may use several types of aids.

**Figure 1 -3—Populations With Disabilities in the United States**




SOURCE: U.S. Department of Health and Human Services, Centers for Disease Control/National Center for Health Statistics, "Assistive Technology Devices and Home Accessibility Features: Prevalence, Payment, Need and Trends," Advance *Data No.* 217, Sept. 16, 1992.

- 3.0 million people use one or more mobility technology devices, including wheelchairs, walkers, crutches, scooters, and other mobility equipment;[24]
- 4.0 million people use hearing technology devices; and
- 0.3 million people use vision technology devices.

This survey probably underestimates the number of persons with mobility and sensory disabilities, because it excludes persons who have disabilities but use no devices; moreover, it relies on self-identification and might exclude persons who use devices only rarely or who have temporary disabilities. However, few other databases with similar statistics exist.[25] A 1982 source estimated that:[26]

- 1.1 million people are legally blind;
- 5.0 million people have sight impairments that make travel difficult; and
- Up to 14 million people have experienced significant hearing loss.

No reliable data exist for persons with cognitive disabilities.[27] Depending on the breadth of the definition used, estimates of the number of persons with cognitive disabilities range from 1 *to* 20 percent of the population.

The U.S. population is aging. The U.S. census projects that the population of Americans 65 and over will grow from 12 percent in 1990 to almost 18 percent in 2020, and to nearly 23 percent in 2050 (figure 1-4). Because of a higher prevalence of disabilities in this age group, an increase in the population of individuals with disabilities is likely in the coming years. (For a profile of a senior citizen who uses public transportation services, see box l-D.)

Almost all individuals with disabilities are potential riders of OTRBs, but, of course, many would choose other transportation modes for the same reasons persons without disabilities choose to fly, drive, or take the train. How many persons with disabilities would ride on an OTRB after the

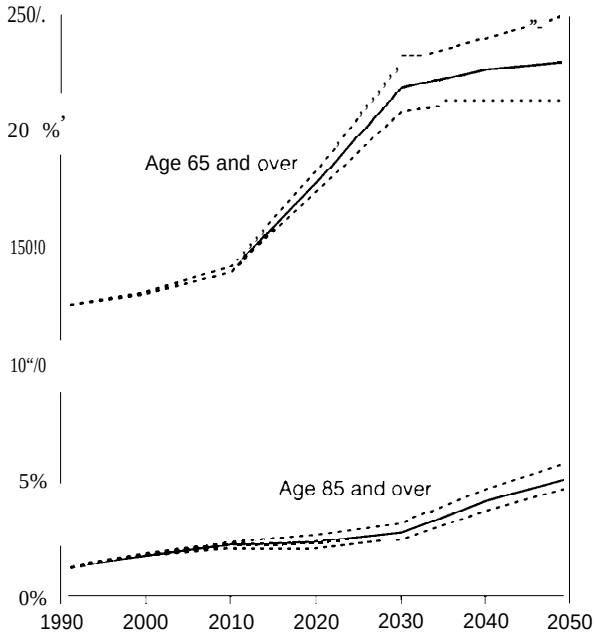
24 This number does not include persons using leg or foot braces and/or canes and walking sticks.

25 Remarks at Office of Technology Assessment Workshop, op. cit., footnote 17.

26 William H. Henderson et al., *Passenger Assistance Techniques: A Training Manual for Vehicle Operators of Systems Transporting the Elderly and Handicapped* (Fort Worth, TX: Transportation Management Associates, 1982), pp. 3-9.

27 Persons with cognitive disabilities do not often have trouble boarding or disembarking from an OTRB, but they may find it difficult to negotiate the terminal, purchase their ticket, and find the appropriate bus.

**Figure 1-4-Projected Growth of Older Population as Percentage of Total Population**




NOTE: Projections are based on a Lowest, a Highest, and a Middle Series of assumptions about fertility, mortality, and immigration.

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Projections of the Population of the United States by Age, Sex and Race: 1988 to 2080*, Current Population Reports, P-25, No. 1018 (Washington, DC: U.S. Government Printing Office, 1989).

systems are accessible? OTA has found no data to provide a reliable quantitative answer to this question.

The primary reason for the lack of demand data is the lack of experience with accessible OTRB service. Only one State-sponsored program in Massachusetts, two demonstration projects in Canada, and limited service operated by the Denver and Golden Gate transit authorities have offered accessible intercity buses on freed routes. (For a profile of the accessible OTRB service offered by the Denver transit authority, see box l-E.) Each of these services had, or has, relatively low ridership by persons with mobility disabilities. However, questions of lift reliability (especially with early generation lifts), insufficient marketing, and limited route coverage might have contributed to low ridership.

## Box I-D-Transportation Needs of a Senior Citizen

**Alice** Beringer[1] is an 84-year-old resident of a retirement home in Alexandria, VA. Several years ago she suffered a stroke and lost the use of her right arm and leg. She has learned to use her right leg with the use of a leg brace, but finds walking more than 50 feet tiring. She is unable to climb stairs.

Alice uses an electric cart to maneuver around her apartment and through the hallways of her building. When she wants to go somewhere else, however, Alice encounters difficulty because she must give up her cart and use a wheelchair that requires the assistance of another person. Alice wishes that she could find away to transport her electrical cart so that she could travel more freely without assistance. "If I could take it along," she says, "I could get off the bus and go. Now I have to have someone with me to push the chair and that is not always possible."

The retirement facility operates an accessible minibus. The minibus has a ramp that Alice says is so steep that it takes great effort to push her wheelchair onto it. Once inside the minibus, there are no tie-downs for Alice's chair, so she must move to another seat and stow her wheelchair in the back of the bus. She is not able to carry her electric cart with her on these trips, which usually take her to a doctor's appointment or to a store. In addition, Alice must have a companion travel with her, something that is not always feasible. Because of the discomfort and inconvenience of this process, Alice frequently relies on her son to provide transportation in his car, with her wheelchair stowed in the trunk. She says she travels well by car and prefers it over the minibus, which she uses only as a last resort.

Since losing full mobility, Alice has not attempted long distance bus travel, but flies when traveling long distance. She feels that the airlines "take very good care of you." However, several years ago, Alice had an uncomfortable experience in a Wisconsin airport where she had to be carried up stairs to board a plane. She says the experience was "disconcerting." Following the passage of the Americans with Disabilities Act, Alice called a major bus service to inquire about travel to Richmond, Virginia, about a 2-hour trip. The operator told her that, as there were no accessible buses, the driver would have to carry her, and she would have to travel with an attendant. Alice did go to Richmond, but by car.

[1] Alice Beringer" is a fictitious name; the person is real.

## Box I-E—Accessible OTRB Service in One Transit Setting

Denver Regional Transit District (RTD) is a public transit system serving the Denver region, including a number of routes to outlying cities on which OTRBS are used. * RTD was one of the first transit agencies in the United States to provide service specifically for persons with disabilities, in response to 1986 Federal requirements under the Surface Transportation Assistance Act. RTD offers discounted fares to individuals with disabilities and free rides to attendants. Two types of wheelchair-accessible service are available: accessible service on regular fixed-route systems, and HandiRide, a separate transit system for riders with more severe impairments.

As of late 1992, the system operated 102 intercity coaches, of which 39 are wheelchair accessible. The large number of intercity coaches and the length of the routes are unusual for a public urban transit system. Overall, 37 percent of the intercity service operates with lift-equipped coaches, with weekend routes generally 100 percent accessible. On weekday services, the percentage of accessible trips ranges from O to 55 percent, depending on the route.

OTRB lifts were first installed in 1987, when RTD asked Stewart& Stevenson Power, Inc. to design a lift for retrofitting an MC-8 coach. The lift was subsequently redesigned not only for retrofitting MC-8s but also as a factory installation on the Neoplan Metroliners and the latest purchase of MCI coaches. These MCI MC102A3 coaches ($235,400 in 1991) are all lift-equipped, seating 47 with one wheelchair tie-down available at all times, and with a second tie-down available by folding and sliding two seats on the left side of the coach. The Stewart & Stevenson Powerlift by itself cost $12,350 in 1990. The lift and tie-down locations permanently reduce seating capacity by four seats. The baggage compartment is reduced by two cubic feet for the lift pump and controls, and in some models the rear baggage compartment is no longer accessible from the right side.

Early ridership on the accessible RTD intercity routes was quite low, at one or two wheelchair-trips per month, but that level has increased over time, as more of the fleet has become accessible. Ridership is heavier on the routes RTD designates as "intercity," as compared to the 'regional' routes that use the same equipment, possibly as a result of fewer accessible buses assigned to the regional routes. The bulk of the lift usage is on the route linking Boulder, downtown Denver, and the Denver Airport, for which 57 percent of total bus trips are scheduled to use the accessible OTRBs. The daily rate of lift usage amounts to nearly 8 lift users out of approximately 2,800 total passengers.

RTD prints an Accessible Service Brochure describing its services. The Marketing Department of RTD coordinates the Handicapped Advisory Committee, comprised of RTD staff and representatives from the disability community who regularly review services and the brochure describing them. The committee has assisted in the development of sensitivity training sessions using in-class discussions, role playing, lectures, and videotapes depicting realistic situations bus operators might encounter. RTD also periodically holds open forums to solicit additional questions and input from the disability community and offers a "training bus" to groups working with persons with disabilities. A RTD Telephone Information Center provides information about intersections and bus stops that may pose difficulties for travelers and suggests alternative routes.

1 Much of the following information is from Econometrics, he., ''Evaluation of Methods to Provide Accessibility to Over-the-Road Buses and Services," OTA contractor report, August 1992.

The experience of public transit systems since buses became accessible provides an interesting counterpoint. Several cities, among them Seattle, Minneapolis, and New York, have seen ridership by individuals with mobility disabilities increase dramatically as the transit systems became more

accessible, although ridership by persons with mobility disabilities remains a small percentage of the total (see ch, 3).

## Estimating Potential OTRB Ridership

Given the limited experience with demonstration projects, OTA has attempted to extrapolate potential OTRB ridership for persons with disabilities from trip frequencies for the total population. First, "trip rates" are calculated for both freed-route and charter and tour services. A trip rate is the average number of freed-route or charter and tour trips taken by a person in the United States.

OTA estimated the fixed-route intercity per capita trip rate by taking the best estimate of U.S. fixed-route intercity ridership and dividing it by the total U.S. population. In 1990, the Interstate Commerce Commission estimated fixed-route ridership on the largest intercity carriers at approximately 28 million passengers. Increasing this number by 10 percent to account for ridership on the smaller carriers results in a figure of 31 million.[28] This figure was divided by the total 1990 U.S. population of 249 million to obtain a national fried-route trip rate of 0.125 trips per person annually .29 Similarly, three separate estimation methodologies resulted in a figure of roughly 290 million trips in 1990 for charter and tour service, and an average per capita trip rate of 1.17 trips.[30]

These trip rates are averages over the total U.S. population. Considerable debate exists about estimating OTRB trip rates for the subset of persons with disabilities, assuming all OTRB services were accessible. On the one hand, some analysts suggest that trip rates for persons with disabilities would be lower than those for the general population due to the subpopulation of persons with disabilities who have overall lower mobility, or due to the generally lower economic status of the population of persons with disabilities (i.e., they could not afford the trip). On the other hand, some researchers suggest that trip rates could be higher due to both the lower economic status of persons with disabilities (because OTRB public transportation operators are a low-cost provider) and low levels of automobile ownership. In fact, the profile of OTRB ridership resembles in many key ways



Wilderness Inquiry

*A travel group arranged this camping trip for persons with disabilities.*

28 These figures represent only intercity fried-route ridership. Ridership on other freed-route OTRB services, such as scheduled airport, sightseeing, and other services, was not estimated.

29 One important not, Concern the possibility of developing different per capita trip rates for different age groups and for urban v. rural populations. While such a breakdown of the national trip rate might be desirable, it is not feasible with available data.

30 The three estimation methodologies used, respectively are: 1) the statistical summary, *Transportation in America*; 2) American Bus Association (ABA) Annual Reports; and 3) two surveys commissioned by ABA. Econometrics, Inc., ' 'Potential Demand for Over-the-Road Bus Service by Persons With Disabilities, " OTA contractor report, July 15, 1992.

(including income, gender, and age characteristics) the profile of the population of persons with disabilities (see ch. 3). In addition, charter and tour trip rates for persons with disabilities could be higher than for the overall population if all OTRB services were accessible due to the convenience of having a tour operator 'scout ahead' to determine the accessibility of the tour route.[31]

Given these differences in opinion, OTA did not adjust the trip rates for differences in travel patterns between persons with disabilities and those without. Therefore, using the trip rates and the demographic figures developed above for fixed-route intercity service, if all OTRBs were accessible today, total trips made annually by persons with sensory and/or mobility impairments might include the following:[32]

- 180,000 trips by persons using wheelchairs,
- 210,000 trips by persons using walkers,
- 380,000 trips by persons using any mobility devices,[33]
- 33,000 trips by persons using vision technology devices,
- 140,000 trips by persons who are legally blind,
- 630,000 trips by persons who have sight impairments that make travel difficult,
- 500,000 trips by persons using hearing technology devices, and
- Up to 1.8 million trips by persons who have experienced significant hearing loss.

Similarly, for charter and tour services, total trips made annually by persons with sensory and/or mobility impairments might include the following:[34]

- 1.7 million trips by persons using wheelchairs,
- 2.0 million trips by persons using walkers,
- 3.6 million trips by persons using any mobility devices,[35]
- 0.3 million trips by persons using vision technology devices,
- 1.3 million trips by persons who are legally blind,
- 5.9 million trips by persons who have sight impairments that make travel difficult,
- 4.7 million trips by persons using hearing technology devices, and
- Up to 16 million trips by persons who have experienced significant hearing loss.

It should be stressed that these numbers are projections based on a simple model and are highly uncertain. Estimating travel demand for services not yet introduced is notoriously difficult. Travel preferences are often unique to the individual, and only data from an operational transportation system can give credible projections of future travel on that system.[36]

In addition to whatever new ridership occurs from passengers with disabilities, there could be other direct changes in demand as a result of making OTRBs accessible. For example, if the

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31 Remarks at office of Technology Assessment Workshop, Op. cit., footnote 17.

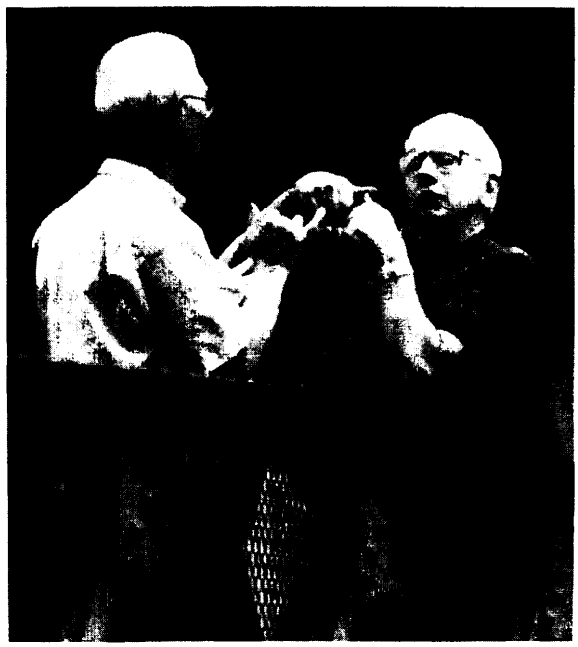
32 These figures do not include persons using leg braces or persons using canes or walking sticks, who might also require assistance, especially in the form of a lower first step, in boarding OTRBs. OTA estimates the number of fixed-route trips made annually by persons using leg braces as 110,000, and the number of fixed-route trips made by persons using canes or walking sticks at 550,000.

33 This number includes persons using crutches, walkers, wheelchairs, scooters, and other mobility equipment, but not persons using leg braces or canes and waking sticks.

34 These figures do not include persons using leg braces or persons using canes or walking sticks, who might also require assistance, especially in the form of a lower first step, in boarding OTRBs. OTA estimates the number of charter and tour trips made annually by persons using leg braces as 1 million and the number of fixed-route trips by persons using canes or walking sticks at 5.1 million.

35 This number includes persons using crutches, walkers, wheelchairs, scooters, and other mobility equipment, but not persons using leg braces and/or canes and walking sticks.

36 Demand forecasts rely heavily on Previous usage data. U.S. Congress, office of Technology Assessment, *Airport System Development,* OTA-STI-231 (Washington, DC: August 1984), pp. 159-185.


National Easter Seals Society

*A quarter million people rely primarily on sign language to communicate, but many more are fluent in it.*

provision of accessible service requires bus companies to raise rates, certain passengers who are price-sensitive may choose to ride other forms of public transportation, go by automobile, or not travel at all. On the other hand, passengers without disabilities might accompany family and friends with disabilities on OTRB trips, increasing the number of trips taken as a result of OTRB accessibility. Combined with the actual ridership of passengers with disabilities, these changes in ridership might result in either a net increase or decrease. (For further discussion, see app. A.) Indeed, since OTRB ridership fluctuates for other reasons (due to changes in the general economy and points of service), the causes of specific ridership changes will probably always be impossible to ascertain with confidence, even retrospectively.[37]

## TECHNOLOGIES FOR ACCESSIBLE OTRBS AND OTRB SERVICE

What will constitute accessible OTRBs and OTRB service? This section reviews technologies appropriate for providing accessible service, training for industry personnel, and restroom accessibility.

Technologies that help persons with disabilities ride OTRBs fall into two categories: 1) those that assist persons with mobility impairments, and 2) those that assist persons with sensory and cognitive impairments. Although the second category addresses a very wide range of disabilities, many people in this category are assisted by the same technologies.

### Accessibility for Persons With Mobility Impairments

Persons with mobility impairments include individuals who use wheeled mobility aids and those who do not. While there is much diversity within these two groups, some generalizations can be made about the technologies that can assist them.

#### **Accessibility** for Individuals Who Use Wheeled Mobility Aids

At present, to board an OTRB, most individuals who use wheelchairs or other wheeled mobility aids must leave the aid and be carried to an OTRB seat. Carrying is presently allowed in OTRB service because of the lack of other means to assist persons with mobility impairments in boarding. However, the interim DOT regulations for OTRBs state that ". . . we agree with the discussion in the Department of Justice's Title II preamble, that carrying is a disfavored method of

37 Thus, in the cost calculations presented later in this chapter, potential fluctuations in overall ridership levels due to changes in fare structures (resulting from the purchase of accessibility technologies) are not included. In addition, ridership changes due to the potential for increased crowding or delays on OTRBs are not included (see app. A).

providing assistance to an individual with a disability. '[38] The Department of Justice preamble states: ". . . carrying an individual with a disability is considered an ineffective and therefore an unacceptable method for achieving accessibility.' '[39]

OTA also notes that carrying persons aboard OTRBs has severe drawbacks:

- Many persons who use wheeled mobility aids find this method of boarding the bus frightening, humiliating, and, in many cases, physically painful.[40]
- Carrying an individual up or down stairs and transferring a person from a wheeled mobility aid to another chair involves many risks. Even if those carrying or transferring the individual are well-trained, the process is always difficult and may result in injury for any of the parties involved.[41]
- Separation from the mobility aid may incur risk for certain persons if the supportive features of that aid are not available during the trip (e.g., some persons with spinal problems require the support of certain restraints built into their mobility aids to minimize the risk of injury) .42

OTA recognizes that, in the absence of a better alternative, some persons with disabilities may find carrying an acceptable interim boarding method. However, (OTA concludes that carrying as a method of boarding assistance does not meet the ADA requirement for full accessibility.

Some bus companies have suggested using special chairs, called ''boarding chairs, " to aid persons with disabilities in gaining access to OTRBs. In order to use a boarding chair, a person with a wheeled mobility aid must first transfer from the aid to the boarding chair. BUS company personnel must then get the person in the boarding chair to the seating area of the bus by either carrying the person and chair together up the bus steps or wheeling the boarding chair up a ramp. Once on the bus, a second transfer is necessary for the passenger, this time from the boarding chair to a standard bus seat. The passenger's wheeled mobility aid is stowed in the baggage compartment. At rest stops and the end of the trip, the transfer must be repeated in reverse.

For most persons with ambulatory disabilities, there is little or no appreciable difference between carrying and using boarding chairs. Only for the most agile persons using wheeled mobility aids—those who may be able to walk a few steps unaided--does transfer to a boarding chair involve less risk or less discomfort. Most people fmd this method of boarding assistance trying; all participants are put at increased risk of injury; and separation from the supportive features of some assistive technologies can be harmful for some persons with disabilities. In addition, DOT regulations for all other forms of public transportation (except air travel, see box l-A) specifically forbid transportation entities from requiring wheeled mobility aid users to transfer to a vehicle seat. The entity may provide information on the risks of not doing so and make a recommendation, but the

38 The interim regulations go on to state that: "[H]owever, since accessible private OTRBs cannot be required by this rule, there maybe times when carrying is the only available means of providing access to an OTRB, if the entity does not exercise its discretion to provide an alternative means. It is required by the rule that any employee who provides boarding assistance-above all, who may carry or otherwise directly physically assist a passenger-must be trained to provide this assistance appropriately and safely. " 56 *Federal Register 45756* (Sept. 6, 1991).

39 U.S. Department of Justice, ''Nondiscrimination on the Basis of Disability in State and Local Government Services, ' 56 *Federal Register 35709* (July 26, 1991).

40 Remarks at Office of Technology Assessment Workshop, "OTRB Accessibility Technologies for Persons With Disabilities, " Mar. 17, 1992.

41 John V. Basmajian and R. Lee Kirby (eds.), *Medical Rehabilitation* (Baltimore, MD: Williams and Wilkens, 1984), p. 247.

42 Remarks at Office of Technology Assessment Workshop, op. cit., footnote 40.

final decision on such a transfer is up to the passenger.

OTA concludes that, to meet the requirements of the ADA, accessible boarding assistance devices must allow persons to remain in their wheeled mobility aids. Such devices include level-change devices that travel with the OTRB or remain at a station, and ramps that meet the appropriate slope requirements (i.e., with a slope of 1 to 12)[43]

At present, OTRB operators may choose from several safe and reliable level-change devices. Some are housed aboard an OTRB, while others are kept at stations. Most of these devices have been operationally tested in transit systems or demonstration projects. Manufacturers have developed several reliable products to meet the growing demand, but the manufacture of accessibility technologies for OTRBs is essentially a young industry. Better technologies at more affordable prices will eventually become available. In fact, several new prototype technologies are currently in development. (For more details, see ch. 4.)

In addition to vehicle- or station-based level-change devices, OTA finds that, in order to meet the requirements of the ADA, accessible OTRBs must be equipped with at least one door wide enough to accommodate a wheeled mobility aid, and with at least two accessible tie-down placements.[44] DOT presently specifies that public transportation vehicles over 22 feet in length (excluding OTRBs) must be equipped with two tie-down locations.[45] Although OTA recognizes that, in some cases, more than two passengers who use wheeled mobility aids may want to ride a specific OTRB, it is questionable whether OTRB service is sufficiently different from other forms of public transportation to warrant a change in this policy.


Motor Coach Industries

*A man in a wheelchair uses one of several available OTRB vehicle-based lifts.*

The technologies used to secure passengers in their wheeled mobility aids aboard OTRBs are still evolving. Several of these tie-down technologies are used aboard transit buses, but few have

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43 A related concern is the need to plan for evacuation of persons in the event of an emergency en route. Although on-tie-road OTRB breakdowns are not a regular occurrence, they are not uncommon. One possible solution might be a regulation specifying that OTRBs not equipped with their own lift or ramp (i.e., those equipped for use with station-based level-change devices) carry a collapsible ramp and boarding chair in order to take persons with mobility impairments off the OTRB or to transfer them to a replacement OTRB. This ramp would not necessarily have to meet ADA requirements for ramps used as routine level-change devices, but must be safe, reliable, and easy to use.

44 In the preliminary draft for the interim Federal regulations for both publicly and privately owned OTRBs promulgated on S@. 6, 1991, the Architectural and Transportation Barriers Compliance Board (ATBCB) suggested a minimum clear width for the door of 32 inches to allow for the passage of persons using wheelchairs or crutches. The American Bus Association (ABA) responded to the draft regulations stating that "... the 32 inch clear width requirement for [front] doors could not be met without major structural changes to the vehicle forward section, suspension and running gear components, and recommended a clear width of 30 inches if a width of 27 inches is allowed when structural members preclude the wider door." ATBCB agreed to the ABA recommendation, since the ADA prohibits the interim requirements from imposing structural changes on OTRBs. ATBCB has not yet made any decisions regarding OTRB technical specifications. 56 *Federal Register 45557* (Sept. 6, 1991). A second door maybe required to meet a width standard of 32 inches.

45 Vehicles under 22 feet in length (excluding automobiles and vans with a seating capacity of less than eight) must *have* one tie-down location.

been fully tested for OTRB use. OTA finds that further testing and evaluation for safety and effectiveness are needed for tie-down technologies. Movement restriction standards for wheelchairs and scooters in tie-downs and the safety of these aids in tie-downs during crash situations must also be reviewed for **OTRB** intercity, charter, and tour use (see ch. 4).

### Accessibility for Persons Who Do Not Use Wheeled Mobility Aids

Many level-change devices and bus modifications are designed specifically for persons using wheeled mobility aids, but may not accommodate persons who use walkers, crutches, or other devices. In particular, some bus doorways are not tall enough to accommodate persons walking off a level-change device. **OTA** concludes that accessible level-change devices must be equipped for persons with all types of mobility impairments (i.e., they must allow individuals to use the level-change device without crouching or experiencing other undue discomfort).%

In addition, while many persons with mobility impairments are sufficiently ambulatory to negotiate OTRB stairs, seats, and aisles, certain OTRB features provide greater risk and inconvenience to these passengers. To address some of these problems, DOT already requires new OTRBs to include slip-resistant flooring, handrails, stanchions, and a minimum clear width for doorways. However, DOT is awaiting the findings of this OTA report to determine whether to require a reduction of the initial step height into an OTRB (currently 16 to 17 inches). OTA has found that such a reduction would be useful and would allow persons with many types of mobility impairments to board more easily and quickly; for example, people with crutches and canes and the frail elderly would benefit immediately .47 Therefore, OTA recommends that accessible OTRBs have means to reduce the height of the first step. Three currently available options (a retractable front step, a kneeling feature, and a step box) all reduce the first step height to 8 to 12 inches.

In addition, movable arm rests on OTRB seats make it easier for persons with mobility impairments to be seated. OTA concludes that some seats (preferably all aisle seating) on accessible OTRBs must be equipped with movable arm rests. Unless all arm rests on an OTRB are movable, signage must indicate priority seating for persons with disabilities. (Movable arm rests are currently a common optional feature on most new OTRBs.)

## Accessibility for Persons With Sensory and Cognitive Disabilities

Persons with sensory and cognitive disabilities do not often have trouble boarding or disembarking from an OTRB, but they may find it difficult to negotiate the terminal, purchase tickets, and find the appropriate bus. While the specific problems faced by persons with sight, hearing, and cognitive disabilities are very different, the problems have the same root cause, which is difficulty in communicating and receiving information. These difficulties are relevant to all modes of transportation, Because they are not unique to OTRBs, they are not explained in depth in this report.

DOT has addressed concerns for persons with sensory impairments in its present regulations, which require privately operated OTRBs to provide additional lighting in doorways and stepwells and contrasting step edges.[48] Over and above these issues, however, persons with sensory and cognitive disabilities often have difficulty communicating with bus company employees and receiving important information. **OTA** finds that OTRB operators will need to pro-

46 Such a requirement is often interpreted to mean the use of a door into the OTRB that is at least 68 inches high.

47 Remarks at Office of Technology Assessment Workshop, Op. cit., footnote 40.

48 DOT has also issued regulations for station and terminal accessibility under the ADA.




*Many transportation systems already use video display terminals and similar technologies to help all passengers, including those with sensory and cognitive impairments.*

vide a range of methods of communicating with persons who have sensory and cognitive disabilities, both on and off the bus.

There are many ways to improve communication with persons with sensory and cognitive impairments. At present, most OTRBs are equipped with public address systems and signage indicating the destination of the bus. These simple technologies satisfy most communication needs. However, OTRB operators may wish to train workers further to interact with persons with sensory and cognitive impairments. They may also choose several versatile technologies already in use in many transportation settings, such as posters, changeable information displays, video display terminals for reporting arrival and departure information in terminals, and color-coding (or symbol-coding) of OTRBs, to allow persons with sensory and cognitive disabilities to better identify specific coaches.[49] For example, color-coded OTRBs and tickets can help persons who cannot read (as well as those who cannot read English) find the appropriate OTRB.

## Training

Good staff training in both equipment use and people skills is vital to ensure the safe and courteous operation of any transportation system, especially one serving persons with disabilities. Employees must be aware of and respond to the needs of those passengers most likely to require special assistance, and understand the policies and procedures of the operator with respect to such passengers. DOT currently mandates that:

> [E]ach public or private entity which operates a fixed-route or demand-responsive system shall ensure that personnel are trained to proficiency, as appropriate to their duties, so that they operate vehicles and equipment safely and properly assist and treat individuals with disabilities who use the service in a respectful and courteous way, with appropriate attention to the difference among individuals with disabilities.[50]

This performance standard allows for improvements in training practices as they develop, and OTA finds that this rule is adequate to ensure appropriate training. Several training programs developed by public transit systems to educate their personnel could be modified for the OTRB industry, and at least one company in Massachusetts has a training program specifically tailored to OTRB service. Bus company personnel must pay special attention to the needs of persons with disabilities who are negotiating a station, purchasing tickets, and boarding and disembarking from OTRBs. For charters and tours, this might also encompass services at travel destinations.

## Restrooms

Onboard restrooms or sufficiently frequent rest stops are essential for *all* OTRB passengers, including persons with disabilities. Section 306 of the ADA prohibits DOT from requiring an

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49 The ADA requires telecommunications companies to provide relay services for persons with hearing and speech impairments at no additional charge to the users. These relay services allow for communication that is functionally equivalent to two-way voice communication. Thus, bus companies will not need to invest in telecommunications devices for the deaf (TDD) or other such equipment for reservation or information services by telephone.

50 *56 Federal Register* 45641 (Sept. 6, 1991).

accessible restroom aboard an OTRB if it results in the loss of seating capacity. However, the only restrooms OTA found in production or under development reduce seating capacity .51 Thus, with today's technologies, DOT cannot require an accessible restroom aboard an OTRB. The only alternative available to DOT for providing adequate restroom access for persons with disabilities is to require sufficiently frequent rest stops. This, however, runs directly into a legal, not technical, issue relating to express service.

Section 302 of the ADA defines as discrimination the failure to make reasonable modifications unless making such modifications would fundamentally alter the nature of the services. For OTRB service, this raises the question as to whether long, nonstop trips (i.e., express service) would be altered by a requirement for frequent stops to accommodate persons with disabilities who could not use an onboard, nonaccessible restroom. Some express service provides passengers with nonstop service between major destinations, such as large cities, with trip lengths up to 5 to 6 hours. Assuming that rest stops would be necessary every 1 1/2 to 2 1/2 hours, and that such stops would take 15 to 30 minutes, it appears that more frequent rest stops might indeed alter the nature of this kind of bus service. Thus, at present, the provision of restroom service on long-duration OTRB runs for persons with disabilities may be legally impossible to require.

OTA cannot resolve these legal questions, but points out that prolonged lack of access to restrooms is not compatible with accessibility. It is unreasonable to force any passenger to endure the discomfort that comes from a prolonged period with no access to a restroom. OTA finds that OTRBs cannot be designated accessible until OTRB operators provide sufficiently frequent access to restrooms for persons with disabilities, either through on-board accessible restrooms or through providing appropriate stops.[52]

## STANDARDS, IMPLEMENTAION, AND COSTS

This section discusses the standards for accessible service for fixed-route and charter and tour operators set forth in the ADA, implementation requirements for OTRBS, and the costs of complying with these accessibility standards. In addition to the regulations already put forward by DOT for accessible OTRBS, OTA defines an *accessible OTRB* as one with:

- **access** to level-change devices (onboard or at stops) that allow individuals to stay in their wheeled mobility aids,
- a sufficiently wide door to accommodate persons with mobility impairments,
- two wheeled mobility aid tie-downs,
- movable arm rests,
- a means to communicate with persons with sensory and cognitive disabilities, and
- provisions for the use of accessible restroom facilities.

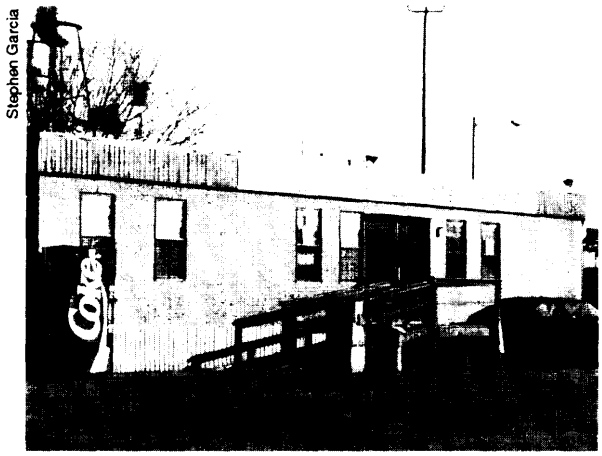
For freed-route transportation systems, with the exception of publicly owned companies that operate OTRBs, the ADA requires private operators to install accessibility technologies when purchasing or leasing a vehicle.[53] Eventually, *all* scheduled freed-route service will use accessible

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51 For example, in 1991 the State of California purchased 22 Neoplan Metroliners with accessible restrooms, which permanently displaced a minimum of three seats on each OTRB. Econometrics, Inc., ''Evaluation of Methods to Provide Accessible Over-the-Road Buses and Services, '' OTA contractor report, July 31, 1992, p. 141.

52 Many transit buses and some OTRBs are equipped with stop request buttons or cords, which alert the driver to a passenger request to disembark. Such a technology might allow persons with disabilities and other passengers to signal the driver for requests for information or restroom access.

53 DOT has interpreted this standard in parallel with other transportation modes covered by the ADA to mean that OTRBs must be accessible when purchased or leased, and accessibility technologies must be installed if the vehicle is remanufactured to extend its lifetime for 5 years or more. 56 *Federal Register 45631* (Sept. 6, 1991).




*OTRB stations differ greatly, so a single accessibility technology may not be practical in all situations.*

vehicles.[54] In the case of privately operated OTRBs, there is some debate about whether DOT has the latitude to promulgate regulations under a different, perhaps lesser, standard of accessibility. However, OTA expects that the same standard of accessibility will be applied to all private operators of public transportation within the jurisdiction of the ADA (see box l-A). Therefore, OTA anticipates that the ADA's standard of accessible service for fixed-route private operators of other public transportation systems extends to fixed-route service using OTRBs. In other words, to meet the requirements of the ADA, all OTRBs purchased or leased for use in fixed-route service must be accessible.

Charter and tour services meet the definition of demand-responsive systems. For demand-responsive transportation systems (other than those using OTRBs and automobiles), the ADA has required each private operator to

> . . . operate such system so that, when viewed in its entirety, such system ensures a level of service to individuals with disabilities . . . equivalent to the level of service provided to individuals without disabilities.

When purchasing a new vehicle, the ADA requires these private operators to purchase an accessible vehicle, unless the operator can show that the system, when viewed in its entirety, provides the same level of service to individuals with disabilities as to those without. As with fixed-route service, OTA anticipates that the ADA's standard of accessibility for private operators of other demand-responsive transportation systems applies to demand-responsive services using OTRBs (i.e., charter and tour operations). In other words, to meet the requirements of the ADA, private operators of demand-responsive OTRB service must eventually have access to enough accessible OTRBs to accommodate the demand.[55]

## Implementing OTRB Accessibility

The ADA specifies that private, freed-route, public transportation operators (those that do not utilize OTRBs, automobiles, or vans with a seating capacity of less than eight) phase in accessible service at the time of the purchase or lease of a vehicle.[56] The ADA does not require retrofitting existing vehicles.[57] OTA finds that this is also the most efficient method of introducing accessible vehicles into an OTRB transportation system, since it allows maximurn flexibility

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54 The ADA does not allow operators to provide accessible service through the use of alternative accessible vehicles or through reservation systems used solely for persons with disabilities. For example, a tour operator could not provide accessible service with an accessible van that transports passengers with disabilities while the rest of the tour patrons ride in an OTRB.

55 When the company needs t. purchase or lease an OTRB, it must buy or lease an accessible vehicle, unless it has met this standard. (No retrofitting is required.) The test of how many OTRBs are enough to provide accessible service is loose. Most fundamentally, if persons with disabilities request accessible service and are turned away a number of times (where the number is yet to be determined by DOT, law, or precedent), then the company has too few accessible OTRBs available.

56 See Sec. 304@)(4) and 302(b)(I)(D)@) of the Americans with Disabilities Act of 1990.

57 56 *Federal Register* 45532 (Sept. 6, 1991).

**Table l-l—Accessible OTRB Terminology**

An *accessible* ***over-the-road bus (OTRB)*** **has:**
- **access to level-change devices (onboard *or* at stops) that allow individuals to remain in their wheeled mobility aids**
- **a sufficiently wide door to accommodate persons with mobility impairments**
- **two wheeled mobility aid tie-downs**
- **movable arm rests**
- **a means to communicate with persons with sensory and cognitive disabilities**
- **provisions for the use of accessible restroom facilities**

A ***trave/er-comp/ete OTRB*** **is:**
- **an accessible OTRB *with* a vehicle-based level-change device**

**A** *trave/er-ready* ***OTRB is:***
- **an accessible OTRB without a vehicle-based level-change device, which relies on station-based level-change devices to elevate passengers with mobility impairments to the passenger deck**

***Accessible service is:***
- **the part of a transportation system that uses accessible vehicles**

SOURCE: Office of Technology Assessment, 1993.

to the operator while preventing the purchase of nonaccessible equipment[s] (see app. A).

The time period between the issuance of the DOT regulations and full accessibility of OTRB transportation systems will most likely stretch over the lifetime of an OTRB—roughly 20 years.[59] some owners ***may turn*** over their fleets more quickly, implementing accessibility technologies as they purchase OTRBs, while others may allow their fleets to age. Much may depend on the resale market for OTRBs, which is often unpredictable. During that 20-year period, OTRB companies will deploy increasing numbers of accessible buses, but the whole system will not be accessible until every OTRB is accessible in fixed-route service and enough vehicles are accessible in demand-responsive service.

When an OTRB has an accessible door, two tie-downs, movable arm rests, provisions for the use of accessible restrooms facilities and means to communicate with persons with sensory and cognitive disabilities (i.e., the ‘‘nonlevel-change accessibility features’ ‘), and has a vehicle-based level-change device, it provides accessible service wherever it goes. OTA calls this OTRB a ‘‘traveler-complete *OTRB” (see* table l-l). If an OTRB is outfitted with the nonlevel-change accessibility features but no vehicle-based level-change device, it is only accessible when it arrives at stations outfitted with station-based level-change devices. OTA calls this a ‘‘traveler-ready *OTRB,” In this* section, OTA addresses several implementation issues concerning the purchase of different types of equipment and the availability of accessible service to persons with disabilities.

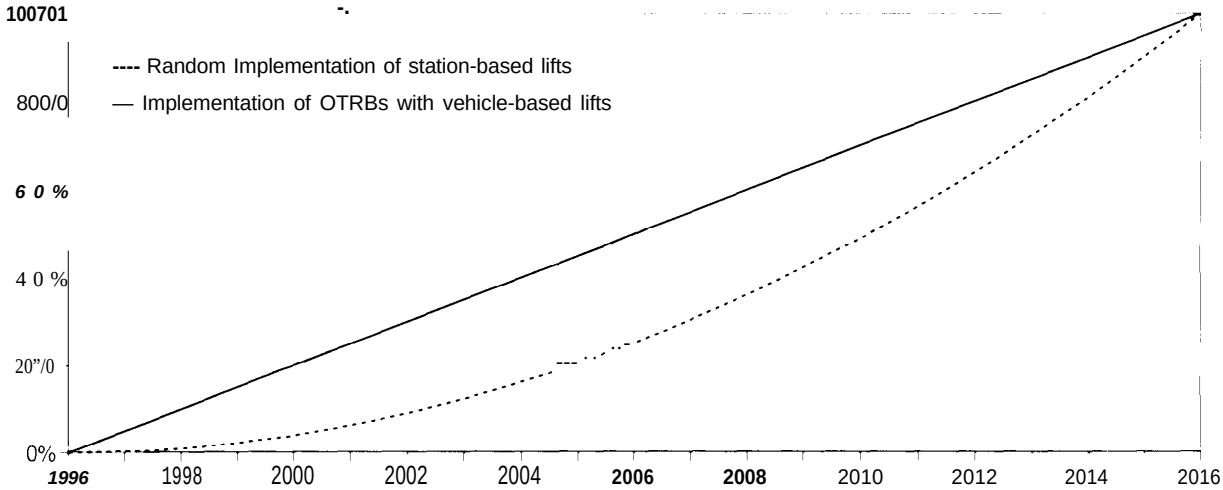
### Fixed-Route Service

The implementation of accessible service for any fixed-route OTRB provider will reflect that company’s specific needs and capabilities. Implementation strategies are likely to combine traveler-complete and traveler-ready OTRBs. While the purchase of station-based level-change devices sounds appealing as a quick, low-cost route to

58 The law instructs OTA to determine the ‘‘most cost-effective’’ methods of providing access to OTRBs and OTRB service. OTA has found no precedent in case history that provides a definitive definition of most cost-effective. However, the Office of Management and Budget (OMB) defines ‘ ‘cost-effective analysis in the case where benefits cannot be quantified (as is the case in this problem) to mean an analysis to find the least costly approach. OMB Circular, No. A-94, Oct. 29, 1992, p, 4. Consequently, OTA defines the most cost-effective method to mean the least costly method of providing accessible service within the requirements set forth by the ADA.

59 OTRB companies may purchase many nonaccessible OTRBs before the regulations go into effect, delaying purchases of accessible vehicles,

**Figure 1-5—Percentage of Accessible Boarding Opportunities, 1996-2016: Two Scenarios**




SOURCE: Office of Technology Assessment, 1993.

implementation, OTA analysis has determined that in many situations a decision to implement accessible service with traveler-complete vehicles may serve all parties best.

Traveler-complete OTRBs are accessible wherever they go; traveler-ready OTRBs are not, unless there is a station-based level-change device at every stop. If 10 percent of a fixed-route fleet of OTRBs are traveler-ready, 10 percent of the stations have station-based level-change devices, and the OTRBs and station-based level-change devices are randomly distributed, then only 1 percent of the scheduled stops would be accessible. Even if the station-based level-change devices are placed advantageously, the number of accessible scheduled stops by the OTRBs could never exceed the number of stops that would be accessible were the OTRBs equipped with vehicle-based level-change devices. In terms of the number of accessible scheduled stops, therefore, if station-based level-change devices are introduced along with traveler-ready OTRBs, accessible service will increase more slowly than if only accessible OTRBs with vehicle-based level-change devices are chosen[60] (see figure 1-5).

In addition to these problems, the use of traveler-ready OTRBs will present DOT with a more complicated regulatory environment. OTRB operators may not ensure that traveler-ready OTRBs are matched with a station-based level-change device to board passengers, so a regulatory structure may be necessary to achieve accessible service.

While there are many potential schemes that DOT could use to monitor bus companies compliance using traveler-ready OTRBs, OTA finds that one option is preferable. Under this option, DOT would instruct companies to operate traveler-ready OTRBs on routes where all of the stops have station-based level-change devices. This strategy provides the same amount of accessible service with traveler-ready OTRBs as provided by traveler-complete OTRBs on the same routes. Since this option is tied to the purchase of

60 This comparison assumes that OTRBs with lifts and OTRBs without lifts will be purchased at the same rate.

vehicles, it also provides flexibility to the bus company and it is enforceable without registration of an ‘‘accessibility plan’ with DOT.

For these reasons, OTA finds that operators providing fixed-route service must operate a traveler-ready bus primarily on routes where the stops are equipped with station-based level-change devices. Since OTRBs break down and scheduling difficulties can arise, bus companies cannot always operate every one of their OTRBs on set routes, and some flexibility is needed. Therefore, DOT could allow new traveler-ready **OTRBs** in the interim before full accessibility is achieved to have, for example, a maximum of 10 percent of their scheduled stops in a given month at stations not equipped with a station-based level-change device. Or DOT may wish to allow a delay—for example, 2 years—between purchase of traveler-ready buses and equipping all of the stations those vehicles serve with station-based level-change devices.[61]

Some bus companies cannot schedule their bus fleets so that certain OTRBs run primarily on specific routes. These companies will have difficulty meeting accessibility requirements using both traveler-ready and travel-complete vehicles. While it might serve the companies’ economic interests to adjust their operations to have a specific set of buses on certain routes, they may find that they are actually best served by purchasing only traveler-complete OTRBs.[62]

Another problem with implementing accessible service in a fixed-route OTRB system is how best to offer accessible OTRBs before complete accessibility is achieved. One way to designate accessible service is to publish schedules showing which routes and times are served by an accessible bus. Another way to match persons with disabilities to accessible service is to allow such persons to make reservations. The ADA does not allow the mandatory use of a reservation system by persons with disabilities when persons without disabilities are not also required to use it; however, while recognizing certain limitations,[63] OTA finds that reservation systems in use by companies for the general public could be employed to maximize the use of accessible vehicles.

OTA concludes that companies using a reservation system for every passenger must make a good faith effort to provide accessible service to individuals with disabilities who give notice, for example, 24 hours ahead. Companies that do not employ such a reservation system must publish schedules with clear designations of routes and times served by accessible vehicles, and, for the OTRB routes and times that are not accessible, the company

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61 In an alternative Option that does not implement accessibility as efficiently, DOT could mandate an implementation schedule in which increasing percentages of the total number of stops that will eventually use station-based lifts receive such lifts (e.g., 25 percent after 5 years, 50 percent after 10 years, and so on). However, this option may not bear any relation to OTRB investment cycles. For instance, such an implementation schedule could result in bus operators purchasing station-based lifts before there are sufficient traveler-ready OTRBs. In addition, an implementation schedule would require OTRB operators to register with DOT their plans to make their systems accessible, in order to show compliance with the regulations, and it may be difficult for companies to certify that these plans are acceptable since they involve decisions over a long time period.

62 In addition while Capital costs for station_ based lifts may be lower than for vehicle-based lifts, and **Station-bred** lifts displace “**baggage** or seating capacity, the number of station-based lifts required on certain routes, the cost of storing a lift onsite, and other factors may combine to increase the cost of implementing a station-based lift scheme beyond than of vehicle-based lifts (see app. A).

63 One limitation is that, even if all passengers use the same reservation system, passengers who do not need boarding assistance have the option of purchasing a ticket at the last minute. Yet riders who need boarding assistance do not have this option since they may not be able to board if the vehicle is not accessible to them. This point also shows one reason why a reservation system in conjunction with a number of trtivclcr-complete OTRBs could never satisfy the requirements of the ADA to provide a fully accessible fixed-route OTRB system.

Stephen Garcia



*Charter and tour transportation destinations change and vary. Therefore, operators may prefer accessibility technologies that travel with the vehicle.*

can specify that persons call in advance if, and only if, they need boarding assistance.[64]

### Charter and Tour Service

OTA anticipates that charter and tour operators will avail themselves of only traveler-complete vehicles, because they will never be able to ensure that every stop will have a station-based level-change device. However, charter and tour companies could explore pooling arrangements as a means to provide more cost-effective accessible service.

Pooling arrangements arise when bus companies share equipment. Insurance coverage is attached to the company that employs the driver, and other costs are apportioned. Similar arrangements, in which access to lift- or ramp-equipped vehicles would be provided, could satisfy the demand-responsive requirements of providing accessible service. In other words, when persons with disabilities make arrangements with a charter and/or tour company, the company could arrange for the use of an accessible OTRB through a pooling agreement established prior to the request for service. For many companies, especially small ones, pooling arrangements could reduce the cost of providing demand-responsive accessible service, since fewer accessible vehicles may need to be purchased.

However, OTA finds that current pooling arrangements are not sufficient to assure accessible service. First, pooling agreements are not widespread throughout the industry, and they often allow companies to renege if they need the OTRB for another purpose. Second, if the demand for accessible coaches exceeds availability, then companies in a pool must determine whether and how they will purchase another accessible coach. To address these problems, DOT could require that pooling arrangements used to satisfy the demand for accessible service specify stringent obligations for participating companies. In addition, DOT could make the conditions that lead to the purchase of additional accessible service capacity more explicit for all companies. If pooling arrangements to provide accessible service were sufficiently stringent, OTA finds that DOT could consider certain pooling agreements acceptable as part of a demand-responsive system "in its entirety," and could

64 At first glance, it appears that the reservation system could be made voluntary along with a system where specific routes and OTRBs were designated as accessible in published schedules, but a second glance reveals a fundamental conflict. Any OTRB made available for a pickup requested by reservation would be most likely taken from a route that had been designated as accessible in a schedule. This reallocation of the bus would disrupt service for persons with disabilities who ride the accessible route that the bus normally serves.

**Table 1-2—Reasonable Cost Estimates for Implementing Accessibility Technologies (excluding accessible restrooms) on OTRBs, Over the Lifetime of an OTRB**

| | |
|---|---|
| Capital costs of level-change devices | $7,000 to $17,000 per vehicle-based lift ($4,500 per station-based lift) |
| Capital costs of a second door, 2 tie-downs, collapsible seats, and movable arm rests | $5,000 to $7,000 per vehicle |
| Maintenance costs of level-change devices (including capital expenses for overhauls) over time with no discounting | $5,000 to $13,000 per vehicle-based lift ($2,700 per station-based lift) |
| Revenue over time with no discounting | $5,000 gained to $3,000 lost per vehicle[a] |
| Totals | |
| Total cost outlays assuming funds on hand | $20,000 to $35,000 per traveler-complete OTRB ($1 1,000 per traveler-ready OTRB) |
| Total costs assuming funds on hand arid discounting over time | $18,000 to $31,000 per traveler-complete OTRB ($1 1,000 per traveler-ready OTRB) |
| Total cost outlays assuming borrowing for capital expenses | $30,000 to $56,000 per traveler-complete OTRB ($19,000 per traveler-ready OTRB) |
| Total costs assuming borrowing for capital expenses and discounting over time | $22,000 to $39,000 per traveler-complete OTRB ($15,000 per traveler-ready OTRB) |

a This figure depends on the number of seats or amount of baggage space lost due to the presence of a vehicle-based lift. Revenue gains are realized due to the increase in ridership from persons with disabilities.

SOURCE: Office of Technology Assessment, 1993.

allow the pooling of accessible buses to accommodate demand for accessible service.[65]

## Costs of Accessibility Technologies

The primary costs of implementing accessibility technologies can be classified into three categories:[66]

1. capital costs (including the cost of the level-change device, any major repairs involving replacement parts that may be needed as the device ages, and features related to the main OTRB structure);
2. maintenance (including routine cycling of the lift and maintenance checks); and
3. lost revenue (that might result from reduced seating or baggage and package storage capacity).

Table 1-2 summarizes OTA's calculations of the costs for one new OTRB to be outfitted and operated with accessibility technologies (not including an accessible restroom). These estimates follow critical assumptions made by OTA (see app. A). As with all future cost estimates, there is a high degree of uncertainty.

While OTA has developed a detailed model to estimate costs for implementing OTRB accessibility (see app. A for description of the model and calculations), these cost issues can be understood in a simpler context. Additional capital costs for

65 Pooling could also be allowed for fixed-route carriers, but this does not alter the requirement for accessibility when all fixed-route vehicles are purchased or leased.

66 This list does not include employee training costs, because OTRB operators already incur such costs. Appendix A discusses other excluded costs.

accessibility features run in the neighborhood of $12,000 to $25,000. Total real costs, including capital expenditures, maintenance, and lost (or gained) revenue over time, range from $18,000 to $40,000.

Since it costs roughly $2.00 to operate an OTRB for 1 mile in freed-route service, a typical OTRB running for 1.5 million miles costs $3 million to operate. These expenses are for payroll, insurance, maintenance, fuel, and other costs (see ch. 2). In addition, new OTRBs typically cost $250,000. Comparing the additional capital, maintenance, and revenue costs for accessibility to these capital and operating costs reveals that accessibility costs are in the neighborhood of 1 percent of the total operating costs.

Two accessible restrooms were in production or development in late 1992: one produced by Neoplan that costs $2,000 in additional bus modifications (over and above an OTRB with a nonaccessible restroom) and permanently displaces three seats; and a prototype made by MCI (for a 45-foot coach) that is estimated to cost $30,000 more than a nonaccessible restroom and permanently displaces seven seats (no additional seats are lost due to tie-down occupancy).[67] Assuming the installation of an accessible restroom similar to the Neoplan restroom and a low-cost lift ($7,000) carried in the baggage compartment, it costs on average $29,000 to $34,000 more than a standard nonaccessible OTRB over 20 years for the additional real capital and operational costs of this OTRB. Assuming the installation of an accessible restroom and lift package combining the MCI restroom and a medium-cost lift,[68] it costs on average $66,000 to $81,000 more over 20 years to operate this OTRB (see app. A).

## Cost of Accessibility Technologies in Fixed-Route Intercity OTRB Service

The results presented above for one accessible bus or station can be used to infer the implementation costs of a completely accessible OTRB fleet. OTRB operators will purchase accessible OTRBs when the need arises and funds are available. Thus, buses will be phased in over time as other buses are retired.

If OTRB operators can choose to purchase traveler-complete *or* traveler-ready vehicles, their choice will depend on the nature of their OTRB system. (See box 1-F for sample implementation schemes.) For example, operators in urbanized areas with many express buses (e.g., in the Northeast Corridor) will benefit more from station-based level-change technologies than will operators in rural areas with many stops. Within the tri-State area of Connecticut, Rhode Island, and Massachusetts, in late 1991, approximately 419 OTRBs traveled daily among 170 stations. Of these stations, 117 serviced at least 10 stops daily (i.e., large stations). Three-hundred thirty-one OTRBs traveled only among the large stations, and 88 of the OTRBs made at least one stop daily at a smaller station. Operators in rural areas like the State of Montana, on the other hand, will benefit more from vehicle-based technologies. On a given day (as of late 1991), only 39 buses traveled in the State, but these buses stopped at 109 stations, only 3 of which had more than 10 stops daily (i.e., Billings, Butte, and Missoula).

Thus, OTA finds that operator choice in where to use traveler-complete and traveler-ready vehicles is an important factor in minimizing costs. By mixing level-change device types, operators can minimize their overall costs (see app. A).[69]

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67 As of early 1993, it is unclear whether these restrooms will meet ADA standards.

68 MCI plans to produce its 45-foot accessible coach with an accessible restroom and an option for a Stewart and Stevenson Powerlift. Norman Littler, coordinator, Regulatory Relations, MCI, Ltd., Winnipeg, Manitoba, Canada, personal communication August 1992.

69 As noted above, some companies may be unable to use both station-based and vehicle-based lift types, because they fired it difficult to restructure their bus deployment so that certain buses only follow certain routes.

## Box I-F—Four Hypothetical Implementation Scenarios for Accessible Over-the-Road Bus (OTRB) Service[1]

### Case 1: A Large Carrier Providing Extensive Fixed-Route Service.

Clover Bus Lines provides freed-route over-the-road bus (OTRB) service, operating at over 700 stations in both urban and rural areas. In order to meet Americans with Disabilities Act (ADA) accessibility standards, Clover's management developed a plan to phase in both traveler-complete and traveler-ready vehicles (see table 1-1).

An analysis showed that 70 percent of Clover's passengers traveled between urban stations. To keep costs down, management decided to furnish these high-traffic stations with station-based lifts; buses traveling to these locations would be traveler-ready, with a wide door and two tie-down positions. Traveler-complete OTRBs would serve the remaining stations. In accordance with U.S. Department of Transportation regulations, Clover purchased accessible buses when its nonaccessible buses became too old to keep in service.

In 2000, Clover replaced 50 older buses with new traveler-complete OTRBs. This, in conjunction with an existing computerized reservation and information system, allowed the company to send accessible vehicles where needed. In the rare instances in which Clover could not get an accessible coach to a passenger requiring one, a boarding chair was available.

By the year 2007,50 percent of Clover's OTRB fleet had turned over. Most of Clover's high-traffic urban stations were equipped with station-based lifts, and traveler-ready OTRBs operated among them. In addition, many traveler-complete buses served rural stations. The company continued to rely on the reservation system to provide traveler-complete buses through an on-call service, all but negating the need for boarding chairs. In the year 2016, all of Clover's service was accessible, and reservations and boarding chairs were no longer necessary.

### Case 2: A Small Urban Carrier Providing Commuter, Airport, and Demand-Responsive Service

Fleet Charter and Transit is a small urban carrier providing airport and charter and tour service. Fleet operates routes from nine local hotels to the airport (running four to six buses daily) and provides charters to sporting and cultural events in nearby cities, In the year1999, Fleet needed to buy several new buses. Fleet decided the least expensive method to implement accessibility was to purchase traveler-complete OTRBs, as the airport service simply had too many stops to make station-based lifts feasible. On the printed airport bus schedules, Fleet noted the times when accessible buses served the route. Since Fleet had no reservation system for its airport service, passengers needing boarding assistance were carried onboard when an accessible bus was not available. Traveler-complete OTRBs used for the airport run were also used for charter and tour service. When purchasing new buses for charter and tour service, the company ordered special video and audio equipment on traveler-complete OTRBs for passengers with sensory disabilities. When booking a charter bus, the operator asked if the customer needed accessible service.

By the year 2006, 50 percent of Fleet's fleet was accessible. In the year 2015, all of Fleet's freed-route coaches were accessible, and Fleet no longer marked special accessible routes on its schedules. Fleet was able to meet its entire demand for accessible charter service with three accessible OTRBs. On the rare occasions that the company needed a fourth accessible bus, it contracted with another carrier.

### Case 3: A Small Rural Carrier Providing Fixed-Route Service

Faitsville Lines is a small rural carrier providing mostly fixed-route service. Faitsville operates 17 OTRBs among Faitsville, Baxter, Rockville, and Sterling, the last being the largest of the four towns and the only one with train or airport service. Faitsville Lines gets a little charter business from area schools, mostly taking students to

[1] All of&e names and companies used in this box are fictitous.

(Continued on next page)

### Box I-F—Four Hypothetical Implementation Scenarios for Accessible Over-the-Road Bus (OTRB) Sevice-(Continued)

the symphony in Sterling. From 1970 to 1990, Faitsville's ridership had dropped by one-half, and the company often had trouble making ends meet.

In 1998, Faitsville Lines needed to replace several buses, and the owner determined that the least costly means to provide accessible service was through traveler-complete vehicles. Many of Faitsville's bus stops were simply grocery stores, car dealerships, or in one case a sporting goods retailer. The infrastructure needed to support station-based lifts was not present and was too costly to introduce. To maximize its options, Faitsville Lines set up a noncomputerized reservation system. Customers could call to reserve seats on the bus and in the process were asked whether they needed accessible service. Whenever possible, individuals who requested accessible service were provided with an accessible bus. If an accessible bus was unavailable, the bus company arranged to have employees carry the traveler aboard. In the year 2006, 50 percent of Faitsville Lines' OTRBs were traveler-complete. The same year, Rockville's public high school enrolled a student who used a wheelchair. Whenever Rockville High chartered a bus, Faitsville Lines was sure to send over a traveler-complete OTRB. Once riders got used to using the reservation system, carrying became a thing of the past.

In 2008, Faitsville Lines faced severe financial difficulties and could no longer maintain service. It was bought out by a neighboring company, Mountain Top Bus Lines, which dropped service to Baxter. Mountain Top had also been purchasing traveler-complete OTRBs, and, by 2015, Mountain Top had replaced its entire fleet with accessible OTRBs.

**Case 4: An Urban Charter and Tour Company**

Custom Tours specializes in overnight tours, taking its customers to nearby cities for sporting or cultural events along with shopping and sightseeing. After the ADA requirments were implemented in 1996, Custom Tours entered into a pooling arrangement with two other charter and tour companies. When customers called requesting accessible service, Custom Tours reserved the accessible bus, which was normally operated by one of the other carriers.

By the year *2005, the* pool had expanded to include one other charter and tour company, and needed two more accessible buses in order to satisfy consumer demand. Custom Tours began to market accessible tours for retired persons as one of its specialties.

In 2010, Custom Tours needed to replace two of its coaches. The company had such success with its accessible tours that it decided to discontinue its participation in the pooling agreement and to purchase both OTRBs as fully accessible with vehicle-based lifts. As a result, Custom captured the elderly tour market, giving the company a market advantage and reducing the demand for accessible service for other carriers in the area.

## I Costs of Accessibility Technologies for Demand-Responsive OTRB Service

For charter and tour service, the demand for accessible service determines the number of accessible OTRBs required. However, even with the demand figures for accessible charter and tour service derived above, the resulting requirements for OTRB purchases are impossible to gauge since the impacts on a specific company are dependent on local demand. In addition, very little operational data exists for charter and tour companies.

As above, if a charter and tour company purchases a new bus with a vehicle-based lift and an accessible Neoplan (low-cost) restroom, the additional cost over the 20-year lifetime of the bus might run $20,000 for capital expenditures, and $4,600 for maintenance costs. However, this figure does not include costs due to forgone revenue. Due to the complexity of charter and tour

pricing schemes, OTA is unable to place a value on lost seating and baggage capacity. Thus, it is impossible to calculate the costs due to revenue losses. However, they are expected to be greater per bus than for fixed-route companies, since charter and tour companies operate OTRBs at higher capacity than do fixed-route operators.

## IMPACT OF ACCESSIBILITY REQUIREMENTS

This section discusses the impacts of the above conclusions on: 1) privately owned public transportation systems using OTRBs; 2) persons with disabilities; and 3) rural OTRB service. In general, mostly due to the large number of bus companies and the proprietary nature of their finances, there are too few data to measure the impacts on OTRB service, except for the fixed-route industry and charter and tour industry in their entireties.

For the *fixed-route OTRB industry as a whole,* OTA calculated above that reasonable estimates of the average cost to implement vehicle-based level-change devices for each new bus will range from $10,000 to $40,000, depending on the choice of level-change technology (see app. A), or approximately 1 percent of total operating costs for that vehicle. Assuming a 20-year phase-in period, costs to the industry as a whole would rise approximately one-twentieth of 1 percent per year.

In 1991, the average operating ratio (before taxes) for Class I OTRB operators was 98.7 **percent.**[70] Therefore, on average, 1.3 percent of revenues were left over after deducting the operating expenses.[71] The change in expenses for the next several years should not significantly affect the economic health of most OTRB carriers; the l-percent change in operating expenses that would result 20 years after the implementation of regulations could do so-but only if one assumes *no* improvements or deteriorations in bus company finances, revenues, or operational factors, and assuming no government assistance.

It is unclear whether the bus industry will continue to operate at such high operating ratios. In 1991, Greyhound Lines, Inc., had Chapter 11 status through October, and the country was in a recession, limiting travel of all types in most sectors. Typical operating ratios in the mid- 1980s were from 94 to 97 percent. Even with these operating ratios, however, a l-percent change in capital and operating costs would be significant.

Thus, accessibility requirements could eventually have some effect on the level of service, as would any increase in costs. However, whether it is in restaurants or in public transportation, Congress found the loss of some service acceptable when it wrote in the ADA that accessibility is required unless it ‘‘. . . fundamentally alter[s] the nature of . . . [the] goods, services, facilities, privileges, advantages, or accommodations[ .]”[72] The fixed-route bus industry has been operating under tough financial conditions for some time due to competition from other modes of transportation and due to the limitations of OTRB service. Thus, Congress may wish to consider financial assistance for this industry-not because of accessibility requirements imposed by the ADA, but from the larger perspective of transportation policy issues such as the provision of low-cost public transportation alternatives and service to rural areas (see below).

For the *charter and tour industry* as a whole, the impact of the cost of accessibility technolo-

70 Interstate Commerce Commission, Office Of Economics, ‘*Large Class I Carriers of Passengers Selected Earnings Data” unpublished document, 1991.

71 Since 1970, the operating ratio for the Class I carriers has risen from roughly 88 percent to its present value. However, from 1980 to 1991, the average operating ratio for the Class I carriers has been especially variable, ranging from between 93 and 109 percent. For the purposes of this report, OTA has used the most recent estimate for the average operating ratio of the Class I carriers.

72 Public Law 101-336, Sec. 302@) (2)(A) (ii).

gies is difficult to gauge, especially since it is not yet clear how many OTRBs must be purchased by charter and tour companies (and because no nonproprietary, nationwide data exist for charter and tour companies). However, while the operating costs per bus-mile for the charter and tour industry (from $1.60 to $1.90) are lower than for fixed-route OTRBs, the operating ratios are believed to be better than those of most fixed-route carriers (see ch. 2). Thus, presumably more funds are available on average for charter and tour carriers to purchase accessibility technologies and to accommodate increased costs for the accessible portion of their fleet required to meet the demand for accessible service.

The impact on *persons with disabilities* of the purchase-oriented phase-in of accessibility technologies means that full accessibility for fixed-route service will not be achieved for probably 20 years-well into the next century. In addition, for a number of years, carrying will still be used as a method of boarding assistance. This means a delay in the full benefits to both persons with disabilities and the bus companies.

In addition, if the costs of accessibility are passed on to passengers in the form of price increases, some passengers may choose not to ride OTRBs. Indeed, as OTRB transportation systems are low-cost providers of public transportation, the market for OTRB transportation, in particular the intercity portion, is very price sensitive. However, given the lack of data on these issues, the nature and effect of a potential price increase are impossible to predict. However, OTA estimates the eventual change in ridership when accessibility is fully implemented to be at most 1 to 2 percent (see app. A).

Congress instructed OTA to examine the impact of accessibility requirements on *service to rural communities.* As stated above, the volume of OTRB fried-route rural service has declined dramatically over the past two decades for a variety of reasons, mostly related to the low profitability of these routes. It is unclear whether the additional costs of accessibility requirements alone will precipitate further route cuts. The loss of routes affects persons both with and without disabilities.

The need to invest in accessibility technologies may lead to abandonment of some service points. However, since fixed-route OTRB operators have been consistently dropping service points over the last two decades, without an analysis of each route and more data detailing the profitability of *all* routes, it is impossible to determine whether the cost of accessibility requirements in and of itself will cause abandonment. This analysis is not meant to minimize the impact of loss of rural service, which can be quite devastating in many areas. OTA concludes only that the extent of any potential losses in service is impossible to quantify exactly, but OTA estimates that, as with ridership, the effect will be marginal.

## PUBLIC FINANCIAL ASSISTANCE FOR OTRB OWNERS

OTRB access for persons with disabilities is required by the ADA, and implementation of accessible service will proceed in accordance with the law and DOT regulations. However, the debate over implementation is likely to include discussion of additional financial assistance for OTRB operators.

Many OTRB operators, particularly those offering fixed-route service, operate with small margins for profit or capital improvements. Since the 1970s, the industry has been in decline in the number of passengers and stops served. In addition, available financial data document a decrease in the profitability of intercity OTRB transportation, especially during the 1980s. This decline is due primarily to competition with other modes of public transportation, such as airplanes, trains, and, most importantly, automobiles. This industry is far from robust and its future is in jeopardy. Continued loss of OTRB service would affect primarily the rural areas served only by this mode of public transportation and passengers who


Elizabeth Robinson

*OTRB scheduled service is the only form of public transportation in some rural areas.*

require the low-cost transportation alternative that OTRB service has provided.

With the additional costs due to accessibility requirements imposed by the ADA, some OTRB companies have said that they may be more likely to discontinue service, either partially or altogether. However, the ADA provided very few means by which to compensate private sector entities for investment in the accessibility technologies necessary for compliance with the law. Several small tax breaks were initiated, primarily to benefit the smallest companies, but no direct subsidies were enacted.

Although Congress clearly did not intend to provide further financial assistance to alleviate the financial burdens of implementing the ADA, in the case of the operators of public transportation using OTRBs, four arguments for financial assistance warrant consideration. First, since OTRB transportation is an essential service for some segments of the U.S. population, especially those with low incomes and those living in rural areas, it would be in the public interest to ensure its continuation and to avoid OTRB companies passing on the costs of accessibility in the form of higher rates for these passengers.

Second, the implementation period for accessible OTRB service will extend over a 20-year period, beginning after the 1996 enactment of regulations by DOT (already 5 years later than regulations published for other public transportation operators). Thus, the benefits to persons with disabilities of accessible OTRB service will be delayed during much of that time. Carefully crafted financial incentives, available over a limited time period, are a possible means of encouraging transportation providers to purchase accessible OTRB , earlier rather than later, thereby accelerating the implementation of accessible service.

Third, the level of financial assistance required is not excessive. OTA estimates that the implementation costs borne by OTRB fixed-route operators nationwide are less than $10 million dollars annually .73

Fourth, several new accessibility technologies are in the concept phase, but their originators lack the funding necessary to develop this equipment for the market (see box l-G). A traditional Federal role has been to support development and testing of technologies that can aid in transportation services. For example, the Canadian Government has supported the development of several accessible OTRB prototypes (see ch. 3). Government

73 This figures assumes that 5,000 OTRBs are currently used in OTRB fixed-route service and that 5 percent are turned over annually. If Congress decides to ensure that the OTRB industry continues to function at present levels of service or higher, additional funding may be necessary.

## Box I-G—Concepts in Search of Development Funds

*In the* face of an over-the-roadbus (OTRB) indusry struggling to survive, the need for low-cost accessibility equipment is acute. Although equipment alternatives exist within a wide range of costs, all may not be practicable for some operators, and the availability of further inexpensive accessibility technologies could ease the burden of complying with Americans with Disabilities Act (ADA) standards.

Several companies have researched ideas for new accessibility technologies, but for various reasons have not gone ahead with development plans. For instance, one company has a concept for a portable lift that folds up and rides on the back of the OTRB. The lift, projected to cost $4,500 to $5,500, would take up no baggage or seating capacity. OTA has calculated that the cost savings of such a lift could be as much as 10 to 25 percent over the least expensive vehicle-based lift (see app. A). The details of the mechanism to move the lift from the rear of the bus to the doorway have been worked out, but the company is concerned about the vulnerability of the exterior parts to harsh weather conditions. Simulations and field testing are required. Another company has an idea for an accessible restroom that collapses to the size of a normal restroom when not required to be accessible. This innovation would reduce the number of seats displaced by an accessible restroom.

Representatives of these companies have explained these concepts to a number of potential buyers, many of whom are enthusiastic, but none can help the company with the need for capital to finance further development and testing. These representatives doubt whether their companies on their own can afford to invest the money it would take to develop these concepts, especially in the face of an uncertain market. Yet the investment amount is relatively modest (e.g., $250,000 for the external lift concept).

research and development (R&D) funding, provided during the early part of the implementation phase, could accelerate progress in this area and result in less costly accessibility devices available at an earlier date.

Therefore, OTA concludes that congressional support for appropriate financial assistance and/or incentives might help prevent the loss of service that could result from the implementation of accessible OTRB service. This assistance could also accelerate the implementation of accessible service. In addition, congressional support of R&D funding for accessibility technologies could be instrumental in providing safe, reliable, and low-cost accessible service.[74]

Presently, Federal and State Governments assist OTRB owners in several ways, including direct and indirect financial assistance. The two forms of assistance from the Federal Government are: 1) limited direct assistance with capital costs for accessibility technologies, and 2) tax breaks. The Federal Transit Authority's Section 18(i) program has authorized the purchase of accessibility technologies as capital expenses that are eligible for partial government funding for up to 90 percent of the cost for rural intercity bus services. In fiscal year 1992, Section 18(i) funding was $5.3 million.[75] However, this funding source was primarily intended to provide funds for the preservation of rural intercity service.

In addition, all businesses may deduct up to $15,000 per year at present in ". . . barrier re-

74 Other businesses affected by the ADA, such as restaurants, stores, and theaters, do not receive subsidies beyond small tax breaks for Capital improvements. In the case of OTRB providers, Congress may wish to consider further financial assistance due to the need of rural communities and disadvantaged groups for the public transportation services offered by OTRB operators, and the challenging financial circumstances experienced by most OTRB companies.

75 This program only addresses the needs of fixed-route service, and only freed-mute OTRB operators serving rural areas are eligible for these funds. Federal Transit Administration, "Section 18 Draft Circular Revisions Proposed Changes to FTA C 9040.1B," Aug. 9, 1992.

moval expenses . . . for the purposes of making any facility or public transportation vehicle . . . accessible and usable by handicapped and elderly individuals. "[76] The expenses cannot include new construction or comprehensive renovation costs, but can encompass expenses that are modifications to *existing* facilities or vehicles. Small companies are allowed a tax credit for 50 percent of the first $10,000 of eligible costs of complying with the ADA.[77]

## I Options for OTRB Financial Assistance

Congress could choose to augment existing financial assistance mechanisms or to develop new ones. For instance, Congress could choose to:

. Augment Section 18(i) funding. Since Section 18(i) funding goes for other purposes, however, Congress will need to take care when appropriating the funds to ensure that other purposes for Section 18(i) funding are not shortchanged, while at the same time ensuring that funds for accessibility equipment are spent. Augmenting Section 18(i) funding has the added benefit of addressing OTRB systemwide concerns as well as accessibility needs. In addition, the apparatus to distribute the funds has already been developed by DOT.
. Enact a new financial assistance program specifically targeted to the purchase and operation of accessibility equipment on OTRBs, most likely at less than $10 million annually. Such a program could provide incentives for bus operators to purchase accessibility equipment earlier rather than later. For example, subsidies for accessibility equipment could be highest in the first 5 years of the program's operation and progressively decrease from that point. In addition, several public policy issues could be addressed. For instance, the program could target rural providers and be geared to maintaining low-cost transportation. Such a program could sit in the Office of the Secretary of Transportation or elsewhere in DOT.
- Support R&D for accessibility technologies on OTRBs. A traditional Federal role has been to provide monies to research, develop, and evaluate technologies that can aid in transportation services. New accessibility technologies could provide lower cost and safer equipment. Technologies to provide accessibility are continually evolving, and government R&D funding could accelerate progress in this area. Congress could initiate an R&D program specifically targeted at accessibility technologies. Such a program could be limited in duration, perhaps 5 to 8 years, and could capitalize on existing R&D developments in industry. In addition, DOT could incorporate R&D for accessibility technologies into its current assistance priorities.[78]

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76 Daniel C. Schaffer, "Tax Incentives, " *The Americans With Disabilities Act: From Policy to Practice,* Jane West (cd.) (New York, NY: Milbank Memorial Fund, 1991).

77 In addition to Federal Section 18(i) funding and tax breaks, several State Governments have supported the purchase of accessible vehicles through contracts for fixed-route accessible service. For example, the State of California has issued several contracts to private companies to provide fixed-route OTRB service to Amtrak train stations, All of these OTRBs must be accessible, and these contracts budget for the purchase of accessibility equipment. State funds have also been used to maintain OTRB service to prevent the loss of service on certain routes.

78 OTA has reviewed two additional options. First, Congress could choose to augment the current tax breaks or enact new ones for the OTRB industry. However, many bus company owners claim that, unless the tax breaks arc in the form of tax credits, they are useless for tbe bus industry because too many companies make little or no profit. In addition, this option would aid some companies much more than others, and not necessarily those with the most need. Second, Congress could choose to allocate funds through contracts for fixed-route service, to maintain rural routes or to serve other needs. However, this approach would be in all likelihood too piecemeal to address the concerns of the OTRB industry in general.

# Over-the-Road Bus Industry and Accessible Service

# 2

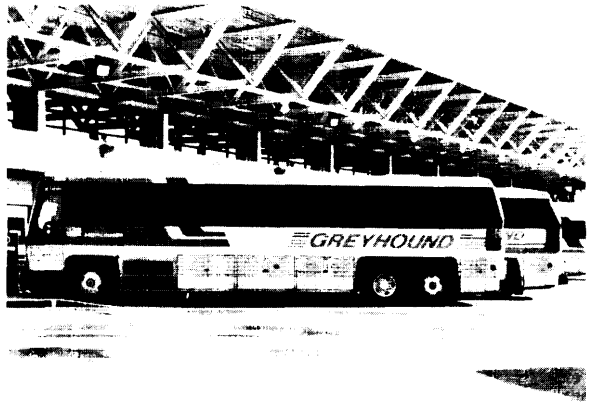
## FINDINGS

- The 3,500 private companies that operate over-the-road buses (OTRBs) range in size from Greyhound Lines, Inc., with 2,300 OTRBs, to small companies with fewer than a half-dozen buses. This essentially unregulated, unsubsidized industry provides a variety of services: fixed-route, regular-route service links some 6,000 communities; charter and tour services provide group travel opportunities; and commuter, airport, and other services play important roles in the lives of many Americans.
- Since the 1930s, OTRB fixed-route service has been an established mode of intercity travel. Since the 1960s, however, the bus industry has faced increasing competition from other transportation modes. In addition, deregulation of the bus industry in 1982 permitted bus companies to drop less profitable routes. Consequently, freed-route OTRB service now covers a much smaller passenger base (shrinking from 130 million passengers in 1971 to 37 million in 1990) and decreasing numbers of points served (from 17,000 in 1968 to 5,700 in 1991).
- The demographics of the markets served by bus companies vary. People who use fixed-route bus service tend to occupy the lower rungs of the economic ladder. (Roughly one-half had incomes below $15,000 per year, in 1991 dollars.) In contrast, one study showed that charter and tour bus passengers had average household incomes in excess of $47,000 per year (1991 dollars).
- Most fixed-route OTRB companies have small net operating incomes when compared with their overall revenues.



(The average operating ratio for the largest carriers in 1991 was 98.7 percent.)[1] While most charter and tour companies appear to run with larger net operating incomes, there is very little nonproprietary data from which to make a comparison.

- The OTRB industry has been subject to limited Federal regulation. Since 1982, Federal regulation has primarily governed vehicle safety and driver qualifications, which apply to motor carriers generally. State agencies have other intrastate requirements. Some States have developed small programs for financial assistance to the bus industry. The Federal Government also has a small assistance program geared to improvement of rural bus service (under Section 18(i) of the Federal Transit Act, which was funded at $5.3 million in fiscal year 1992).
- Before passage of the Americans with Disabilities Act (ADA), private OTRB transportation operators were not required to provide accessible transportation to people with disabilities. A number of bus companies, however, have provided accessible service under contract to public agencies that, because of Federal or State assistance, were required by law to purchase lift-equipped vehicles. As of early 1993, virtually all lift-equipped OTRBs (approximately 350 in the United States) operated by private bus companies had been purchased or operated with the aid of public monies.




Elizabeth Robinson

*OTRBs wait in a loading bay at a large intercity bus terminal. Over 5,000 OTRBs provide scheduled, intercity service daily.*

## CHARACTERISTICS OF THE INDUSTRY

The privately owned and operated bus companies comprising the OTRB industry[2] offer many types of service. The two principal service categories are fried-route scheduled service, and charter and tour service.[3] Some companies provide both, thus maximizing use of their vehicles.

Some 3,500 bus companies in the United States operate an estimated 23,000 to 27,000 OTRBs.[4] (See box 2-A for a description of an OTRB.) Only about 450 of the 3,500 companies, or 1 in 8, provide fixed-route scheduled service; most of these also offer charter and tour service. Some supply commuter, airport, scheduled sightseeing, and other specialized services, sometimes under contract to public entities. Bus package express is often provided in conjunction with fixed-route service, competing with numerous other package

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[1] This 1991 operating ratio figure reflects Greyhound's bankruptcy status, and thus may be anomalous.

[2] Sometimes called the motorcoach industry,

[3] The Americans with Disabilities Act (ADA) defines "fixed-route system" as , , a system of providing designated public transportation on which a vehicle is operated along a prescribed route according to a fixed schedule. " (Public Law 101-336, Sec. 221(3 ).) It describes both the fixed-route services of transit systems and what is usually referred to in the OTRB industry as fixed-route service, regular-scheduled service, or intercity bus service. Whether operated exclusively or as an adjunct to freed-route, the charter and tour segment of OTRB operations is "demand responsive. " The ADA states that: "The term 'demand responsive' system means any system of providing transportation of individuals by a vehicle, other than a system which is a fixed-route system. ' (Public Law 101-336, Sec. 301(3 ).)

[4] The most common estimate of the number of OTRBs in this country is 25,000, "Metro's 1991 Top 50 Motorcoach Survey, " *Metro Magazine,* January/February 1991, p. 32.

## Box 2-A—What Is an OTRB?

The Americans with Disabilities Act (ADA) defines an over-the-road bus (OTRB) as ". . . a bus characterized by an elevated passenger deck located over a baggage compartment."[1] In practical terms, this describes a bus 35 feet or longer, usually seating 40 or more passengers (depending on configuration), and commonly called an intercity bus or motorcoach. This defintion does not include transit buses, vans, minibuses, school buses, and a variety of other types of vehicles that can be used in intercity transportation.

The exact dimensions of OTRBs vary. Before passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), some States did not permit buses longer than 40 feet. However, ISTEA now authorizes the use of buses up to 45 feet long in all 50 States. The height of an OTRB passenger deck ranges from 55 to 60 inches above the ground. Prominent exceptions to this were the GMC Scenicruiser and Flxible Vistaliners, manufactured in the mid- 1950s, with seating on two levels. OTRB widths are either 96 or 102 inches. Aisle widths range from a standard 14 inches to as much as 20 inches, and door widths from 24 to 36 inches (40 inches on a Neoplan double-deck model).[2]

Most new standard OTRBs cost approximately $250,000. Although most OTRBs include a restroom as a standard feature, OTRBs providing freed-route service tend to have fewer additional features than those used for tours. More and more tour buses are equipped with video systems and other extra features. Wider doors and aisles are available by special order, as are larger (tinted) windows for sightseeing. Reading lamps, card tables, and AM/FM stereo/cassette players are becoming more common. These additional features cost more money, of course, and manufacturers equip their OTRBs with custom features as specified by the purchaser.

The average life of an OTRB in the United States is about 20 years. Most bus operators expect to replace a vehicle after 10 to 15 years, but replacement schedules are determined by a number of factors, including the availability of capital and the status of the bus resale market. The resale market consists of a handful of large national firms that sell, lease, recondition, and rebuild used buses, plus an unknown number of small used-bus dealers. Some bus companies handle their own resales. Purchasers of used buses are usually small bus companies, private organizations, and nonprofit groups.

1 Public Law 101-336, Sec. 301(5).

2 At one time, AFC, Crown Coach, Eagle, Flxible, General Motors, MCI, and Neoplan all had OTRB production facilities in the United States. Now only MCI, Eagle, and Neoplan remain. MCI, originally a Canadian company bought by Greyhound in 1948 and now owned by Greyhound Lines of Canada, Ltd., produces OTRBs in Manitoba, Canada; a U.S. presence is maintained by an assembly plant across the border in Pembina, North Dakota. Neoplan, a German company, has manufacturing facilities in Colorado. Eagle, owned first by Trailways, then by Greyhound, has been acquired by Mexican interests—Moto Diesel Mexicana S.A. de C. V., Aguascalientes, Mexico-and has resumed OTRB production on the United States-Mexican border. In addition to MCIs, Neoplans, and older buses no longer manufactured here, OTRBs used in this country include Prevost (Canadian), Van Hool and LAG (Belgian), and Setra (German). A Wisconsin company, SABRE Bus and Coach Corp., plans to manufacture a European-style touring OTRB. A European-style coach is characterized by larger windows and made-to-order features, such as wider aisles and doors.

express services. The remaining 3,000-plus companics offer charter and tour service exclusively.

Approximately 7,500 OTRBs, or 1 in 3, are found in the fleets of the 43 largest bus companies, and only 10 of those firms are essentially fixed-route scheduled service providers.[5] Grey - hound Lines dominates the fixed-route industry with its transcontinental network of routes. Grey - hound and 27 other companies are Class I carriers, defined by the Interstate Commerce Commission

5 "Metro's 1992 Top 50 Motorcoach Survey," *Metro Magazine*, January/February 1992, p. 18.

(ICC) as those carriers having over $5 million in gross annual revenue.[6]

About one-half of the Class I companies, and about two dozen slightly smaller fins, are considered regional carriers.[7] Their operations, if linked together, could form the basis of a national system comparable to Greyhound's network of routes. Many of the regional carriers are members of the National Trailways Bus System (NTBS), a group of 28 companies that coordinate schedules and share terminals and stations.[8] All other companies providing freed-route scheduled service in the United States offer intercity transportation and specialized transportation services in smaller, often local geographic areas.

To provide transportation services within a State, whether freed-route, charter and tour, or special services, a bus company often must register with its State Public Utility Commission (PUC) and file tariffs of services and fares. If the company wishes to offer interstate transportation services, it must also register with the Interstate Commerce Commission (ICC) and file tariffs of services and fares with that body.

## A Brief History of U.S. OTRB Service

The first recorded fixed-route bus service began in 1913 between the towns of Hibbing and Alice in northern Minnesota. By 1926, 4,040 companies were operating nationwide, including Greyhound. The rapid growth of bus service throughout the country led individual States to establish regulatory control over intercity bus service within their borders. Pennsylvania was the first to act, and by 1930 all but Delaware had some form of regulation. Passage of the Motor Carrier Act of 1935 authorized ICC to regulate interstate fares, routes, safety, and other activities of the motorbus industry. Under its policy of ''universal service,' ICC permitted some monopolistic practices, ensuring companies an absence of competition in exchange for making services widely available. The industry developed rapidly during the Depression and World War II years, growing from 10 billion passenger-miles in 1940 to 27 billion in 1945.[9]

Developments in the 1950s, however, led to erosion of the freed-route passenger base. The number of personal automobiles burgeoned, construction of the Interstate Highway System began, and air travel increased rapidly. To combat the loss of ridership, the bus industry added package delivery and charter service. Many bus companies sought to scale back on their unprofitable routes, primarily in rural areas. In many cases, this was met with fierce resistance from State authorities, who could reject requests for abandonment of routes deemed to be in the public interest.

The bus industry was further challenged in the 1970s by the formation of Amtrak and by airline deregulation. Amtrak offered comfortable rail service at rates comparable to those for bus travel, thus cutting into market share, especially in the densely populated and highly profitable North-

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[6] Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Passenger Carriers, " draft report, 1991. Class II carriers have gross annual revenues between $1 and $5 million and Class III carriers less than $1 million, but ICC neither collects nor maintains data on Class II and Class III carriers. The designation is a holdover from the days before enactment of the Bus Regulatory Reform Act of 1982.

[7] Of the 28 Class I carriers in 1991, 21 were classified by ICC as ''intercity carriers" and 7 as ''local carriers. " Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: 1991," draft document, table 5. As ICC explains: "Passenger carriers are classified as intercity carriers if the revenues received from intercity traffic equal or exceed 50 percent of the total revenues received from intercity and local or suburban traffic. If the intercity revenues are less than 50 percent, the passenger carriers are classified as local.'' Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Motor Carriers Part 2, for the Year Ended December 31, 1990, " unpublished report, p. 2.

[8] Greyhound purchased Trailways Lines, Inc. in mid- 1987, consolidated routes, schedules, and stations, and in November 1991 discontinued use of the Trailways name, also withdrawing from the National Trailways Bus System.

[9] John Meyer and Clinton V. Oster, Jr., *Deregulation and the Future of Intercity Passenger Travel* (Cambridge, MA: The MIT Press, 1987), p. 171.




*Passengers wait for a bus in Gettysburg, PA in September 1943. Since the 1940s, OTRB fixed-route service has diminished, serving many fewer communities and passengers.*

east Corridor.[10] Airline deregulation created a market for carriers such as Peoples Express, with longer distance rates often less expensive and travel almost always faster than by bus.

Federal deregulation of the bus industry came with the Bus Regulatory Reform Act (BRRA) of 1982. Among the BRRA's findings were that:

> ... the existing Federal and State regulatory structure has tended . . . to inhibit market entry, carrier growth, maximum utilization of equipment and energy resources, and opportunities for minorities and others to enter the motor bus industry; that State regulation . . . has . . . unreasonably burdened interstate commerce; [and] that overly protective regulation has resulted in operating inefficiencies and diminished price and service competition in the motor bus industry.11

The BRRA expedited the entry of new carriers, eliminated most of the ratemaking authority of ICC, and allowed the Commission to overrule any State decision preventing abandonment of service points. Bus companies were able to discontinue service to unprofitable locations and concentrate on their more profitable service points, usually the larger cities. (See the discussion of Rural Service later in this chapter.)

## FIXED-ROUTE SCHEDULED SERVICE

A 1990 survey of bus companies revealed that 452 firms operated fixed-route or regularly scheduled service.[12] These companies operate a complex web of interconnecting routes, linking approximately 6,000 communities of all sizes, some with no other means of public transportation.

Greyhound has dominated the fixed-route bus industry since the 1930s. For 1991, the operating revenues of all 2 I Class I intercity carriers totaled $980 million, with Greyhound accounting for 70 percent of this sum.[13] Greyhound is the only bus company providing scheduled service coast-to-coast and, as of January 1993, it served 2,730 locations.[14] Inevitably, Greyhound's actions influence the rest of the industry, including many of the other Class I *carriers* and additional smaller companies that provide extensive fixed-route service on a regional and local basis. Some of them, especially the independent companies now part of NTBS, interline with Greyhound.

Interlining allows a passenger to travel from origin to destination on a single ticket via two or

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10 The Northeast Corridor is the concentrated area of urbanized population from Richmond, VA to Boston, MA.

11 Public Law 97-261, *Sec.* 3, Sept. 20, 1982, 96 Stat. 1102.

12 The ENO Foundation for Transportation Inc., "Report on the American Bus Association Confidential Survey of Intercity Operations,' unpublished report, December 1990. *Russell's Guide* includes only 107 intercity fried-route carriers. Russell's Guides, Inc., *Russell's Official National Motor Coach Guide* (Spokane, WA: Friendship Publications, Inc., September 1991), p. 1.

13 Interstate Commerce Commissio, op. cit., footnote 6.

14 Greyhound Lines, In C., "Greyhound Lines Fact Sheet, " April 1992, p. 1.

more carriers.[15] If a bus company belongs to the National Bus Traffic Association (NBTA), it issues tickets and accepts those issued by another carrier with the assurance that NBTA will allocate among the interlining companies the percentage of the proceeds to which they are entitled.

For example, if a bus company issues a ticket to a passenger's destination and does not serve that community, the company will carry the passenger to a point where he or she can connect with a second company, which accepts the ticket and transports the passenger to the final destination. The two companies share the proceeds according to agreed on allocation factors. At present, many companies do not regularly inform subsequent carriers of any specific information about passengers (e.g., if they have disabilities and require assistance) who will be interlining with their service.

Pooling, a less common method of intercompany coordination, is a formal agreement among carriers that enables the passenger to take a single bus from origin to destination over the routes of several carriers. For example, a company issues the ticket and carries the passenger on its own bus with its own driver from point A to point B. At point B, another driver from another company continues the journey on the original bus. If the journey is long enough, the same bus might end up at the destination point, having been driven by drivers of three or four companies under this type of pooling agreement. Often the participating companies contribute buses to the pool of equipment operated on such a route.

## Decline of Fixed-Route Service

The freed-route intercity bus industry declined in virtually every measure of output or financial performance from 1967 through 1986.[16] Figure 2-1 shows the decline in the number of passengers during this period, with key events affecting the bus industry highlighted. Immediately after deregulation, many companies acted to reduce costs. For instance, Greyhound embarked on a planned shrinkage of the firm, leading to further ridership losses from 1985 to 1988, even steeper than those of previous years.

In March 1987, Greyhound was sold to GLI Holding Co. (GLIH), which also purchased Trailways Lines, Inc., the second largest bus company in the United States. The new owners sought to maintain their reduced operating costs while offering lower fares, marketing actively, and improving services. With these attempts to gain ridership, Greyhound increased its passenger-miles by 23 percent from 1986 to 1989. In 1990, these efforts were overwhelmed by the strike of the Amalgamated Transit Union Greyhound Council, representing most of the firm's unionized drivers, and by the bankruptcy filing of GLIH in June of that year.[17] Other fixed-route providers were affected by these developments because of their interlining arrangements with Greyhound, or because their service fed into Greyhound routes. They were also subject to many of the economic trends affecting Greyhound and had taken similar steps to improve their operating ratios.[18]

Figure 2-2 shows the steady decline in the number of points served by the entire freed-route

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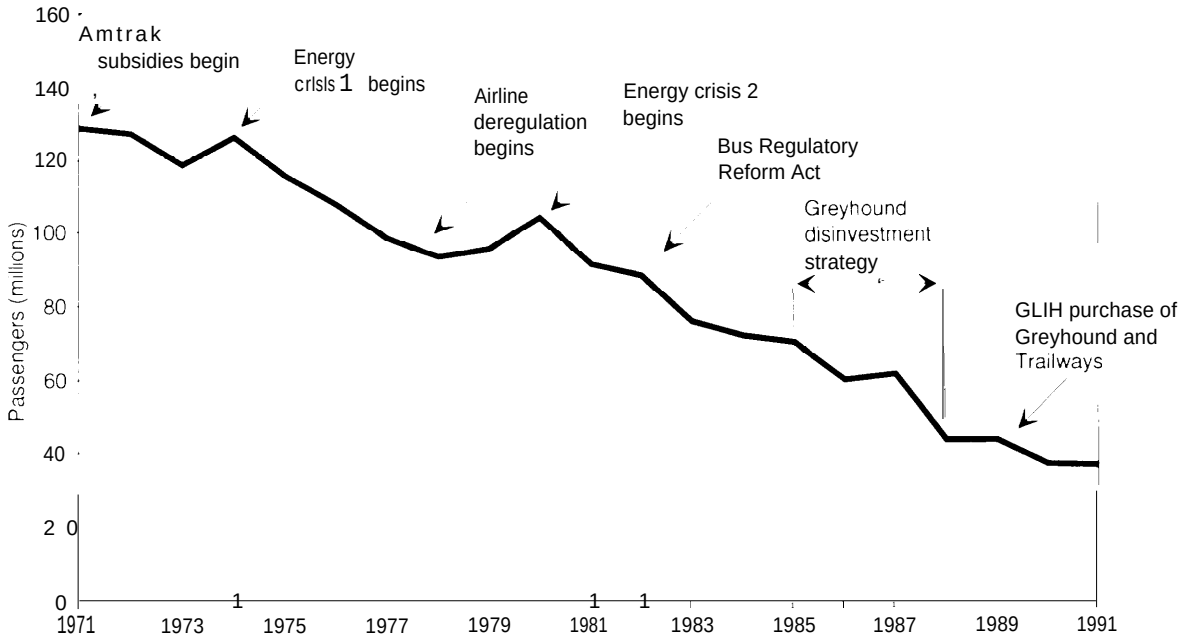
15 Interlining is much less common since deregulation.

16 Much of this discussion is adapted from Ecosometrics, Inc., "Background Paper on the Accessibility for the Disabled and the Intercity Bus Industry," OTA contractor report, Mar. 31, 1991.

17 From June 4, 1990 through Oct. 31, 1991, Greyhound operated pursuant to Chapter XI of the Federal Bankruptcy Code. As Of early 1993, the company was still operating under an approved Chapter XI reorganization plan.

18 Operating ratio is calculated as operating expenses divided by operating revenues.

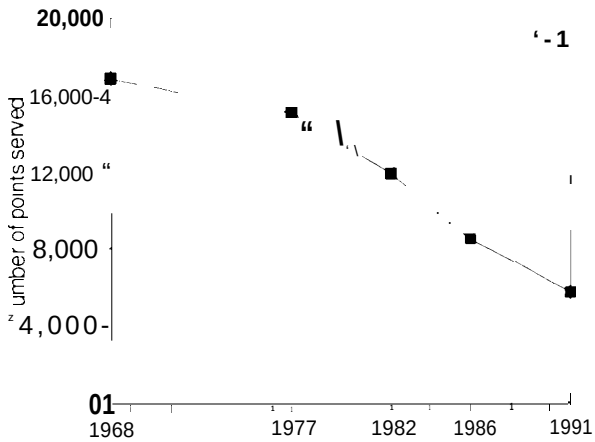
**Figure 2-1—Intercity Bus Ridership: Class I Carriers, Regular Route Service, 1971-91**




SOURCE: Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Second and Final Release, Passenger Carriers, " unpublished reports, issued annually for the years 1970-91.

industry during the 1968 to 1991 period. Even before passage of the BRRA, the fixed-route network was contracting, despite State regulations that made service discontinuation difficult. Much service ended due to firms going out of business, or approved changes allowing routes to shift to the Interstate Highway System. An ICC report found that between passage of the BRRA in September 1982 and January 1986, 3,763 points lost all intercity service.[19] This wave of abandonment included discontinuance of service to some 1,300 points on Greyhound's routes. As of mid-1990, an additional 481 locations served by Greyhound or Trailways had been abandoned. As of November 1991, the number of service points nationwide had declined from 16,800 in 1968 to an estimated 5,690.[20]

**Figure 2-2—Points Served by Regularly Scheduled Intercity Bus Service, 1968-91**




SOURCE: U.S. General Accounting Office, ***Surface Transportation: Availability of Intercity Bus Service Continues to Decline,*** Report to the Chairman, Subcommittee on Surface Transportation of the Senate Committee on Commerce, Science, and Transportation (Washington, DC: June 1992), p. 50.

19 Heather J. Gradison, chairman, Interstate Commerce Commission, letter to Senator Larry Pressler, Sept. *8, 1986.*

20 U.S. Generat Accounting Office, *Surface Transportation: Availability of Intercity Bus Service Continues to Decline*, Report to the Chairman, Subcommittee on Surface Transportation of the Senate Committee on Commerce, Science, and Transportation (Washington DC: June 1992), p. 50.

## Box 2-B—Use of ICC Data in This Study

The best data on the financial and operational performance of the over-the-road bus (OTRB) industry have been collected from individual bus companies by the Interstate Commerce Commission (ICC). However, the portion of the industry reporting to ICC and the comprehensiveness of those reports have not been consistent over time. Therefore, ICC data must be used cautiously.

ICC has collected data from bus companies since 1938. Until passage of the Bus Regulatory Reform Act of 1982 (BRRA), data were collected from all carriers registered with ICC to perform interstate service. Large, medium, and small carriers, referred to as Class I, Class II, and Class III carriers respectively, were classified by their adjusted annual gross operating revenues. After passage of the BRRA, data were no longer collected from Class II and III carriers, and data collected from Class I companies were less detailed. Thus, any attempt to use ICC data to measure performance of the OTRB industry over the past decade must be confined to Class I carriers.

OTA's use of ICC data also recognizes the following inconsistencies and shortcomings.

- Class I definitions

  The ICC definition of Class I carriers since 1938 has been based on adjusted annual gross operating revenue in excess of a certain threshold. However, this threshold has been changed four times since 1938.[1] In addition, from 1970 to 1991, the numbers of bus companies with adjusted gross incomes above the threshold varied from year to year.[2]

- Definition of "Intercity Service Providers"

  For purposes of this study, (OTA used ICC data on intercity service providers. ICC classifies carriers as intercity if more than 49 percent of their total revenues comes from intercity traffic. Many of the Class I intercity carriers, however, provide a mix of services. ICC breaks out these costs by type of service, but it is unclear how these numbers are calculated. In addition, OTA discovered that at least one of the Class I carriers providing primarily local service did not report to ICC revenues in the form of extensive public subsidies it received for certain of the local services it provided. As a consequence, its operating ratio was substantially above 100 every year it appeared on the Class I list.

- Quality control

  ICC does not routinely check, and has few means to verify, whether carrier figures are accurate.

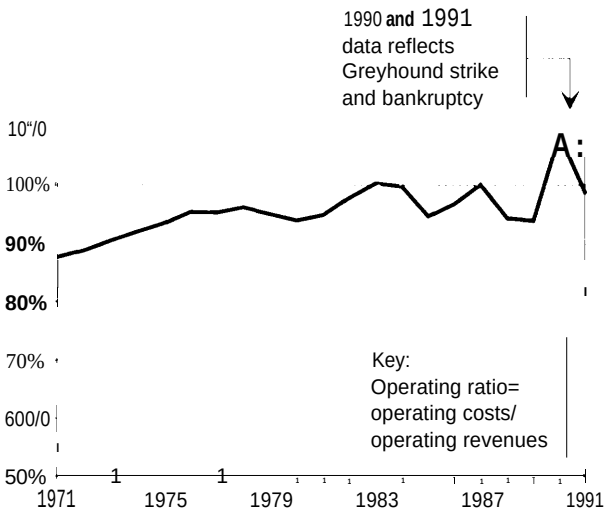
[1] This threshold, initially established at $100,000, was raised to $200,000 in 1950, to $1 million in 1969, to $3 million in 1977, and to the current level of $5 million in 1988.

[2] In 1970, there were 71 Class I carriers providing essentially intercity service; in 1990, there were 21. The 1991 Class I carrier report has been compiled by ICC and, as of early 1993, waa under internal review.

ICC publishes very limited data on carrier net operating income.[21] (For a discussion of the problems with ICC data, see box 2-B.) However, in 1970, the 71 Class I intercity carriers (defined, at that time, as receiving revenues over $1 million) had a collective net operating income of $260 million (1989 dollars). In 1989, the 20 Class I intercity carriers (then defined as receiving

[21] Measurement by ICC of the activity of Class I carriers has varied considerably over the years. The ICC definition of Class I carriers since 1938 has been based on adjusted annual gross operating revenue in excess of a certain threshold. Through 1979, the level of detail in the Class I carrier reports was considerable. The reports of 1980 to 1986 were less detailed, and those from 1987 to 1991, the latest year available as of autumn 1992, were far more rudimentary. However, not until 1987 were data displayed by carrier; before that they were broken down only by geographic district and region.

**Figure 2-3-Intercity Bus Industry: Class I Carriers, Operating Ratios, 1971-91**




SOURCE: Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Second Release, Passenger Carriers," issued annually for the years 1971-91,

revenues in excess of $5 million) had a collective net operating income of $72 million. By 1991, that figure had dropped to $13 million.[22]

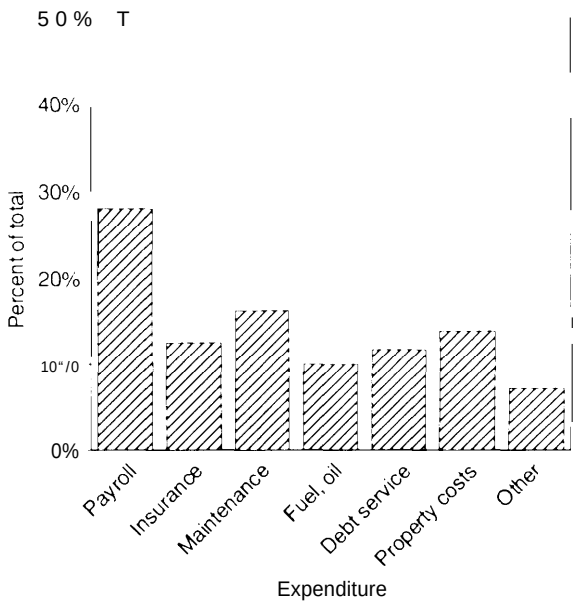
Figure 2-3 reveals a steadily worsening operating ratio for Class I fried-route carriers, from 87.6 percent in 1971 to 94.0 percent in 1989 and 98.7 in 1991. The energy crises of 1973-74 and 1980 had relatively little effect on this trend, which frost peaked in 1983, the first full year of regulatory reform. Subsequent cost reduction efforts improved the operating ratio, but were overwhelmed by the insurance rate spike in 1986-87 (see box 2-C), the strike and bankruptcy of Greyhound Lines, Inc., and the recession of 1990-92,

Figure 2-4 illustrates the allocation of finds by category of expenditure for an average bus company.[23] Payroll expenditures were the largest category (28 percent), followed by maintenance (16.3 percent), property costs (14 percent, including rental, mortgages, and taxes), insurance (12.6 percent), and debt service (1 1.8 percent). The remaining allocations are for fuel and oil (10 percent), and "other," including profit (7.3 percent).

While these figures show general trends for the industry, individual companies vary substantially in their financial outlook. Carriers differ tremendously in:

- size,
- number of passengers carried,
- annual mileage per bus,
- sizes and numbers of communities served,
- use of temninal facilities,
- computerization of operations,
- ability to increase fixed-route and charter rates over the past 10 years,

**Figure 2-4-Average Allocation of Funds by the Typical Bus Company**




SOURCE: United Bus Owners of America, NTS, Inc., SnapShot: 1991 (Washington, DC: 1991), p. 7.

22 Interstate Commerce Commission, Office of Economics, "Transport Statistics in the United States: Second and Final Release, Passenger Carriers, ' unpublished reports, issued annually for the years 1971 through 1990 and the draft report for 1991.

23 Both fixed-route and charter and tour carriers participated in the United Bus Owners of America survey from which these data were taken.

### Box 2-C-How Over-the-Road Buses Are Insured

**Insurance** for over-the-road buses (OTRBs) covers bodily injury, personal property damage, collision, and general liability on or around the bus and on any premises owned or operated by the carrier. The operator of a public transportation vehicle is legally responsible for providing safe passage to all riders, whether boarding, riding, or leaving the bus, under both normal and emergency conditions.

A handful of insurance companies provide OTRB coverage.* The few bus companies unable to secure insurance directly for financial, operational, or other reasons have access to the assigned risk pool maintained through each State's insurance commissioner's office. A few of the largest bus companies self-insure, but these must secure Interstate Commerce Commission (ICC) permission to do so. In addition, product liability insurance is available for manufacturers of OTRBs and accessibility equipment. Whether the increased numbers of passengers with disabilities and their use of accessibility equipment will affect insurance rates for OTRBs is difficult to predict.

The Commercial Insurance Market—Rates for the bus industry and for individual operators are based on ''10ss experience"—accidents that result in the insurer paying a claim. Four years of data are usually necessary to develop hard loss experience figures.[2] Only then is the insurance industry confident that its rates reflect reality. In the absence of hard data, insurers may be inclined to believe that a perceptible increase in the number of passengers with disabilities will lead to an increase in claims, but it is impossible to predict what effect this supposition may have on rates.[3]

In the mid-1980's, bus operators found their insurance rates to be quite unstable. Until 1985, the bus industry obtained its insurance from a small number of company's, the most prominent of which were Transit Casualty Insurance Co., CIGNA, National Indemnity, AIG, and Carriers Insurance Co. In late 1985, Transit

1 Less than a dozen insurance companies write policies for public transportation operators: Progressive, Lancer, Lincoln National, National Interstate, Great American, Carolina Casualty, Reliance, Clarendon National, and Aetna. Aetna does an extensive business in paratransit, and is thought to have the best industry data on transportation of disabled individuals. Progressive, Lancer, and Reliance are the principal insurers of OTRB operators.

2 These data are expressed in "bus-years," with a minimum of 1O,(K)O bus-years of data required to develop a satisfactory level of confidence. Kenneth G. Sislak, assistant vice president, Transportation Division, Progressive Companies, Cleveland, OH, personal communication, Dec. 6, 1991.

3 Ibid.

- operating ratio,
- gross revenues, and
- net operating income.

Many differences are attributable to the nature of the companies' service areas and the magnitude of competition from other bus companies or other transportation modes, but each company is also unique in its operation and the type of service offered. (For a description of a mid-size carrier, see box 2-D.)

## Terminals and Stations

Facilities for fixed-route services provided by OTRBs are either terminals or stations.[24] The bus terminal serves the needs of intercity bus passengers. Most terminals in cities or large towns handle ticketing, baggage, and package express service. A station is a business location that provides services to bus passengers as a secondary activity. These are usually gas stations, grocery stores, restaurants, motels, or similar

24 The ADA considers terminals and stations to be public accommodations. Section 301(7)(G) specifically identifies as such . . a terminal, depot, or other station used for specified public transportation.' Section 302(a) states that ". . . (n)o individual shall be discriminated against on the basis of disability in the full and equal enjoyment of. . . any place of public accommodation by any person who owns, leases (or leases to), or operates a place of public accommodation."

Casualty Insurance Co. and Carriers Insurance Co. became insolvent, and CIGNA dropped its participation in a plan under which coverage was provided at group rates for members of the United Bus Owners of America. Without these major providers, insurance became more difficult to obtain and rates increased dramatically, in many cases doubling. By mid-1987, however, with the entry of other insurance companies into the field, rates began to drop.

Assigned Risk Pools—The insurance industry administers most assigned risk pools. Risk pool premiums can be twice those available directly from a commercial insurer. Anyone reasonably entitled to insurance and unable to obtain coverage in the open market is placed in the pool. In Washington State, for example, the only eligibility criterion is that an applicant's coverage must not have been canceled for nonpayment within the past 2 years. Pool rates are currently set at 150 percent of the standard rates for commercial vehicles within the State.[4]

Self-Insurance--ICC requires each motor carrier applying for self-insurance to provide financial, safety, and claims data for the last 3 years and evidence of safe operations in the form of a satisfactory safety rating from the U.S. Department of Transportation. ICC reviews this and other information under general guidelines; wide differences in motor carriers' size and operational characteristics preclude the use of specific criteria.[5] Once permission to self-insure is granted, ICC monitors the carrier, requiring quarterly financial reports and claims data.

As of summer 1992, only two bus companies were self-insured: Greyhound and Peter Pan. Three other companies had permission to self-insure but had not done so. Some companies may want to self-insure only for the first $1 million of the required $5 million and buy the rest on the open market, where the first $1 million of coverage is the most expensive. Other companies may view permission to self-insure as a bargaining chip with insurance carriers.[6]

Product Liability Insurance-Product liability insurance protects the manufacturer of a lift device or an OTRB, but not all manufacturers carry such insurance. Manufacturers generally retain legal and engineering experts to advise them on how best to prevent accidents and lawsuits.

4 Mien Morrow, deputy insurance commissioner, State of Washington, personal communication, Jan. 14, 1992.

5 Interstate Commerce Commission, "EX Parte No. MC-178: Investigation Into Motor Carrier Insurance Rates," decided Jan. 20, 1987, p. 6.

6 Alice Ramsey, assistant to the deputy director, Section of Operations and Enforcement Interstate Commerce Commission, personal communication, Feb. 18, 1992.

small business establishments whose proprietors serve as agents for the freed-route lines serving the community. The flag stop-locations by the side of the road where the bus picks up passengers—is far less prevalent with the decline of rural service.

In 1984, a combined ICC/U.S. Department of Transportation (DOT) study found that in cities of more than 100,000 population, 84 percent of bus facilities were terminals compared to only 39 percent in towns under 15,000 population.[25] The study identified 1,991 terminals and 1,775 stations for a total of 3,766 fixed-route passenger facilities. More than 80 percent of these facilities were owned or leased by Greyhound, Trailways, and the members of NTBS. Independent carriers accounted for the remainder.

The subsequent shrinkage of the Greyhound and Trailways networks, the sale of many terminal properties by Greyhound, the purchase of Trailways by Greyhound, and the consolidation of facilities, have resulted in far fewer terminals

25 U.S. Department of Transportation, Office of the Secretary, Transportation Systems Center, and Interstate Commerce Commission, Office of Transportation Analysis, "The Intercity Bus Terminal Study: A Report to the President and the Congress of the United States," unpublished report, December 1984, p. 13.

## Box 2-D-Profile of a Fixed-Route Carrier

Acme Bus[1] is a family-owned mid-size intercity bus company that has operated in the Midwest since shortly after World War I. The company's routes and services have evolved with the changes in the intercity bus business, but do not connect on a regular basis with publicly operated rural bus service or paratransit.

Acme serves more than a half-dozen States in the Midwest and interlines with Greyhound. Scheduled freed-route service represents about threequarters of the company's ridership. The remainder consists of charter service plus a bit of tour service. Its fixed-route service has changed considerably since the passage of the Bus Regulatory Reform Act. The company has eliminated most service to small towns in favor of large and medium-size cities, although a couple of routes linking major cities have been dropped. Acme managers estimate that more than 90 percent of its passengers board at full-service terminals. Only one or two bus stations operating out of a food store or gas station remain on the system; there are no bus shelters on Acme's routes, and it serves no flag stops.

The company's freed-route passengers are seniors, students, and middle- to low-income persons who do not fly for financial or other reasons. Since 1981, ridership has declined steadily. Although Acme has conducted no marketing surveys, management views the private automobile as its prime competitor and believes that its passenger profile has not changed since the early 1980s.

None of Acme's nearly three dozen over-the-road buses-average age about 10 years-is lift-equipped. Acme's managers estimate that each year they receive around 15 inquiries about accessible service from passengers who use wheeled mobility aids and that perhaps 100 of its 250,000 passengers need some kind of assistance to board. Boarding assistance extends to lifting and carrying if necessary.

Acme has 50 or so drivers and approximately one dozen mechanics, all of whom are male. These employees are unionized; employees who perform supervisory, managerial, clerical, and other support functions are not. Acme uses computers for accounting and for charter information, but not for dispatching. The company does not have an advance reservation system.

The company's operating ratio for 1985 to 1990 was around 95 percent. Like many similar companies that interline with Greyhound, Acme was affected by that company's 1990 strike. Acme's operating ratio was further hurt by the recession of the early 1990s and the reluctance of some individuals to travel during the Gulf War in early 1991. However, Acme's worst year coincided with the insurance crisis of 1986-87. Due to competitive pressures, Acme has not raised its fixed-route fares since a 10 percent increase in 1983. Its charter rates rose in 1985 by 6 percent and again, in 1991, by 5 to 10 percent.

When asked, "If you could do anything you wished, what would you change about your business?" Acme management replied: "The company has changed about as much as it could over the last 10 yearn, eliminating most of the nonproductive routes and cutting out a lot of fat. Not much more can be done. " The managers think the future of the industry lies in cooperative arrangements among bus companies, through the sharing of systems, terminals, and technology.

[1] "Acme" is a fictitious name; the bus company is real.

and stations than a decade ago. Generally, terminals are no longer staffed by bus company employees, but by contract agents. Greyhound figures show that, as of May 1991, the company used a total of 1,967 terminal and station facilities.[26]

[26] Econometrics Inc., ''Description of Available Intercity Services, OTA contractor report, May 21, 1992, p. 35.

## Fixed-Route Ridership

In August 1989 and 1991, Greyhound conducted onboard passenger surveys to establish an updated passenger profile.[27] Results characterized the income, age, employment, and other demographics of riders. The questions posed in the two surveys varied only slightly (see table 2-l). Along with the high percentages of low-income, female, minority, and elderly individuals using intercity buses, the surveys found that most trips were taken to visit friends or relatives, over one-third of bus travelers took 4 to 10 trips of 50 or more miles per year, over 20 percent defined their communities as rural, and almost 50 percent did not own an automobile capable of a 500-mile trip.[28]

In the 1991 survey, 47 percent of riders had household incomes under $15,000 per year. That same year, the poverty line for a family of four was $13,400. Census data for 1990 indicate that approximately 16.9 percent of all families had incomes below $15,000. A 47-percent ridership among individuals at that income level means that those with incomes below $15,000 are roughly three times more likely to be bus riders than a random draw of the population would predict.[29]

Similarly, 1977 census data show that low-income families (then under $10,000 per year) accounted for 45 percent of intercity bus passenger-miles, compared to 25 percent of rail passenger-miles, 18 percent of auto passenger-miles, and 15 percent of air passenger-miles (see figure 2-5). Figure 2-6 shows the age distribution of bus, rail, auto, and air travelers. The bus passenger is characterized by extreme youth and age. Business was the travel purpose of only 4.6 percent of bus passengers, compared to 50.7 percent of airline passengers and 37.2 percent of rail passengers.[30]

**Table 2-l-Characteristics of Greyhound Riders**

| | 1989 | 1991 |
|---|---|---|
| Personal characteristics | | |
| Incomes under $15,000 per year | 44.30/0 | 47.20/. |
| Female | 60.9 | 57.8 |
| Minority [a] | 37.8 | 41.8 |
| Never married | 41.9 | 43.8 |
| High school graduate or less | 42.6 | 41.7 |
| Age | | |
| Ages 16-24 | 26.3 | 28.1 |
| Ages 65 or over | 15.1 | 12.2 |
| Employment | | |
| Full time | 41.3 | 40.4 |
| Retired | 19.0 | 15.5 |
| Part time | 13.5 | 15.3 |
| Full-time student | 13.6 | 14.0 |
| Unemployed | 10.9 | 13.3 |
| Active military duty | 1.7 | 1.5 |
| Purpose of trip | | |
| To visit someone | 55.4 | 53.2 |
| Business | 3.8 | 6.2 |
| **Total annual trips of 50+ miles** | | |
| 1-3 trips | 35.1 | 33.2 |
| 4-10 trips | 36.3 | 36.7 |
| 11-30 trips | 18.8 | 20.2 |
| 30+ trips | 9.8 | 9.9 |
| **Miscellaneous** | | |
| Traveling alone | 64.2 | 64.4 |
| Never traveled by air | 21.3 | 23.2 |
| Do not own auto capable of 500-mile trip | 49.7 | 46.0 |
| Describe home community as rural | 20.4 | 21.7 |

[a] Minority includes nonwhites, listed as Asian, Black, Hispanic, and other.

SOURCE: Greyhound Lines, Inc., "Greyhound On Board Passenger Profile Surveys," unpublished surveys, 1989, 1991.

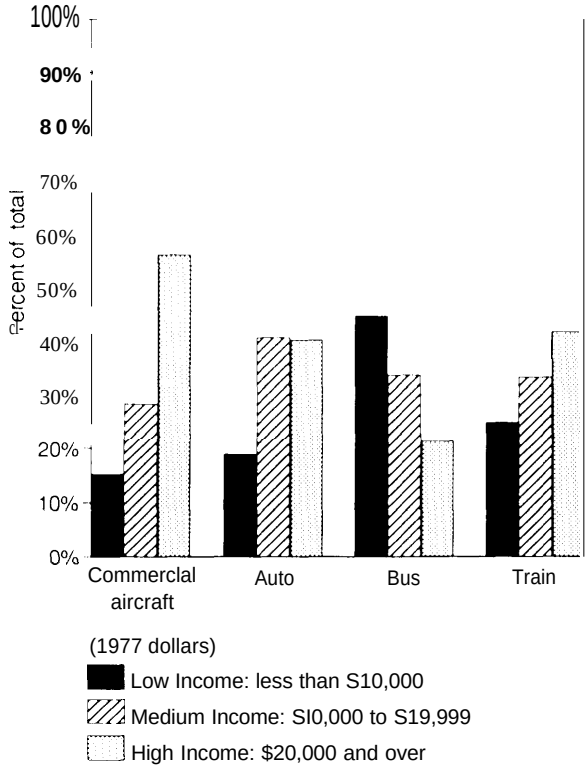
27 Econometrics, Inc., op. cit., footnote 16, pp. 24-25.

28 A Bureau of the Census survey in 1977 found that more than 30 percent of bus riders came from rural areas.

29 Richard v, Burkhauser, professor of economics, The Maxwell School, Syracuse University, personal communication, June 26, 1992.

30 Ecosometrics, Inc., op. cit., footnote 16, p, 25. OTA notes that these data and those in figures 2-5 and 2-6 are from 1977, before airline and OTRB deregulation and many other changes in U.S. transportation. Thus, they may not be entirely applicable to OTRB service in the 1990s. However, OTA analysts spoke with a number of bus companies in early 1992 to determine if company officials had noticed any change in the composition of their ridership over the past 10 years, Responses indicated no changes, except to reflect trends in the mix of services, e.g., if fixed-route services to smaller communities were reduced, and charter and tour services were increased, the overall ridership tended to have a higher percentage of older, retired people with more discretionary income.

**Figure 2-5-Intercity Passenger Travel, by Family Income and Transportation Mode, 1977**




NOTE: In 1977, the poverty threshold for a family of four was $6,191.

SOURCE: Robert R. Nathan Associates, Inc., from data in U.S. Department of Commerce, Bureau of the Census, "Travel During 1977," October 1979.

## CHARTER AND TOUR SERVICE

The charter and tour industry is the largest user of OTRBs. One study found that some 12,750 intercity coaches in use in North America in 1990 were in tour and charter fleets, compared to 10,500 in scheduled service.[31] As noted earlier, however, firms that offer both fixed-route and charter and tour services might use the same coach for any of these purposes. (See box 2-E for a description of a company providing a mix of services.)




Elizabeth Robinson

*Charter and tour service provides many opportunities to travel to sites in North America, such as the Lincoln Memorial.*

Prior to deregulation, ICC and individual State PUCs granted charter authority only to those companies operating freed-route service. Profits from charter and tour service often subsidized financially weak fixed-route service. Deregulation enabled this linkage to be broken.[32] Following passage of the BRRA in 1982, many smaller firms abandoned freed-route service to concentrate exclusively on charter and tour operations. Indeed, during the first year of regulatory reform, ICC processed 2,028 applications for new authority, one-half of which were from first-time applicants and 1,775 of which were for charter only.[33]

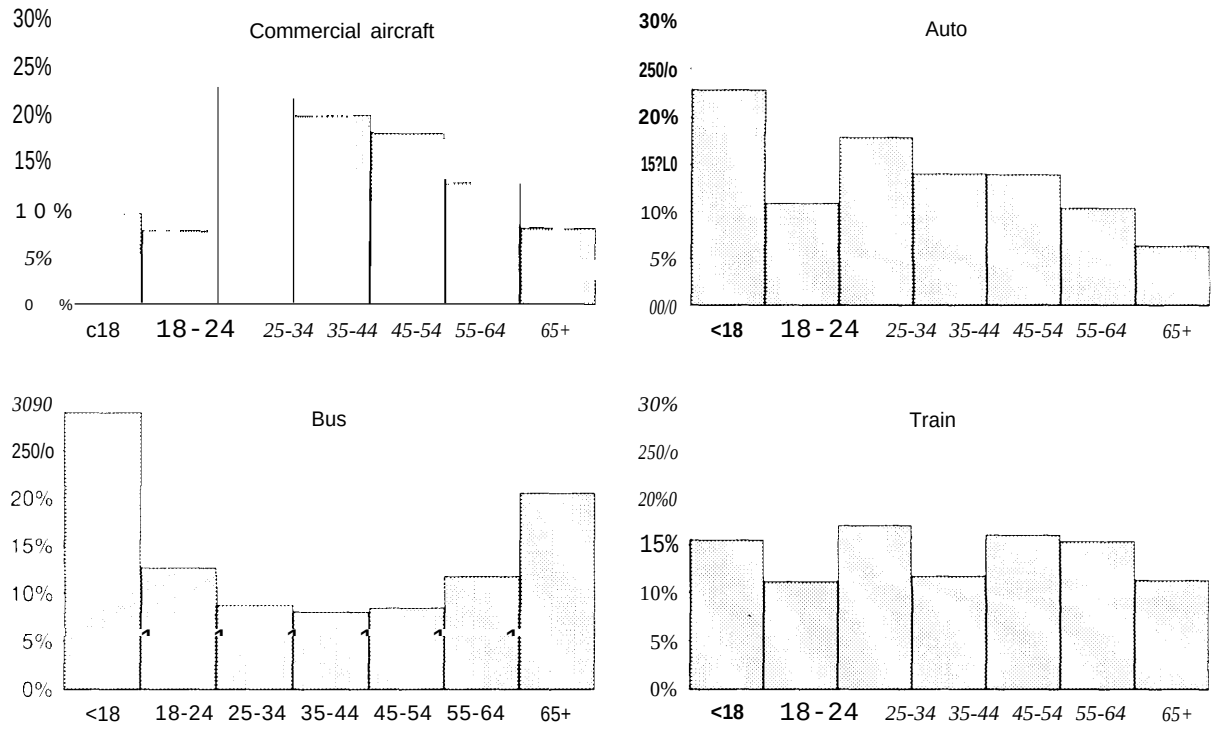
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31 "Coach Sale Growth is Predicted Through 1994," *Metro Magazine*, January-February 1991, p. 20. Other coaches nOt included in these numbers may be owned by churches, private and public organizations, or other groups.

32 In Michigan, 24 bus companies provided both fixed-route and charter service during the late 1960s. There are now 128 bus companies in the State, of which only 6 operate any freed-route service, and 4 of the 6 provide only local commuter or airport limousine service. Similarly, Virginia now has 3 firms supplying fixed-route service, compared to 13 prior to deregulation. Frederic D. Fravel et al., "Rural Inter-Regional Public Transportation Study," prepared for the Virginia Department of Transportation, Rail and Public Transportation Division, November 1988, p. 4. Although national data have never been collected, evidence suggests that the non-Class I carriers still providing scheduled service are more than likely supplying it as commuter service, airport service, or scheduled sightseeing. Econometrics, Inc., op. cit., footnote 16.

33 Interstate Commerce Commission, *The Intercity Bus Industry* (Washington, DC: January 1984), pp. 75-76.

**Figure 2-6—Intercity Passenger Travel, by Age of Traveler and Transportation Mode, 1977 (percent of total, by mode)**




SOURCE: Robert R. Nathan Associates, Inc., from data in U.S. Department of Commerce, Bureau of the Census, "Travel During 1977," October 1979.

The total number of bus companies grew from less than 1,000 in 1982 to an estimated 3,600 in 1990, with much of the increase provided by small firms. However, when insurance rates rose dramatically in 1986-87, and increased competition in charter and tour service created severe cost pressures, some large companies with both fixed-route and charter and tour services focused on fixed-route because of its relatively stable revenue.

Of the 3,000 providers of charter and tour services, about 750 classify themselves as operators of escorted group tours, either with their own buses or with charters.[34] A bus company may provide only a bus and a driver to the tour operator on a charter basis, or may itself serve as tour operator, selling tours to the public. These differing roles are described by three types of service:

- *Charter transportation* provides group travel where the schedule, origin, and destination is set by members of the group. The company providing the bus receives payment from the group; no transaction occurs between the bus operator and individual passengers.
- *Charter tours* include additional services requested by the group and arranged by the bus operator, such as meals, lodging, or attractions.
- *Retail tours* include the same services as charter tours but are sold directly to the

[34] Stephen M. Johnson, director, Government and International Relations, National Tour Association, Inc., personal communication, Mar. 16, 1992.

### Box 2-E—Profile of a Carrier Providing Mixed Services

Anchor Bus Co.[1] is a large carrier operating in a major metropolitan area in the Northeast. Founded in the late 19th century, the company has been owned by the same family since before World War II. Anchor provides a variety of services with 65 over-the-road buses (OTRBs), 15 transit buses, and 1 van. one-quarter of its OTRB fleet is lift-equipped, with 10 lift-equipped buses acquired through a State-financed program to promote OTRB accessibility, and 6 through contract arrangements with a public agency. The van and three transit buses are also lift-equipped.

Ninety percent of Anchor's service is fixed-route; the remainder consists of charter and tour. The fixed routes link outlying suburban and rural communities in the metropolitan area to downtown and the airport.The maximum distance one-way is about 115 miles, with most riders traveling shorter distances. This mostly commuter service operates all day, with peak frequency during rush hours. As a result, the company's OTRBs are available for charter and tour service, primarily on weekends.

About 75 percent of the company's ridership is handled at three full-service terminals in the metropolitan area. The terminals are owned by other operators; Anchor is a tenant. Other passengers, mostly commuters, board at ''Park & Ride' stations; a few are picked up at flag stops. The company has done some marketing surveys, confirming that its market for fixed-route services is blue- and white-collar workers traveling to and from the central business district. Retirees and students predominate during off-peak hours. The charter market is comprised largely of suburban groups.

Some persons with disabilities travel regularly on Anchor's Ml-equipped OTRBs; most are commuters. The vehicle-based MCI internal lifts are used about 75 times per year. Anchor keeps records of lift usage, but does not track the number of passengers whose disabilities may require other boarding assistance. The company has a 24-hour advance reservation system for passengers requesting accessible service, and works closely with the disability community to publicize the availability of its lift-equipped buses.

Anchor's 100-plus drivers and 12 mechanics are all unionized. About 10 percent of the drivers are women. Drivers undergo an intensive 4-week training program, and mechanics are subject to continuing training requirements. The company has not computerized any of its operations.

Anchor's operating ratio runs between 90 and 95 percent. In a tight market, the company has been able to raise its freed-route fares by only 5 percent over the last 10 years. Its chief competition is a State-subsidized van pool system, and its main concern is the regional transit authority's proposed extension of commuter service into Anchor's service area. Looking ahead, Anchor management believes the company's future as a provider of commuter and airport services may lie in securing more contracts with competing public bodies.

[1] ''Anchor'' is* fictitious name; the bus company is real.

public on an individual basis by a tour operator who makes all arrangements for meals, attractions, accommodations, tour guides, and so forth. The tour operator may be a bus company or a travel agent. (See box 2-F for a profile of a medium-size tour bus operator.)

## Comparing Fixed-Route and Charter and Tour Service

The 1990 American Bus Association (ABA) survey of the 452 firms performing fixed-route service as well as charter and tour operations revealed that, of their estimated total revenue of $1.8 billion, charter and special service accounted for an estimated 30 percent, and tour transporta-

## Box 2-F—Profile of a Medium-Size Bus Tour

Ajax Tours, Inc.[1] is a medium-size bus tour operator, in business for almost 20 years, and based in a midwest community of about 100,000 population. Ajax operated 150 tours in 1991, about 75 percent of them between May and October, the peak season in that part of the country. Business is fairly good during the shoulder seasons from October to early December and again from March to May. During the winter it falls off drastically.

The company owns two new over-the-road buses, which are not lift-equipped but have a kneeling feature for easier boarding.[2] Four 12-passenger vans are used mostly for passenger pickups. Ajax charters six to eight additional over-the-road buses from a bus operator located a few miles out of town, making reservations 6 to 8 months in advance. The operations of Ajax Tours, Inc. are completely computerized.

The company conducts tours throughout the continental United States and Canada with its own buses and its charters. The most popular and frequent tours, representing 25 percent of the company's total business, are to Nashville, Tennessee, and Branson, Missouri, centers for country music. Sixty percent of all tours are for 1 day. The typical longer tour is 3 to 5 days, with some tours as long as 30 days.

Most passengers are over 55 years of age, with disposable income, who like to travel but can no longer drive or who prefer not to. In recent years, the number of passengers in their fifties has increased, and females clearly predominate. In a typical tour group of 40, only 4 to 8 are males.

Customers tend to be less interested in tours of 2 weeks or more, preferring in such cases to fly to their destinations and spend more time touring locally. Increasing numbers seem to want less structured tours than in years past, with more options to see sites of particular interest to them.

In a given year, Ajax will accommodate from 12 to 15 persons using wheeled mobility aids who thus far, with the kneeling feature of the bus, have been agile enough to board by themselves. Their wheelchairs or scooters are stowed in the baggage compartment. Larger numbers of passengers who have limited mobility but do not use wheeled mobility aids, and others with visual and hearing impairments, tour on Ajax during the course of a year.

The company's chief competition is nonprofit organizations running tours for their members. Over the past 5 years, Ajax has been able to raise its tour rates by 10 to 15 percent and remain competitive in the commercial tour market.

1 "Ajax" is a fictitious name; the company is real.

2 The kneeling feature reduces the height of the first step to 9 inches above the ground, a reduction of 4 1/2 inches.

tion for about 6 percent.[35] Fixed-route service accounted for 57 percent and package express for 7 percent of revenues.[36]

The 452 firms provided an estimated 38 million passenger-trips on charter and special services, and 1.5 million trips on tours. The average revenue for tour passengers is estimated to be $64.04 per passenger, compared to $12.98 per charter passenger and $21.18 per fixed-route passenger. These figures also reflect differences in average trip lengths. Of particular note is that the average passenger revenue was $1.97 per fixed-route bus-mile compared to $1.63 for charter and special services, and $1.83 for tour services.[37] However, a subset of 56 firms operating only fixed-route OTRBs reported $2.21 per

35 Mark Beavers, "A Picture of the Industry," *Destinations (American* Bus Association), December 1990. Magazine survey respondents tend to be self-selecting and therefore do not always represent the target audience.

36 ENO Foundation for Transportation, Inc., op. cit., footnote 12. percentage of revenues derived from package express varies from carrier to carrier, ranging from about 5 to 15 percent.

37 ibid., p. 3.

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bus-mile. This may be due to the fact that some OTRBs on freed-route service generate income from package express.

These revenue estimates suggest that although freed-route ridership is shrinking, it is the only service capable of paying higher operating costs. For charters and tours to be profitable, operating costs must be lower on a bus-mile basis. This may be the reason why a number of the unionized fins, which pay higher wages, such as Greyhound Lines, Jefferson Lines, and Carolina Coach, have substantially reduced their charter and tour operations, focusing instead on their fixed routes.[38] The large increase in the number of companies offering charter and tour services has also increased competition, severely limiting the ability of some higher cost firms to compete in this market.



Stephen Garcia

*Many OTRB companies offer both fixed-route and charter and tour service. These buses are part of such a mixed fleet.*

## Ridership

Little nonproprietary information about charter and tour passengers is available. A 1986 market research effort to identify the characteristics of the customers of one particular firm showed that bus tour patrons have a median age of 60, and take an average of nearly five l-day vacation trips per year, 4.1 overnight or weekend vacation trips, and 2.3 extended vacation trips annually.39 They travel primarily to socialize, attend sporting or cultural events, and go sightseeing; have a household income of over $34,000 (1985 dollars, over $47,000 in 1991 dollars), and an average auto ownership of 1.8 autos per household; prefer package tours and economy vacations and are relatively averse to planning their own vacations; are more likely to be female; and prefer group travel to travel on their own. Most groups contain sizable numbers of widows or widowers. Studies undertaken by the National Tour Association, Inc. show that the average tour patrons are well-educated, middle to upper middle-level income seniors living in metropolitan areas, with no children residing at home.[40] One tour operator, with tours ranging from 1 to 30 days, describes the day-tripper as typically less affluent than those taking much longer tours.[41]

The primary market for escorted bus retail tours includes persons ages 50 and above, a group totaling about one-quarter of this country's population.[42] The American bus tour industry generated $13.8 billion worth of escorted tour business in 1990, carrying more than 60 million passengers on more than 1.5 million trips. Sixty percent of these passengers were over the age of 64.[43]

From this limited statistical information, it can be inferred that the median income of tour patrons is likely to be much higher than that of fixed-route passengers. However, both tour and fixed-route

38 Some Class I firms have been able to develop tour operations into a major revenue provider despite higher Cost structures.

39 Lawrence F. Cunningham, "Profiling Tour Patrons and Non-Patrons in Intercity Bus Passenger Markets,' paper presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 1986.

40 National Tour Association, "NTA Today," newsletter, 1991, pp. 7-9.

41 S. Burkett Milner, vice president/general manager, Capital Tours, Inc., personal communication, June 4, 1992.

42 National Tour Association, op. cit., footnote 40, pp. 7 9.

43 James Santini, Washington, DC Representative, National Tour Association personal communication, March 1992.

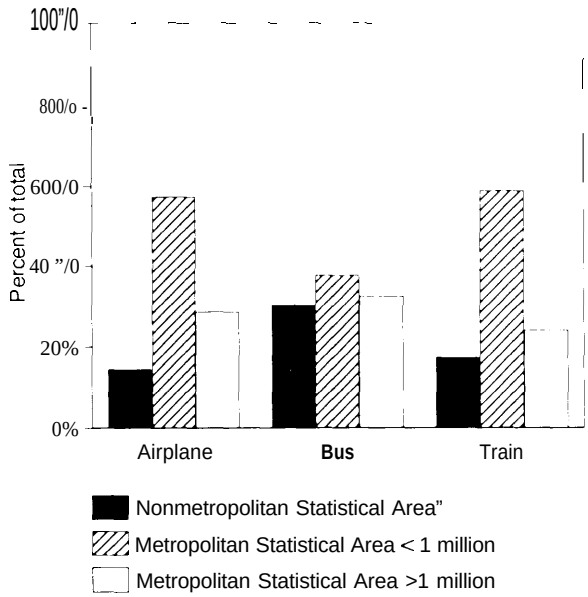
patrons are more likely to be over 65 than travelers on other modes of transportation. This group will be a growing percentage of the population in coming years. The Bureau of the Census projects a growth in population in the 65 and over category, from 31 million in 1990 to more than 65 million in 2050, rising from 12,5 percent to 22.9 percent of the overall population.

## SERVICE TO RURAL AREAS

Among the six specific areas the ADA directs OTA to analyze is: "The impact of accessibility requirements on the continuation of over-the-road bus service, with particular consideration of the impact of such requirements on such service to rural communities. "[44]

The OTRB is often the only public carrier option for the resident of a rural area or small town.[45] The approximately 6,000 U.S. communities served in 1992 by fixed-route bus service are only one-half as many as those reached in 1982, yet far more than the 477 served by air carriers or the 498 linked by Amtrak. Indeed, over 30 percent of fixed-route passengers describe their home community as rural, a far greater percentage than for either air or rail travel.[46] (See figure 2-7.) These riders have been affected by the loss of rural services. One survey estimated that 83 percent of the communities that lost bus service after deregulation had no other means of public intercity transportation.[47]

**Figure 2-7—Intercity Passenger Travel, by Travelers' Area of Residence**




•Metropolitan Statistical Areas are defined as a county or group of counties that include: 1 ) a city of 50,000 or more residents, or 2) an urbanized area of at least 50,000 people that is part of a county or counties with at least 100,000 total residents.

SOURCE: Robert R. Nathan Associates, ***Inc., federal Subsidies for Passenger Transportation, 1960-1988: Winners, Losers, and Implications for the Future*** (Washington, DC: May 1989), p. 18.

Meanwhile, the rural population of the United States has declined, from 49 percent in 1920 to 27 percent in 1990.[48] (For further characteristics of

44 Section 30.5(1))(6) of the ADA.

45 Robert R. Nathan Associates, Inc., *Federal Subsidies for Passenger Transportation, ]960-1988: Winners, Losers, and Implications for the Future* (Washington, DC: May 1989), p. 17.

46 A survey by Greyhound placed the figure at 20.4 percent, while a survey conducted by the Bureau Of the Census in 1977 found that over 30 percent of bus riders came from rural areas. Although it is over 16 years old, the census survey still provides the most accurate demographic breakdown of modal ridership. Ibid., p. 17.

47 Paul Shultz, "In the Gateway of Commerce: The Impact of Deregulation on Intercity Transit Service, " *Community Transportation Reporter,* vol. 5, No. 8, September 1987, p. 8.

48 U.S. Department of Commerce, Bureau of the Census, 'Summary: Number of Inhabitants for 1980," PC 80- l-Al (Washington, DC: U.S. Government Printing Office, 1980), p. 1-335; U.S. Department of Commerce, Bureau of the Census, 1990 press release, CB 91-344, December 1991; and OTA analysis. The U.S. census defines rural areas as those that are not urban, i.e., 1) central cities and their immediate surroundings, with a combined population of at least 50,000, and 2) towns outside of these areas with a population of at least 2,500. The Office of Management and Budget defines populations on the basis of metropolitan and nonmetropolitan areas (see table 2-2). U.S. Congress, Office of Technology Assessment, *Defining ' 'Rural' Areas : Impact on Health Care Policy and Research* (Washington DC: U.S. Government Printing Office, 1989), pp. 5-7.

**Table 2-2—Selected Characteristics of Metropolitan and Nonmetropolitan Populations[a]**

| | Metro | Non metro |
|---|---|---|
| Total population | 187,072,000 | 56,324,000 |
| Population density per square mile | 328 | 19 |
| Median age | 30.0 | 30.2 |
| Percent of population under age 18 | 27.8% | 29.4% |
| Percent of population age 65 and over | 10.7Y0 | 13.0% |
| Median family income | $33,131 | $24,397 |
| Percent with family incomes below poverty level | 12.5% | 16.9?4. |
| Unemployment rate | 6.9% | 8.4% |
| Median years of education completed | 11.6 | 10.9 |

a Based on office of Management and Budget definitions: Metropolitan Statistical Areas (MSAs) are counties or groups of counties that have either a city of 50,000 or more people or an urbanized area that has at least 50,000 people located in a county or group of counties of at least 100,000 population. Counties that do not have central cities can be counted as MSAs if they have other characteristics of metropolitan areas such as significant commuting to other counties or high population density. Nonmetropolitan populations reside in all other counties.

SOURCE:U.S. Congress, Office of Technology Assessment, ***Health Care in Rural America, OTA-H-434*** (Washington, DC: U.S. Government Printing Office, September 1990), p. 40.

metropolitan and nonmetropolitan populations, see table 2-2.) For example, Iowa, with an extremely large rural population of 39 percent,[49] has a higher percentage of the elderly than all but three States, two of which, Florida and Arizona, are retirement havens.[50] This demographic picture appears to make rural America a good fit for the fixed-route bus market, whose passengers tend to be disproportionately made up of the poor, young, and elderly.

## Effects of Deregulation on Rural Service

The passage of the BRRA resulted in significant point abandonment, with service lost to 2,154 communities in the first year alone.[51] This abandonment did not necessarily eliminate service to entire rural areas; often just unprofitable stops were dropped. Further, many bus operations shifted to the Interstate Highway System, eliminating stops along parallel local routes using older U.S. and State highways. This meant that, for individuals able to travel a short distance outside their home town, intercity service was sometimes still available.[52] How much of the reduction in service points was due to deregulation is a matter of debate. Quite possibly, economic trends would have eventually forced the shut down of service to some communities.[53]

Small towns bore the brunt of deregulation because of their lack of ridership and locations off of main routes. In Iowa, 70 percent of the points that lost service served fewer than 10 passengers per month.[54] Figures such as these did not translate into profits for the intercity carriers, especially when the bus had to travel off the beaten path to pick up only a few riders. In a

49 U.S. Department of Commerce, Bureau of the Census, "Percent Urban and Rural Population, 1990 and 1980," *The Census and You*, vol. 27, No. 1 (Washington DC: U.S. Government Printing Office, January, 1992).

50 Osha Gray Davidson, Broken *Heartland:* The *Rise of Americans Rural Ghetto* (New York, NY: The Free Press, 1990), p. 63.

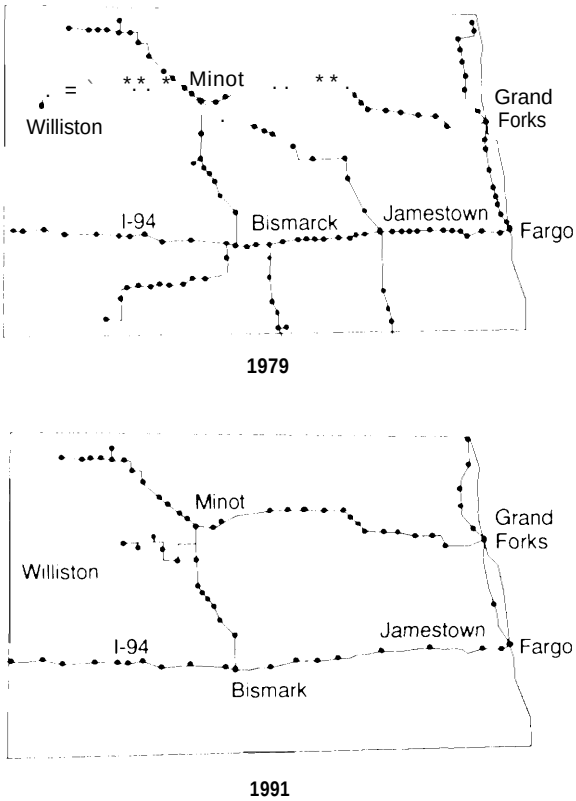
51 Ecosometrics, Inc., op. cit., footnote 16, p. 17.

52 All communities in Florida that lost service had another intercity bus stop between 9 and 21 miles away. In Iowa, 37 percent of ticket agents in communities that lost service reported that the nearest stop was over 20 miles away. John Due et al., *Transportation Service to Small Communities: Effects of Deregulation (Ames*, IA: Iowa State University Press, 1990), p. 86.

53 Meyer and Oster, op. cit., footnote 9, p. 219.

54 Mary Kihl, "TheImpact of Bus Deregulation on Small Towns," *Transportation Research Record 1012 (Washington* DC: Transportation Research Board, National Research Council, 1985), as cited in Eric Hansen et al. *The Benefits of Intercity Bus Service* (Milwaukee, WI: The School of Architecture and Urban PIarming, The University of Wisconsin-Milwaukee, October 1986), p. A9.

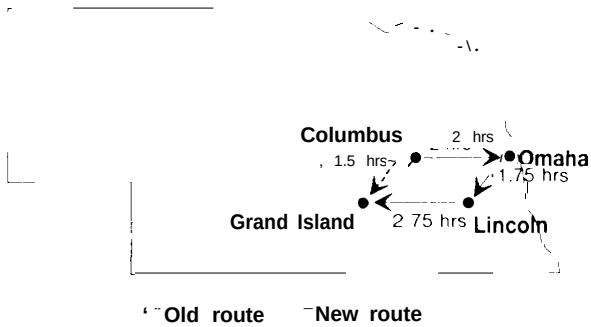
**Figure 2-8—North Dakota Fixed-Route Service, 1979 and 1990**




• = Service points

SOURCE: U.S. General Accounting Office, *Surface Transportation.' **Availability** of* Intercity ***Bus Service Continues*** to ***Decline*** (Washington, DC: June 1992), pp. 21-22.

**Figure 2-9-Fixed-Route Service From Columbus to Grand Island, Nebraska**




SOURCE: Russell's Guides, Inc., Russell's ***Official National Motorcoach Guide*** (Spokane, WA: Friendship Publications, Inc., October 1982 and November 1991), cited in U.S. General Accounting Office, ***Surface Transportation: Availability of Intercity Bus Service Continues to Decline*** (Washington, DC: June 1992), p. 25.

sample of 12 States, of the communities that lost service in the first 2 years of deregulation, 82 percent had populations under 2,500 and 94 percent had populations of less than 10,000.[55] When given the option, the major carriers concentrated on the most profitable routes, those between large central cities. Unlike the Airline Deregulation Act of 1978, which provided subsidies for continued air service to small communities, the BRRA included no such provision for communities left without bus service.

For example, the two maps in figure 2-8 compare freed-route service in North Dakota in 1979, when 129 locations were served, and in 1991, when 68 locations received service.[56] All communities south of Interstate 94 (I-94) lost service during that period. Bus service along the I-94 corridor still connects Fargo, in the east, through Jamestown and Bismark to the Montana border. However, I-94 now serves 17 intervening points compared to 34 in 1979. Service was also discontinued for points along the route linking Jamestown on I-94 and Minot, and the route between Minot and Williston. Williston, the Williams County seat, and eight other communities in that part of western North Dakota, now have no bus service.

Unlike Williston, Jamestown is still linked to Minot by bus, but the Jamestown passenger must now go through Bismark, adding approximately 25 percent to the distance traveled. Similarly, figure 2-9 demonstrates why, in 1992, travel by

55 Clinton Oster and C. Kurt Zorn, *The Impacts of Regulatory Reform on Intercity Bus Service (Bloomington, IN: Indiana University, **September 1984.***

56 U.S. General ***Accounting*** Office, *Surface Transportation: Availability of Intercity Bus Service Continues to Decline* (Washington, DC: June **1992),** pp. 21-22.

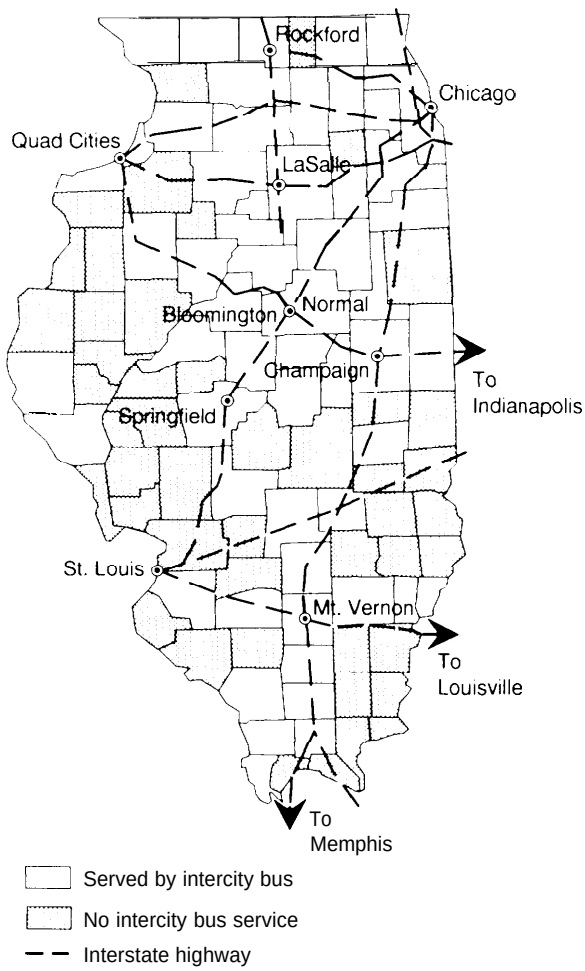
bus within Nebraska between Columbus and Grand Island is less convenient than it was 5 years earlier and less attractive as a travel option.[57] Formerly a 1 l/2-hour trip, the journey now takes 6 1/2 hours.

Figure 2-10 illustrates how areas served by intercity bus routes in Illinois correspond to Interstate highway routes.[58] Communities in 51 Illinois counties have fixed-route service; 39 of those counties are intersected by Interstate highways. Communities in the remaining 50 counties have no intercity bus service; only 13 of those counties are intersected by Interstate highways.

## Rural Bus Stops

Besides differing ridership levels, the most signifilcant distinction between rural and urban intercity service is in the facilities servicing the bus. In a large city center, a traveler goes to a full-service terminal, usually with its identity prominently displayed outside. In small communities, buses often stop at stations, where servicing the bus is not the primary business function. Because businesses usually either break even or lose money as ticket agents, they view the enterprise more as a public service operation than a profitable venture.[59] Thus, it can be difficult for carriers to find business owners willing to operate stations and publicize their service. As a result, while stations may be known to town residents, other potential riders do not always know where the bus stops or where they can purchase a ticket.[60]

**Figure 2-10-Fixed-Route Service in Illinois and the Interstate Highway System**




SOURCE: Russell's Guides, Inc.., ***Russell's Official National Motorcoach Guide*** (Spokane, WA: Friendship Publications, Inc., November 1991), cited in U.S. General Accounting Office, Surface Transportation: ***Availability of Intercity Bus Service Continues to Decline*** (Washington, DC: June 1992), p. 24.

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57 Ibid., p. 25.

58 Ibid., p. 24.

59 Randy Isaacs, director of State Government Affairs, Greyhound Lines Inc., personal communication, Aug. 13, 1991.

60 In order to alleviate this problem, Michigan, North Carolina, and Oregon have established programs to place signs identifying bus stops.

## Reliance on Service

The extent to which rural areas depend on fixed-route passenger and package service is difficult to determine. Studies of rural communities that have lost service have concluded that, while on the whole the adverse consequences to towns were usually not severe, some individual businesses and people who had used the bus endured significant hardship.[61]

### Dependence on Passenger Service

With the exception of the private automobile, no readily available alternative exists for travel along many passenger bus routes. Therefore, the potential adverse effect of abandonment can be very high in rural communities. But in any analysis, the perceived need for the intercity bus must be separated from the actual demand for the service.[62]

Community Dependence—Studies have consistently shown that route abandonment has had minimal effects on rural communities in general. A study of 15 States facing substantial route discontinuance after the passage of the BRRA found no formal protests from communities losing service,[63] Whether this was due to indifference or because of ignorance of how best to protest is unclear. In the few States where significant protest has occurred, a proposed abandonment has often been stalled, or the route has been partially subsidized by government funds. In Nebraska, the work of a' 'Save the Bus' committee eventually led to State funding of a rural route. Citizens were able to demonstrate that bus service was in the public interest and that a substantial portion of the community wanted to maintain the service. The route from Omaha to Rapid City, South Dakota, was maintained by Arrow and Black Hills Stage Lines for several years after a Federal Transit Authority study recommended State subsidies. However, ridership continued to decline, and the bus company stopped operation of the route on June 1, 1991.@

Because most residents of rural areas never use bus service, its loss has little impact on their lives. The business community is seldom affected significantly, either, as most fixed-route bus trips are taken for purposes of visiting friends or relatives, and not for shopping or business trips.[65] A nationwide study of service to rural areas concluded that ''. . . most intercity trips taken by rural residents . . . are not critical to their day-to-day needs [and] do not materially relate to the basic economic functions of rural areas, ''[66]

Individual Dependence—For individuals dependent on bus service, however, community abandonment often means increased isolation. In the Wisconsin study, 20 percent of bus riders from small towns said they would not be able to make a similar trip if bus service were unavailable. Among the elderly, dependence on the bus is even more striking: 48 percent of those over 65 said they would not be able to make the trip if bus service were unavailable.[67]

However, community abandonment does not seem to have occurred disproportionately in towns with numerous poor and elderly residents.

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61 The Wisconsin Department of Transportation conducted a study on the benefits of intercity bus service, which included an analysis of towns that have lost service. Similar studies have been conducted in Iowa and other States. Hansen et al., op. cit., footnote 54.

62 Due et al., op. cit., footnote 52, p. 88.

63 Ibid., p. 89.

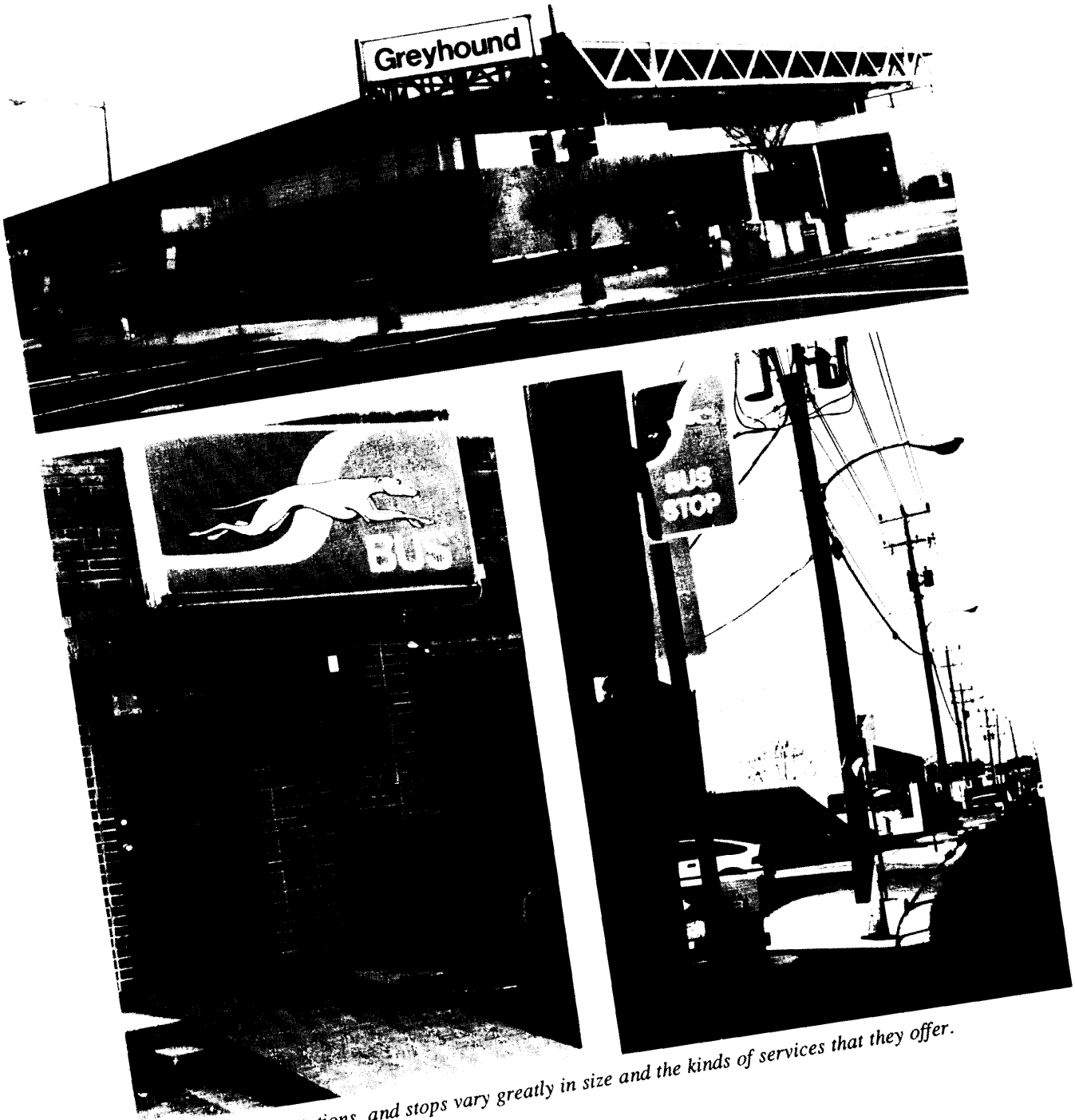
64 U.S. Department of Transportation *Comprehensive Study of Intercity Bus Service in Nebraska* (Washington, DC: March 1988); and Frederic D. Fravel, Ecosometrics, Inc., personal communication, Feb. 16, 1993.

65 Due et al., op. cit., footnote 52, *p. 85.*

66 John Wells et al., U.S. Department of Transportation, Office of the Assistant Secretary for Policy and International Affairs, *Inter-City Bus, Rail, and Air Service for Residents of Rural Areas, 1980* (Washington, DC: U.S. Government printing Office, 1980), cited in Hansen et al., op. cit., footnote 54, p. Al.

67 Hansen et al., op. cit., footnote 54, p. B2.

Photos by Stephen Garcia




*OTRB terminals, stations, and stops vary greatly in size and the kinds of services that they offer.*

Because the elderly and poor use the bus at a high rate, they often provide sufficient ridership to justify continuation of bus service in places where their numbers are large. In fact, communities that retained service after deregulation had lower per capita incomes and higher percentages of elderly citizens than small towns where service was discontinued. [68]



*Most passengers travel on intercity, fixed-route OTRBs for vacations, visits to relatives, and shopping trips.*

### Dependence on Package Service

Bus package delivery finds its largest market in rural areas, serving small businesses, farmers, or hospitals. However, with the expansion of next-day-delivery services, the importance of bus package delivery has diminished greatly. Greyhound saw a significant drop in its revenue from package service as these companies expanded; Federal Express, for example, now delivers to innumerable locations.@

Those who use bus package service find it attractive because it often supplies the only available same-day delivery of important perishable items, such as blood and agricultural products, cargoes not handled by carriers such as Federal Express or United Parcel Service (UPS). OTRBs have less stringent weight and size restrictions than other services, allowing heavy packages, such as auto parts, to be shipped in a timely fashion. Although package air service is becoming increasingly available to small communities, its cost compared to bus freight shipment makes the latter more appealing to some businesses.[70] Individuals who had relied on package service in areas where bus service has been eliminated have been forced to adjust. For example, when bus service was curtailed in Bishop, California-a town of 3,500-blood had to be rushed from Reno by the California and Nevada State highway patrols.[71] Businesses that need to transport larger or different objects than UPS handles now rely on personal delivery or travel to the nearest intercity bus station to ship their packages.

Given the low volume of packages shipped by intercity bus in most communities, the adverse economic effects of service discontinuance are not widespread. For example, 81 percent of the routes abandoned in Iowa handled fewer than 50 packages a month.[72] In most of the small towns that lost bus service following deregulation, the few small businesses that used bus package service have switched to other alternatives, primarily UPS, and the towns' general economic health was rarely affected.[73]

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68 Meyer and Oster, op. cit., footnote 9, p. 219.

69 Randy Isaacs, director of State Government Affairs, Greyhound Lines Inc., personal communication, Sept. 17, 1991.

70 For example, in the case of a 100-pound package Shipped from Wausau, WI to Rhinelander, WI, a town of under 10,000 residents, United Parcel Service would not take the package because of weight restrictions; sending it by Federal Express would cost $146 more than shipping it by bus. Hansen et al., op. cit., footnote 54, p. 43.

71 John E. Gallagher, "Where There's No Bus, There's No Exit," *Time, Mar. 26, 1990,* p. 59.

72 Kihl, op. cit., footnote 54, p. A9.

73 Hansen et al., op. cit., footnote 54, p. 50.

## Government Assistance to Rural Transit

Federal and State Governments offer financial assistance for rural transit services, which are generally provided by vehicles other than OTRBs. The principal instrument for this assistance is Section 18 of the Federal Transit Act, successor to the Urban Mass Transportation Act of 1964.

- Section 18 authorizes the Secretary of Transportation, through the Federal Transit Administration (FTA), to provide funds to each State to be used for public transportation projects in nonurbanized areas .74 The funds may be used for planning, capital, and operating assistance by State and local government bodies, nonprofit organizations, operators of public transportation services, and others.
- The Section 18 program aims to facilitate rural residents' access to health care, education, employment, public services, and other activities through improvement of public transportation systems in rural and small urban areas. It also seeks to encourage as much as possible the participation of private transportation providers in rural and small town transportation service.
- State agencies receive additional funds under Section 16(b)(2) of the 1978 Surface Transportation Assistance Act. These FTA funds assist private nonprofit organizations to purchase vehicles and equipment to transport the elderly and individuals with disabilities in both rural and urbanized areas. Transportation providers serving primarily rural areas may receive both Section 16(b)(2) and Section 18 funds from their State agencies; some may also receive funds from the U.S. Department of Health and Human Services to provide transportation for certain disadvantaged individuals.[75]



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*Package express service, which delivers large, perishable, or other special cargo, can generate significant revenue for the bus company.*

Over one-quarter of all rural transit agencies operate in more than one county, their vehicles often traveling long distances over several counties on individual trips.[76] A number of these buses travel distances similar to those of the average rural freed-route bus trip (estimated at 125 miles), making some rural transit operations suitable surrogates for discontinued bus service .77 Persons who use wheeled mobility aids make up 7 percent of all riders of Section 18 systems; 39 percent of all passengers are over 65.[78] Many vehicles operated by FTA-supported agencies are lift-equipped, enabling passengers with mobility disabilities to travel more easily.

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74 States receive funds based on their percentage of the Nation's total rural population using *the census definition* of rural.

75 The Department of Health and Human Services provides $1 billion for transportation. However, that money Often is Spread out over a variety of local agencies, and coordinating resources among transportation providers is a major stumbling block in rural transportation. U.S. Department of Agriculture, *Reconnecting Rural America: Report on Rural Intercity Regional Transportation* (Washington DC: U.S. Government Printing Office, July 1989), p. 2.

76 Community Transportation Association of America, *A Profile of the Section* 18 *program* (Washington, DC: 1990), p. 4.

77 Due et al., op. cit., footnote 52, p. 85. In a 1984 survey, the majority of former intercity bus ticket agents in Iowa recalled that three-quarters of their passengers traveled less than 100 miles, usually within the State.

78 Community Transportation Association of America, op. cit., footnote 76, p. 4.

### 1991 Amendments to Section 18

Section 18 was amended by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA),[79] which added Subsection (i) to encourage the further involvement of the OTRB industry in serving rural areas. Section 18(i) calls for each State to spend no less than a fixed percent of its apportionment for that purpose, unless the Governor certifies that the State's intercity bus needs are adequately met.[80]

- Section 18(i) provides funds to support a set of national objectives that: 1) connect nonurbanized areas to the larger regional or national system of intercity bus service; 2) meet the intercity travel needs of residents of nonurbanized areas; and 3) improve the infrastructure of the fixed-route network.
- Eligible activities for funding under Section 18(i) include planning and marketing, capital grants for shelters, joint-use stops and depots, operating grants through purchase-of-services agreements, user-side subsidies and demonstration projects, and coordination of rural connections between small transit operations and fixed-route carriers .[81] FTA draft guidance specifies that capital assistance may be used to purchase vehicles or vehicle-related equipment such as wheelchair lifts for use in intercity service. For vehicle-related equipment required by the ADA, the Federal share is 90 percent of its incremental cost. For purposes of Section 18, charter and sightseeing services are not eligible for FTA assistance; commuter service is not included in the definition of intercity service, but package express is.

In connection with its June 1992 report on the intercity bus industry, the U.S. General Accounting Office (GAO) identified 20 States with intercity bus service programs ranging from financial support for individual bus routes to toll-free telephone numbers for route and schedule information.[82] Seventeen of these States use Federal funds, 14 also use State or local government funds, and 3 use only funds generated within the State.[83] While 30 States have no programs for supporting fixed-route service, 43 States indicated to GAO that they expect to use the Section 18(i) set-aside moneys for improvement of intercity bus transportation.

### Rural Connector Programs

As major freed-route carriers dropped rural stops from their routes, community leaders and industry sought ways to provide transportation to potential riders in isolated areas. In 1987, Greyhound, with the cooperation of the Community Transportation Association of America (CTAA) and FTA, sought to link existing intercity routes with public providers of rural transit by establishing the Rural Connector Program (RCP).[84] As of December 1991, 73 transit agencies serving over 850 communities in 20 States were participating in RCP.[85] Local transit systems took passengers

79 Public Law 102-240.

80 Five percent in fiscal year 1992, 10 percent in fiscal year 1993, and 15 percent in fiscal year 1994 and thereafter. The fiscal year 1992 appropriation for Section 18 activities was $66.13 million, the fiscal year 1993 appropriation is $90.83 million.

81 The maximum Federal share is 80 percent of capital expenses and 50 percent Of Operating costs.

82 U.S. General Accounting Office, Op. Cit., footnote 56, pp. 34-41

83 Fourteen of the 20 States provide operating subsidies, typically designed to maintain public transportation services for rural and Small town residents. Six have vehicle programs whereby State-owned buses are leased to private operators to provide intercity bus service. Five offer assistance for construction or remodeling of terminal facilities, particularly for intermodal transportation. Ten provide other types of assistance such as promotional materials, maps, signage, passenger shelters, and tax credits on fuel expenditures.

84 Greyhound Lines invested approximately $500,000 in RCP, with CTAA contributing $200,000. CTAA's costs were offset by a grant from FTA. U.S. Department of Transportation, *Intercity Bus Feeder Project Program Analysis: Final Report* (Washington, DC: September 1990), p. S-13.

85 U.S. General Accounting Office, op. cit., footnote 56, p. 4.

to and from intercity bus stops and acted as ticket agents for Greyhound, selling intercity bus tickets along with the regular transit service fee. Between 1987 and the beginning of the Greyhound strike in 1990, the program allowed Greyhound to add 941 points to its fixed-route service.[86] The strike and the company's subsequent bankruptcy filing, however, placed the program on hold in all but a few communities.

The greatest concern surrounding RCP was the lack of ridership.[87] After almost 2 years of operation, the program had generated 2,744 total trips, with average ridership for individual transit agencies ranging from O to 64 trips monthly .88 Local operators offered the following reasons for the program's inability to attract passengers: lack of advertising funds made marketing difficult; Greyhound marketing materials were ill-suited to small community needs; and intercity coaches often arrived during hours not covered by local providers. In addition, many rural transit operators serve primarily human service agency clients, and have limited abilities to serve the general public.[89]

Another reason for the program's low ridership was that Greyhound was unable to serve a portion of the Section 18 operators' clientele—individuals with disabilities, In fact, Minnesota's State Department of Transportation declared that it would not support the participation of its Section 18 operators in RCP in view of the inaccessibility of Greyhound's OTRBs.[90]

## OTRB ACCESSIBILITY PRIOR TO THE AMERICANS WITH DISABILITIES ACT

### Legislative Precedents, 1970 to 1990

Twenty years of legislation, rulemaking, and court decisions involving access to publicly funded transportation preceded the 1990 enactment of the ADA.[91] Milestones during that time included:

- In 1970, the Urban Mass Transportation Assistance Act established as national policy that individuals with disabilities have equal right of access to publicly assisted mass transportation facilities and services, and that planning and design of such facilities and services should assure that right. It authorized the use of up to 3.5 percent of total mass transit appropriations for improved access. But suits brought by individuals with disabilities claiming that public transit authorities must now purchase accessible vehicles were dismissed by the courts.
- In 1973, Section 504 of the Rehabilitation Act became law, stating that: "No otherwise qualified handicapped individual . . . 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. "[92]
- In 1976, the Urban Mass Transportation Administration (UMTA, now FTA) of DOT adopted regulations requiring public transit

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86 Ecosometrics, Inc., op. cit., footnote 16, p. 19.

87 In 1987, the State of Michigan instituted its own connector program with FTA support, providing funds to local transit agencies to conduct the service. By the spring of 1991, Michigan's RCP had attracted more ridership than Greyhound's national version. Once FTA funding ended, however, even these ridership levels could not justify continuance of the program, which continued to lose money.

88 U.S. Department of Transportation, op. cit., footnote 84, p. s-11.

89 Isaacs, op. cit., footnote 59.

90 David Raphael, executive director, Community Transportation Association of America, personal communication, July 18, 1991; and Randy Isaacs, Isaacs & Associates, personal communication, Oct. 6, 1992.

91 The following material is based on Paul Stephen Dempsey, "The Civil Rights of the Handicapped in Transportation: The Americans With Disabilities Act and Related Legislation, " *Transportation Law Journal, vol. 19, No. 2, 1991,* pp. 314-317,

92 Public Law 93.112, approved Sept. 26, 1973, 29 USC 794.

agencies to make special efforts to accommodate individuals with disabilities, but without indicating how that should be done. Some agencies responded by purchasing Lift-equipped buses and others established dial-a-ride or paratransit services.[93]

- In 1978, the then-Department of Health, Education, and Welfare issued lead agency guidelines requiring that individuals with disabilities be "mainstreamed' into Federal programs. Retrofitting of buses and subway systems was required, with the provision of specialized services allowed to supplement or substitute for accessibility. In 1979, UMTA issued rules requiring that all new fixed-route buses be made accessible to individuals with disabilities, including those using wheelchairs. The rule required that 50 percent of peak-hour buses be accessible within 3 years.
- In 1981, however, the courts held that such specific requirements were beyond the scope of DOT authority. Congress then enacted the Surface Transportation Assistance Act (STA) of 1982, with provisions requiring DOT to establish minimum service criteria for indiviuls with disabilities, but requiring neither equal access nor comparable service.
- In 1986, UMTA issued final rules pursuant to the STA, giving transit agencies three options: installing lifts on buses, establishing a paratransit system, or establishing a mixed system of accessible buses and paratransit. In rulings on suits brought against the mixed system approach, the courts held that mixed systems were legal since no right for equal access existed at that time, either legislatively or constitutionally.
- In 1990, however, equal access became the law with passage of the Americans with Disabilities Act, which for the first time addressed private entities providing public transportation.

## I Current Status of Accessible Service

Prior to passage of the ADA, the statutes, regulations, and court decisions noted above required federally assisted public transit systems to provide some accessible transit buses and vans, and by 1990 considerable progress had been made. However, examples of accessible OTRBs were few. The first lift-equipped OTRBs appeared in 1985 in Canada under government-sponsored demonstration programs. In 1986, Massachusetts initiated its own program providing publicly financed, lift-equipped OTRBs to a number of private operators within the State for freed-route, commuter, and other services, In 1987, two public transit agencies, the Denver Regional Transportation District and the Golden Gate Bridge, Highway and Transportation District of San Rafael, California, began operating a total of 39 lift-equipped OTRBs. (See chapter 3 for a discussion of the Denver RTD project.)

### Privately Operated Service

As of late-1992, OTA had identified 26 bus operators nationwide who ran some 350 lift-equipped OTRBs. At that time, these 26, plus other operators without lift-equipped buses, had an additional 100 accessible buses on order. Of the 26 bus operators, 7 are public transit authorities. The remaining 19 are private companies, but, with two exceptions, they operate their accessible

[93] Paratransit, also formerly referred t. as di~.a-ride, is characterized by flexible routes and schedules, curb-to-curb or door-to-door pickup and dropoff points, requested in advance by a user eligible for the service. Under the DOT Interim Regulations (issued pursuant to Sec. 306(a)(2)(A) of the ADA), paratransit ". means comparable transportation service required by the ADA for individuals with disabilities who are unable to use fixed-route transportation systems, 56 *Federal Register 45624* (Sept. 6, 1991).




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*A sign at a Greyhound terminal in February 1993 indicates the company's willingness to serve persons with disabilities.*

OTRBs under contract to public bodies.[94] (One of the exceptions is a tour operator whose single lift-equipped OTRB was purchased and operates without public financial assistance. See box 2-G.) Fewer than 5 of the 26 operators are principally providers of traditional freed-route service; the others provide essentially commuter, airport and special services, and charter and tour services.

Approximately 40 companies list themselves in the 1992 *Motorcoach Marketer* as providers of accessible tours to persons with disabilities. However, OTA has been able to confirm only six of these as having lift-equipped OTRBs.[95] The rest provide accessible service with minibuses, vans, school buses, and other vehicles.

A few travel agents and tour operators have persons with disabilities as their primary client base.[96] Travel agents and tour operators specializing in travel for individuals with disabilities claim that arranging accessible motorcoach tours in the United States is next to impossible, although a few small bus companies may have accessible vehicles for highly localized tours, and some tour destinations are thoroughly accessible, most notably Disney World. (See chapter 3 for a discussion of the charter and tour market for individuals with disabilities.)

## PRESENT DOT REGULATIONS

DOT regulations require privately operated OTRBs to provide handrails, stanchions, increased lighting, slip-resistant flooring, contrasting edge surfaces, and a door width of 30 inches where possible and in no cases less than 27 inches. The ADA also called on the Secretary of Transportation to issue interim regulations 1 year after enactment, so that each private entity using an OTRB provides access for persons with disabilities .97 These regulations could not require structural changes in OTRBs or the purchase of boarding assistance devices, and remain effective until supplanted by the Secretary's final regulations.[98]

The DOT interim regulations require private entities operating OTRBs to assist individuals with disabilities in boarding and disembarking,

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94 In addition t. the private bus companies participating in the Massachusetts demonstration, and the two public agencies, the Denver Regional Transportation District and Golden Gate, the following private operators provide accessible OTRB service, all under contract to public agencies: California—Laidlaw Transit, Antelope Bus Co., Inc., Gray Line Tours, Goodall's Charter Bus Service, Inc., All-West Coach Lines, Amtravel; Connecticut—Post Road Stages; and New York-Central New York Coach Lines, which owns a lift-equipped OTRB but has never operated it. A public transit authority operating its own accessible OTRBs is Dallas Area Rapid Transit. Houston Metropolitan Transit Authority ordered 40 accessible OTRBs in early 1992. This list may not be all-inclusive.

95 Brush Hill, Central New York Coach Lines, Goodall's Charter Bus Service, Inc., H&L Bloom, Inc., Post Road Stages, and Peter Pan.

96 "A travel agency is a retail merchant who sells travel to the consumer. A tour operator is a wholesaler who puts tours together, then sells them to a travel agency. Many travel agencies are also tour operators." Helen Hecker, *Directory of Travel Agencies for the Disabled* (Vancouver, WA: Twin Peaks Press, 1991), p. 2. Some foreign travelers with disabilities who are interested in touring the United States by motorcoach assume accessible coaches are available, and foreign travel agents making inquiries on their behalf are often astounded to find otherwise. Yvonne Nau, Nautilus Tours, Inc., Tarzana, CA, personal communication, Jan. 28, 1992.

97 Publicly operated OTRBs (or privately owned OTRBs operated under contract to a public entity) must meet all of the service requirements applying to public entities, and all of the vehicle accessibility requirements that apply to transit buses under Part 38 of DOT's regulations.

98 56 *Federal Register 45624* (Sept. 6, 1991).

### Box 2-G—An Accessible Tour Bus: Evergreen Travel Service, Inc.

Evergreen Travel Service, Inc., of Lynnwood, Washington, has been operating tours since 1960. After 20 years of conducting tours all over the world for persons with disabilities, proprietors Betty Hoffman and her son Jack decided they needed their own bus. The Hoffmans bought a used bus, equipped it with a Crow River lift, rebuilt the restroom to make it accessible, and installed 16 tie-down positions. Its current configuration accommodates 12 tie-downs. The Crow River is an external lift, takes up no baggage space, and is located in front of the rear wheels and immediately in front of the restroom. The restroom is equipped with a 40-inch-wide door facing the aisle.

Jack Hoffman says the bus was used for only 1 year before the insurer discovered it was being used to transport a number of passengers with disabilities and raised the insurance rates to $3,000 per month. Hoffman claims he was told he could pay normal rates only if he were to tear out the lift. Instead, he parked the bus and left it unused for 7 years. Meanwhile, he unsuccessfully tried to secure coverage through the State of Washington high-risk pool. He was later placed in a high-risk pool in San Francisco where he could have obtained coverage for $900 per month, but that figure was not economically feasible. Only in early 1992 was the Evergreen bus put back into operation, after being insured at $525 per month through a pooling arrangement with another eight buses operated by a family company in the Seattle area. Hoffman believes that rate to be about $125 per month above the going rate for OTRBs in Washington State.[1]

In more than 30 years, Evergreen has conducted tours to more than 100 countries for individuals with a variety of mobility and sensory disabilities. In some countries, accessible coaches can be arranged easily. Britain, Scandinavia, several other countries in Western Europe, and Israel are favorite destinations where accessibility presents few major problems. In other countries, including Tibet, Nepal, India, and Burma, accessible buses do not yet exist, nor are facilities accessible. In such cases, lifting and carrying are the only options. Hoffman has conducted six tours to China and in 1991 took a group of 23 individuals with disabilities there. He tells the story of getting persons who use wheeled mobility aids or scooters to the top of the Great Wall of China via routes unknown to his Chinese guides, using ramps initially built for supply horses and encountering only five steps along the way.

[1] It is Hoffman's belief that insurance company concerns are misplaced. Most suits brought by individuals with disabilities are dismissed, he claims, with the court finding that they are already disabled, and proof of further disability as a result of an accident difficult to establish. Suits brought by formerly able-bodied people disabled in accidents, however, are frequently found in favor of the passenger; it is in these cases that insurance companies end up paying claims. Hoffman believes that insurance companies should not focus on a company's ability to transport disabled passengers but on its safety record.

including moving to and from the bus seat. Carrying is a disfavored method of assistance, but since the purchase of boarding assistance devices cannot be required, there may be times when carrying is the only available means of access. In such cases, it is the responsibility of the entity to ensure that personnel providing boarding assistance, especially by carrying or direct physical aid, are trained to do so safely and appropriately.

Wheelchairs and other mobility aids and assistive devices may be accommodated in the areas for personal effects in the passenger compartment, size permitting. If this is not possible, they are to be stored in the baggage compartment of the bus. At any stop, a person with a wheelchair or other assistive device would have the device loaded before other items at the same stop, although luggage already on the bus could not be "bumped" to accommodate the device.

The OTRB operator may require up to 48 hours advance notice, but only if boarding assistance is necessary. "While advance notice requirements are generally undesirable, this appears to be a case in which a needed accommodation may be able to

be provided successfully only if the transportation provider knows in advance that some extra staffing is needed to accomplish it. ' '[99] If advance notice is not provided, the entity still has the obligation to offer boarding assistance, if it can be done with available staff.

One year after submission of the OTA study, DOT must issue final regulations specifying the level of service required on accessible intercity coaches for individuals with disabilities. These regulations will be enforced by a governmental framework divided among many different agencies. While modes such as air and rail have entire administrations within DOT geared to their oversight, private OTRB companies find regulatory authority splintered not only within DOT but throughout the State and Federal Governments (see app. B.) Within this complex regulatory environment, DOT must determine how best to administer and enforce accessibility regulations.

[99]56 Federal *Register 45756* (Sept. 6, 1991).

# Demand for Accessible Over-the-Road Bus Service

# 3

## FINDINGS

- The number of persons with disabilities is very difficult to estimate. Data-collection methods differ, and in many cases the data conflict. In addition, the definition of 'disability" varies by source.
- The prevalence of disabilities correlates with advanced age. U.S. Bureau of the Census projections indicate that the 65-plus age cohort is growing rapidly, from 12.5 percent of the total population in 1990 to as much as 25 percent by 2050. Thus, it is likely that the proportion of persons with disabilities will increase as well.
- The profile of over-the-road bus (OTRB) ridership resembles in key ways the profile of the population of persons with disabilities. The similarities include age, gender, and income characteristics.
- A handful of programs and demonstration projects have offered accessible OTRB service. In general, the use of accessibility equipment in these projects has been very low. However, since the projects covered limited areas with infrequent service, and since several are new and still building ridership, it is not possible to generalize from their ridership levels to total ridership in a nationwide, completely accessible OTRB system.
- To calculate the level of OTRB ridership (for both fixed-route and charter and tour service) by persons with disabilities, the Office of Technology Assessment (OTA) extrapolates from OTRB usage for the entire U.S. population. This methodology estimates the annual trips by persons using wheelchairs at 0.5 to 0.6 percent of the current annual trips by persons without disabilities; the annual trips



by persons using any type of mobility technology device comprise 1.2 percent; the annual trips by persons with hearing impairments come to 5.6 percent (annual trips by those using hearing technology devices total 1.5 percent); annual trips by persons who are legally blind amount to 0.4 percent; annual trips by persons who are sight impaired comprise 2.0 percent; and annual trips by persons using vision technology devices total 0.1 percent. Data on the number of persons with cognitive impairments are too vague and inadequate to predict the number of such persons who require assistance in riding OTRBs.

- OTA cautions that these calculations of potential demand are only estimates, and that projecting demand for accessible service that has not yet been offered is next to impossible.

## BACKGROUND

Section 305 of the Americans with Disabilities Act (ADA) requires that OTA study ". . . the anticipated demand by individuals with disabilities for accessible over-the-road buses and accessible over-the-road bus service. "[1] The law asks OTA to develop figures about how many persons with disabilities are likely to use accessible OTRBs; it does *not* state that the results of OTA's study will affect the requirement to make OTRBs accessible.

This chapter presents OTA's analysis of the demand for accessible service in three sections: 1) a discussion of persons with disabilities, their characteristics, and their numbers; 2) a description of demonstration projects that have attempted to provide accessible OTRB service to persons with disabilities; and 3) an explanation of OTA methodology and the resulting demand projections.

## PERSONS WITH DISABILITIES IN THE UNITED STATES

Accessible OTRB service must accommodate a population of persons with various types and degrees of disabilities. The following section includes estimates of the occurrence of various types of disabilities, the characteristics of some of the more common types of disabilities, demographic data on persons with disabilities, and a comparison of the demographics of bus riders and persons with disabilities.

While data on persons with disabilities have been compiled at the national level, there is little available at the State and local level. The national level data have been developed from the perspective of health and medical services, public assistance, education, employment, and income, but little has been done with regard to transportation services or needs. The data that are available vary in their definitions of "disabled' and "disability." In a report on its workshop on Disability Statistics held in April 1989, the Committee on National Statistics observed:

> Statistics on persons with disabilities are produced by many government agencies whose needs for information are governed and driven by their respective administrative requirements. These agencies, neither individually nor collectively, provide a consistently applied, widely accepted definition of disability.[2]

Confusion concerning the number of individuals with disabilities arises from several factors: some persons have multiple disabilities, the severity of a disability can vary, and survey methodologies and questions can differ significantly.

In Section 3 of the ADA, Congress establishes a three-pronged definition of the term ' 'disability': 1) a physical or mental impairment that substantially limits one or more of the major life activities of an individual; 2) a record of such an impairment; or 3) being regarded as having such

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[1] Public Law 101-36, Sec. 305(b).

[2] Committee on National Statistics, "Disability Statistics: An Assessment," workshop summary on disability statistics, April 1989.

an impairment. Senate report language expands on this definition; under the first prong, a‘ ‘major life activity” means functions such as caring for oneself, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, and working. A ‘‘substantial limitation’ is a restriction of a major life activity in terms of the conditions, manner, or duration under which it can be performed. In Section 2 of the ADA, Congress finds that “. , . some 43,000,000 Americans have one or more physical or mental disabilities. This figure is one of several, ranging from 20 to 50 million and based on data developed by the National Center for Health Statistics, the International Center for the Disabled, the National Council on Disabilities, the Bureau of the Census, the Health Care Financing Administration, and others.




*Individuals with physical disabilities participate in many aspects of life.*

## Types of Disabilities

Disabilities are difficult to quantify and categorize; they manifest differently in each individual, and have different effects. For example, a mobility impairment may affect a particular individual’s ability to board an inaccessible bus, while having no impact on that person’s ability to use a computer. Thus, persons with disabilities are in no way a homogeneous group.[3] For the purposes of this discussion, OTA presents three categories of disabilities: 1) mobility impairments; 2) sensory impairments; and 3) cognitive impairments.

### Mobility Impairments

National Health Information Survey (NHIS) data[4] indicate that approximately 1.4 million Americans use wheelchairs, 1.7 million use walkers, a total of 3.0 million use mobility devices other than canes or walking sticks[5] (table 3-l), 4.4 million use canes or walking sticks, and 0.9 million use leg braces.

The NHIS relied on self-identification to determine the use of technology devices for mobility and sensory impairments. The study thus might exclude persons needing accessible services who do not use devices, as well as some individuals with temporary disabilities.[6] Thus, the survey probably underestimates the numbers of persons with mobility and/or sensory disabilities. However, the NHIS is the most comprehensive source of national data on persons with disabilities.[7]

When considering level-change devices to assist individuals with mobility impairments to board an OTRB, it is useful to consider the activities involved in boarding a bus to understand how some persons would have difficulty

3 ‘‘Who Are the Disabled?’’ *The CQ Researcher,* vol. 1, No. 32, Dec. 27, 1991, p. 999.

4 Numbers do not add up to one overall total because of duplication. Derived from U.S. Department of Health and Human Services, *Advance Data Vital Health Statistics of the Centers for Disease Control/National Center for Health Statistics,* Sept. 16, 1992 and Dec. 15, 1992. The National Health Information Survey is a statistical analysis of health-related issues, including disability prevalence.

5 This number includes crutches, walkers, wheelchairs, scooters, and other mobility equipment in a total with no duplication.

6 As an example, this latter group might include people recovering from broken bones or surgery. Similarly, table 3-1 indicates that crutches are used most often by persons between the ages of 25 and 64.

7 Remarks at Office of Technology Assessment Workshop, ‘‘Building Accessible OTRB Service, ” July 15, 1992.

**Table 3-1-Disability Statistics (number of persons** in thousands)

| | All ages | 24 and under | 25-44 | 45-64 | 65-74 | 75 and over |
|---|---|---|---|---|---|---|
| **Any hearing technology device** | 3,987 | 152 | 257 | 818 | 1,142 | 1,618 |
| Any vision technology device | 261 | 12 | 67 | 39 | 32 | 111 |
| Any mobility technology device | 3,040 | 223 | 350 | 629 | 620 | 1,218 |
| Crutch | 671 | 87 | 173 | 209 | 137 | 64 |
| Walker | 1,687 | 34 | 72 | 275 | 350 | 957 |
| Wheelchair | 1,411 | 139 | 168 | 304 | 924 | 476 |
| Scooter | 64 | 6 | 11 | 18 | 18 | 11 |
| Other mobility equipment | 254 | 18 | 28 | 66 | 57 | 85 |

NOTE: Totals may not add because some persons may use more than one device.
SOURCE: U.S. Department of Health and Human Services, *Advance Data, From Vital Health Statistics of the Centers for Disease Control National Center for Health Statistics, No. 217,* Sept. 16, 1992.

with the current OTRB system. Functions necessary to use an inaccessible OTRB include the ability to walk, climb stairs, stand up, sit down, and grip. The loss or impairment of one or more of these functions may result from age, disease, birth defects, or injury. A person who is unable to perform one or more of these actions will likely need some form of assistance, ranging from the support of a steadying hand to a level-change device.[8] (For a profile of a person who uses a wheeled mobility aid and must travel for his work, see box 3-A.)

Among conditions affecting these key functions are loss of muscle control (e.g., as a result of multiple sclerosis), loss of balance (associated with inner ear problems, nerve damage, and vision impairments), amputations, breathing difficulties, chronic pain, arthritis, spinal cord damage, heart disease, cancer, and weakness from cancer treatments. Many of these conditions are associated with advanced age.[9]

### Sensory Impairments

**Estimates** of the number of persons with sensory impairments vary according to the source of the information and the definition of impairment. For example, the Survey of Income and Program Participation (SIPP) in 1984 counted 11.1 million individuals ". . . who have difficulty seeing ordinary newsprint with eyeglasses or contact lenses. "[10] The 1978 Survey of Disability and Work, however, found less than 1.8 million people ". . . who have difficulty seeing well enough to read ordinary newsprint even with glasses. ' '[11] The NHIS, meanwhile, gave a total of 4.5 million people who have difficulty seeing even when wearing corrective lenses, and 261,000 who use a vision technology device. These data illustrate that estimates of the numbers of persons with sensory disabilities can vary greatly according to the nature of the study .12

Visual Impairments—According to one count, two-thirds of the 1.1 million individuals defined as legally blind still have some perception of light

[8] William H. Henderson et al., *Passenger Assistance Techniques: A Training Manual for Vehicle Operators of Systems Transporting the Elderly and Handicapped (Fort* Worth, TX: Transportation Management Associates, 1982), p. 3.

[9] Ibid., pp. 3-9.

[10] Mitchell P. LaPlante and Leslie A. Grant, "Persons Who Need or Benefit From Accessibility Features in the Built Environment' paper prepared for the Architectural and Transportation Barriers Compliance Board, April 1988, p. 18.

[11] Ibid., p. 19.

[12] Ibid., pp. 19-20.

## Box 3-A—Profile of a Traveler Who Uses a Wheelchair

Randall Martin,[1] of Houston, Texas, is a senior vice president of a research institute and a professor of rehabilitation medicine at a medical college. Randall is a quadriplegic as a result of a spinal cord injury and uses a motorized wheelchair.

When relocating to Houston 2 years ago, Randall and his wife looked for a house as close as possible to his workplace in order to minimize commuting time. A quadriplegic can sit in a wheelchair for only a limited number of hours each day, and commuting time directly affects available productive hours.

Randall has a subscription arrangement for paratransit service for the 4-mile trip to and from work. On a given day, if he is unable to meet the prearranged schedule, Randall attempts to arrange alternative paratransit service, which can be time consuming because of the heavy demand for paratransit services in his city.

Randall's other transportation options include a regular city bus route to his office that stops in front of his house, but only 50 percent of those buses are accessible and they run randomly; two or three buses might pass before an accessible one comes along. However, another bus route that is 100 percent accessible travels within about l/4-mile of both his office and his home. His wife, who also uses a wheelchair, can drive their lift-equipped van as her own schedule allows.

Randall travels frequently by air, almost always accompanied by an attendant. On business-related travel, he sometimes arranges for a lift-equipped van from his office at the medical center to the airport. Otherwise, he tries to schedule paratransit in advance, or relies on his wife. When traveling to Washington, DC, he prefers to arrive at National Airport, where he has two options: the Metro rail system or accessible taxis. Randall claims that next to Vancouver, Canada, Washington has the best accessible on-call taxi service. However, whereas a cab trip from the airport to a nearby hotel costs a person without disabilities $4.50, it runs $20 for the accessible service.

Randall wishes that accessible over-the-road bus (OTRB) service were available for some of his travel needs. For instance, from time to time he travels to Princeton, New Jersey, flying from Houston to Newark. As of late 1992, no accessible OTRB service existed between Newark and Princeton. Instead, at a cost of about $200, he must arrange for ground transportation to Princeton via the nearest provider of accessible service, a contractor in Philadelphia with a lift-equipped school bus.[2]

One of the worst travel experiences Randall had was in Chicago en route from the airport to his hotel. He had arranged for airport pickup by a lift-equipped van operated by a contract service. The driver operated the lift without much difficulty, but events proved that he did not properly secure the tie-down mechanism. The van swerved in traffic and Randall's wheelchair tipped over, throwing him onto the lift mechanism. The result was a 4-inch gash on his head, which bled profusely. At a nearby hospital, Randall was treated for a concussion and stitched up. He sued the van company; the outcome was an insurance settlement to replace his damaged wheelchair and cover his medical expenses.

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1 Randall Martin is a fictitious name; the person is real.

2 Princeton has an Amtrak station, but it is not easily reached from town. Paratransit systems abound in New Jersey, serving county-wide areas. However, they are funded through State and county resources, and Randall's experience has been that only residents are eligible for the service.


National Federation for the Blind

*Persons with vision impairments often use aids, such as dogs or canes.*

and shape.[13] As many as 5 million persons are not legally blind but have vision impairments to a degree that makes travel difficult (see box 3-B). As with many disabilities, vision impairment correlates with advanced age.[14]

Auditory Impairments—Hearing loss has a strong correlation to advanced age and is considered a wide-spread condition in the United States, affecting as many as 14 million persons.[15] Some individuals with auditory disabilities benefit from hearing aids, but many do not. While persons with acute hearing sometimes expect individuals with auditory impairments to read lips, this is an ineffective means of communication in which as much as two-thirds of the conversation must be guessed.[16]


Gallaudet University

*Persons with hearing impairments rely on several forms of communication, including sign language.*

## Cognitive Impairments

The ADA includes mental retardation, emotional or mental illness, and learning disabilities as part of its definition of 'mental impairment,' referred to by OTA as ''cognitive impairment. ' In addition, an injury, disease, or condition affecting the brain can create a situation in which an individual may have difficulty with particular functions. Examples include the following:

. Mental retardation, also referred to as subaverage intelligence, has many causes, most of which are not well-understood. Categories of mental retardation include borderline retardation, which encompasses Intelligence Quotients (IQs) of 84 to 71; mild retardation (IQs 70 to 50); moderate retardation (IQs 49 to 35); severe retardation (IQs 34 to 20); and profound retardation (IQs 19 and below). Depending on the level of retardation, individuals with this type of cognitive disability may require simple, more explicit instruc-

13 Henderson, et al., op. cit., footnote 8, pp. 3-9.

14 Ibid., 3-9.

15 Many fewer individuals have speech disabilities, some of which stem from auditory impairments or the aftereffects of strokes or cancer surgery. Ibid., pp. 3-9.

16 Ecosometrics, Inc., ''Potential Demand for Over-the-Road Bus Services by Individuals With Disabilities,' OTA contractor report, July 15, 1992, p. A-4.

## Box 3-B—Profile of a Traveler Who Is Blind

Geraldine Dole[1] is a middle-aged social worker in a large city in the Mid-Atlantic region. She is totally blind and uses a seeing-eye dog. Her work requires that she travel around the metropolitan area to visit clients and attend meetings. Advance planning for even the simplest of this travel is necessary and time consuming.

In a recent week that Geraldine describes as typical, she attended a meeting in a location not served by local transit. She arranged with a friend and colleague to provide her and her seeing-eye dog with automobile transportation there and back. The following day she visited a client in the hospital and was able to take local transit both ways. She determined from the driver that his bus was the one she wanted and relied on her dog to guide her onto the bus and to a seat. Later that same week she arranged automobile transportation *to* a reception. On the way back, in the rain, she tried her luck on paratransit, with the help of a friend using a wheelchair who had arranged a paratransit pickup for herself. In Geraldine's city, only persons with mobility disabilities are eligible for paratransit service. With her friend's intervention and the willingness of the paratransit driver to look the other way, Geraldine was able to ride to within 2 blocks of her home.

Geraldine flies frequently. While making advance ticket reservations she asks for assistance at the other end and requests either a window or middle seat. She must reconfirm these arrangements at the airport; quite often, airline personnel presume she would prefer an aisle seat and change her seating assignment without checking with her. An aisle seat is riskier for her dog, who is more exposed to being stepped on. The dog lies facing the front of the aircraft, with as much of her body as possible under the seat in front of Geraldine.

Over-the-road bus travel is the least convenient of all modes for Geraldine. She claims that assistance from bus personnel for people with disabilities is less available since the Greyhound strike. The entrance to the bus terminal in her city is less accessible by car than is the airport, and she has no escort into the bus terminal if she takes a cab; if she is taken by a friend who can escort her, parking is inconvenient and expensive, Without a guide she has no idea where the ticket counter is, and there seem to be no bus personnel around to help with directions or luggage. It is very difficult to hear announcements of bus departures and finding the departure gate is a major challenge unless someone, usually a fellow passenger, helps.

Rest stops on Interstate highways are particularly difficult. All of the buses seem to arrive at once, and even helpful fellow passengers make a bee-line to the restrooms or the lunch counter to beat the inevitable lines, leaving Geraldine, and her dog, wondering which direction to take. In such circumstances, she says, it is important to be able to rely on the driver for courteous and considerate assistance in guiding the passenger in the right direction, understanding that the rest stop is for both passenger and dog, and refraining from moving the bus to a different location without warning.

Geraldine believes training of bus personnel in dealing with persons with disabilities is a critical need. She maintains that lack of awareness of others' disabilities and how to deal with them usually underlie the occasional uncaring behavior or rudeness.

[1] Geraldine Dole is a fictitious name; the person is real.

tions than other persons need in order to travel.

. Strokes, which occur predominantly in people over the age of 55, can cause losses of both physical and mental functions. While rehabilitation therapy may eventually restore part or sometimes all of the lost function, a stroke can affect an individual's ability to speak, read, make purposeful movements, use certain muscles, recognize shapes and objects, remember, and maintain emotional control.

. Autism is a poorly understood condition that exists from birth. Persons with autism re-

quire explicit instructions in order to travel independently. Among the manifestations of autism that bus company personnel may encounter are a tendency for persons with autism to repeat back what is said to them, a reluctance to contact other persons even when needing assistance, and a loss of emotional control when interrupted or confronted with a disorderly environment.[17]

No reliable data exist on the numbers of persons with cognitive disabilities. Depending on the breadth of the definition used, estimates of the number of persons with cognitive disabilities range from 1 to 20 percent of the population at large.

## Demographics

**In** order to compare the population of persons with disabilities with that of the riders of the current OTRB system, it is necessary to examine the demographics of each group. In addition to the 1980 NHIS, a 1977 study by the Urban Mass Transportation Administration (UMTA) and the 1984 SIPP provide data on the demographics of persons with functional difficulties. These data tend to be consistent in key measures.

### Demographics and Travel Characteristics of Persons With Disabilities

**The** UMTA study focused on persons with disabilities that limited their ability to travel.[18] These included individuals using wheelchairs and other mobility aids, as well as those with vision and hearing impairments. The results describe persons who:

- Are older (67 percent are over 55 years of age; 47 percent are over 65 years of age);
- Have lower incomes (34 percent had household incomes of $4,000 or less in 1977 dollars-$9,000 in **1991 dollars); and**
- Have demographic characteristics associated with older age and lower incomes, including: predominantly female (63 percent); less education (41 percent have an 8th-grade education or less); and unlikely to be employed (only a 15-percent employment rate).

Working-age persons with disabilities were employed at a rate of 23 percent, low compared with 64 percent of the population in general. Characteristics for individuals using wheeled mobility aids did not differ significantly in the above categories.[19]

The 1984 SIPP presented statistics very close to those of the UMTA study .20 The SIPP found that women, African Americans, and persons with lower levels of education were disproportionately represented among the groups with the most limitations of function. For example, women accounted for 51 percent of the working-age population, but they made up 61 percent of those with ". . . a substantial limitation in functioning."[21] Similarly, in a total population that was 11 percent African American, 16 percent of persons with severe limitations in functioning were African American. While marriage rates for working-age adults were similar for persons with and without disabilities, this was not true for the total population of persons with disabilities who were more likely to be older and to have had spouses

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17 Henderson et al., op. cit., footnote 8, pp. 3'9.

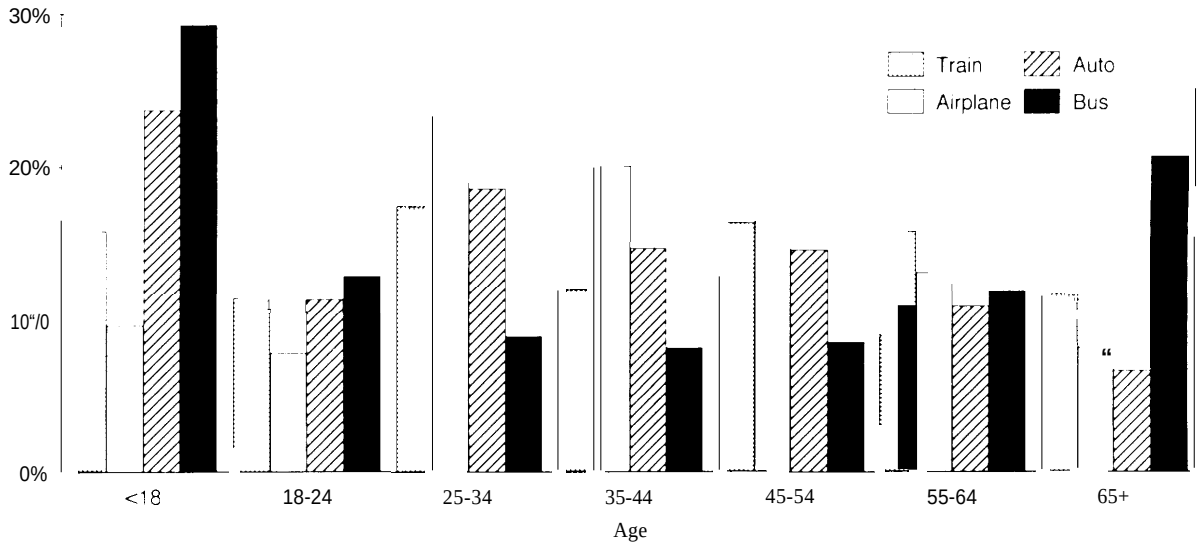
18 Some analysts within the disability community have reservations about this study. Heavy discounting of potential ridership on accessible transportation occurred when persons with disabilities did not give particular responses. For example, when asked if the absence of "curb cuts' would be a problem, a person with disabilities who had a means of coping with sidewalk curbs and therefore answered "no' would have his or her response dropped. Thus, in some cases numbers as high as 60 percent were discounted to as little as 3 percent.

19 Econometrics, Inc., op. cit., footnote 16, pp. 4-12 to 4-13.

20 Mathematica Policy Research, ''Task I: Population Profile of Disability," report for the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, October 1989, pp. xvii-xx.

21 Ibid., p. 57.

**Figure 3-1—Intercity Passenger Travel, by Age of Traveler and Mode of Transportation, 1977 (percent of total)**




SOURCE: Robert R. Nathan Associates, Inc., from data in U.S. Department of Commerce, Bureau of the Census, "Travel During 1977, " October 1979.

who died.[22] For elderly persons with no physical limitations, the SIPP found that 26 percent lived alone, compared to 37 percent for elderly persons who needed some form of assistance. These data indicate that elderly persons with disabilities may not find it easy to bring traveling companions .23

### Demographics of OTRB Riders

Fixed-Route Travelers-For Class I carriers, age, income, gender, and race are distinguishing variables of the fried-route OTRB market.

- Age. Surveys of intercity bus passengers tend to support the observation that fixed-route passengers include riders who are younger or older than passengers in other modes of transportation (see figure 3-l).
- Low income. The intercity bus rider is much more likely to have a low income than is the air or rail passenger. Furthermore, because most OTRB passengers travel to visit someone rather than for business purposes, they are likely to be paying for the trip out of personal funds. According to 1991 Grey - hound passenger survey data, roughly one-half of its riders have incomes under $15,000 per year, and do not have a car capable of a 500-mile trip.[24]

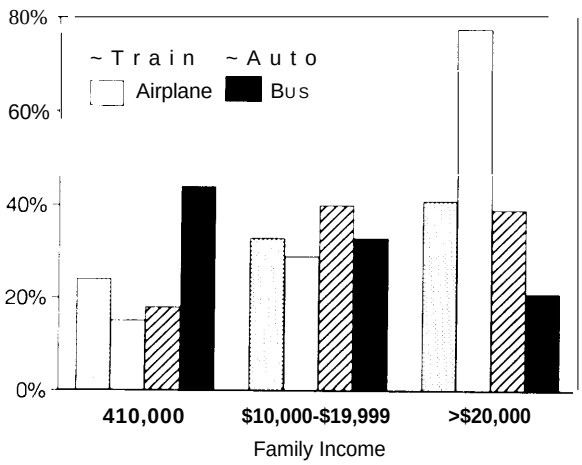
These numbers are even more pronounced when compared to similar data from other intercity transportation modes. Figure 3-2 shows that in 1977, families with $10,000 (1977 dollars-$22,500 in 1991 dollars) or less annual income accounted for 45 percent of fixed-route intercity bus-miles, compared to 25 percent for rail, 18 percent for automobiles, and 15 percent for air. However, less than 5 percent of bus riders were traveling on business, in contrast to 37 percent of railroad passengers and 51 percent of those opting to

22 Ibid., pp. 57-61.

23 Ibid., pp. 115-117.

24 Greyhound Lines, Inc., "Greyhound Lines Passenger profile, " unpublished report, August 1991, as cited in Econometrics, Inc., op. cit., footnote 16, p. 1-18.

**Figure 3-2—Intercity Passenger Travel, by Family Income and Transportation Mode, 1977 (percent of total)**




SOURCE: Robert R. Nathan Associates, Inc., from data in U.S. Department of Commerce, Bureau of the Census, "Travel During 1977," October 1979.

fly. These patterns continue to hold true into the early 1990s.[25]

- Gender and racial characteristics. Riders of fixed-route OTRB service are largely female. The percentage of persons from minority groups riding intercity buses is also high. Fifty-eight percent are female, compared to51 percent of the overall population, and 42 percent are nonwhite compared to 16 percent of the overall population.[26]

Charter and Tour Service—Information is not readily available regarding the demographics of charter and tour passengers. However, a 1986 survey shows that unlike fixed-route passengers, they have an average household income of over $34,000 (1985 dollars; over $47,000 in 1991 dollars) and own 1.8 autos per household. But similar to fixed-route passengers, they are likely to be older, with a median age of 60.[27] Thus, advanced age, which has a strong correlation to disability, also characterizes charter and tour travelers.

Demographic Projections—The Bureau of the Census projects that the proportion of the U.S. population age 65 and over will increase from 12 percent in 1990 to around 18 percent in 2020, reaching 21 to 25 percent in 2050 (see figure 3-3). With the high incidence of disabilities among the elderly, it is possible that the growth of this age cohort will correspond to growth in the number of persons with disabilities (see box 3-C). While data are not available quantifying the numbers of ''ii-ail' elderly, it seems likely that this group will grow along with the percentage of the population 80 and over (3 percent in 1990,4 percent in 2020, and 8 percent in 2050).[28] Frail elderly persons might not have specific disabilities, but may still need assistance. As age is a strong correlate of both disabilities and use of OTRBs over other modes of transportation, the aging of the U.S. population could lead to increased ridership.

## EXPERIENCE WITH ACCESSIBLE SERVICE[29]

Because there has already been a great deal of experience with technologies for persons with sensory and cognitive impairments (see ch. 4), this section focuses on experience with technologies for persons with mobility disabilities. U.S. experience with accessible OTRB service for persons with mobility impairments is extremely limited. In seeking programs that might shed

25 U.S. Department of Commerce, Bureau of the Census, ''Travel During 1977, ' October 1979, as cited in Econometrics, Inc., op. cit., footnote 16, p. 1-20.

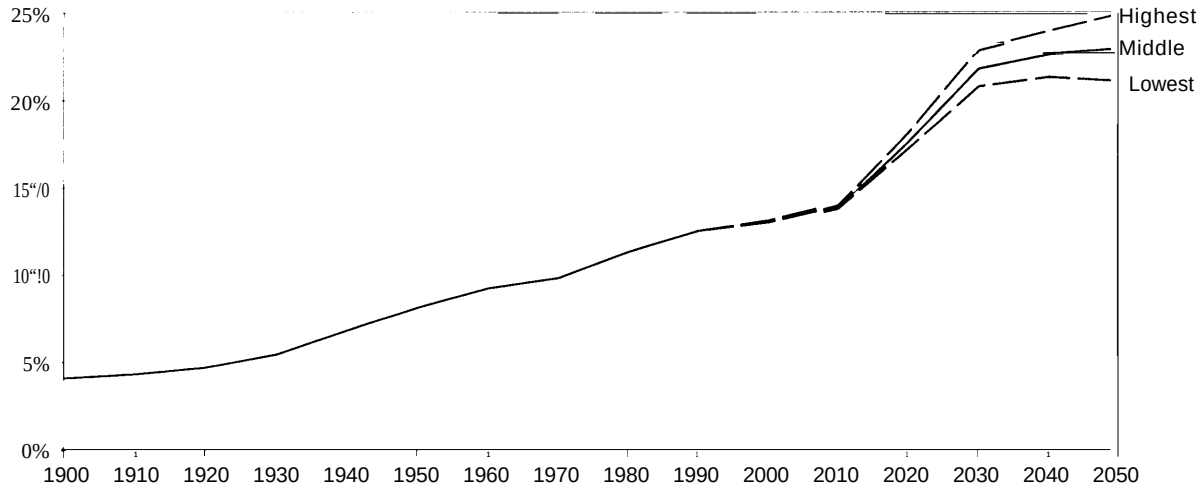
26 Greyhound Lines, Inc., op. cit., footnote 24, p.1-18.

27 Lawrence F. Cunningham, ''Profiling Tour Patrons and Non-Patrons in Intercity Bus Passenger Markets," paper presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 1986.

28 U.S. Department of Commerce, Bureau of the Census, Projections *of th, populations of the United States by Age, Sex, and Race:* 1988 *to* 2080, Current Population Reports, P-25, No. 1018 (Washington, DC: U.S. Government printing Office, 1989).

29 Except where noted, this section is based on Econometrics, Inc., Op. cit., footnote 16.

**Figure 3-3-Growth of Population, Ages 65 and Over, Actual and Projected**




SOURCE: Data for 1990 from 1990 Census of the Population (CPH-L-74, modified age and race counts). U.S. Department of Commerce, Bureau of the Census, ***Projections of the Population of the United States by Age, Sex, and Race: 1988-2080,*** Current Population Reports P-25, No. 1018 (Washington, DC: U.S. Government Printing Office, 1989).

some light on the likely demand for such OTRB service, OTA discusses one State-sponsored program in Massachusetts, a demonstration project in Canada, and a portion of the Denver transit system. Data from these programs are of marginal use, because such factors as poor lift reliability (especially with early generation lifts), inadequate marketing, incomplete coverage of routes, and unsatisfactory service affected the ridership. Indeed, many of these operations collected data in such a way that lift usage is extremely difficult to quantify. Further, some lift-equipped OTRBs served limited regions; only a few traveled to major destinations.

Elizabeth Robinson



*There is a strong correlation between disability and age.*

## The Massachusetts Program

Sustained accessible intercity bus service did not exist in the United States prior to 1986, when Massachusetts began a project to make OTRBs operating in the State accessible. The program stemmed from the convergence of three efforts:

- the Massachusetts Coalition of Citizens with Disabilities (MCCD) identified improvement of inter-regional travel options for persons with disabilities as a priority;
- the Governor’s Commission on Accessible Transportation found a need for improvements in the public transportation system; and
- the State moved to assist private bus operators whose services linked Boston with outlying areas.

## Box 3-C-The Aging of America

The Bureau of the Census, using data from 1990 and earlier, has projected the growth of the Nation's older population through 2050.[1] Projections are based on a Lowest, a Highest, and a Middle Series of assumptions about fertility, mortality, and immigration. The Middle Series projections through 2050 illustrate the passage of the Baby Boom generation and provides an interesting glimpse into the future of an aging America During this 60-year period, those 65 and over grow from 12.5 percent of the population to 22.9 percent, and those 85 and over increase from 1.2 percent to 5.1 percent of the total (see figure).

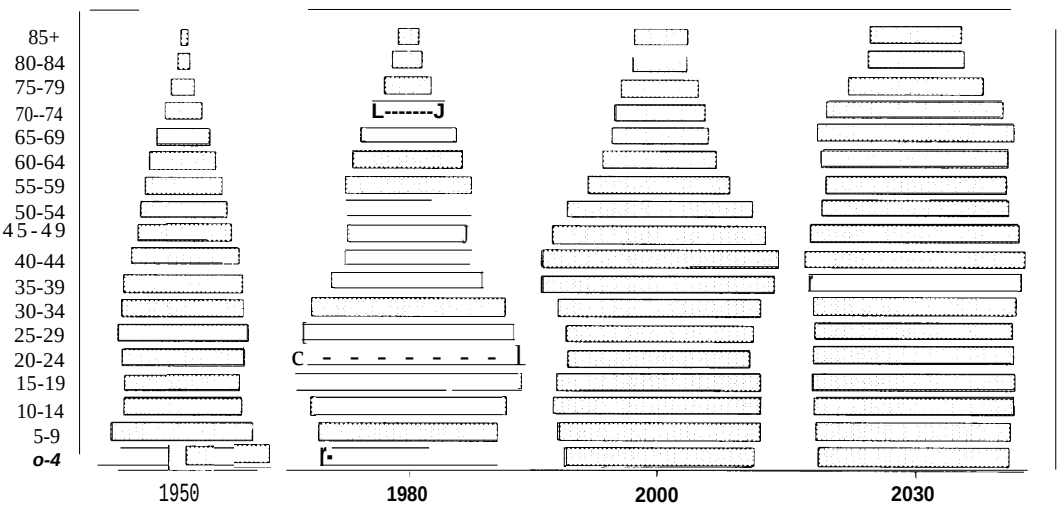
In 1990, 31,079,000 Americans were 65 years and over, in a total population of 248,710,000. The Bureau of Census projections break these figures into 5 categories ages 65 to 74 (7.3 percent), 75 to 79 (2.5 percent), 80 to 84 (1.6 percent), and 85 and over (l.2pecent); the fifth category, those 80 and over, represented 2.8 percent of the Nation's 1990 population.

The first 20 years of the 1990-2050 period begin with the proportion of elderly in the total population increasing to 13.9 percent. Most growth is among the upper ranks of the elderly and is not matched by those entering the 65 to 74 year category. As a percentage of the population, the 65 to 74 group actually declines in 2000, rises to 1990 levels in 2010, then swells in 2020 as the Baby Boom generation begins its march through the ranks of the elderly.

By 2020, the number of those 65 and over will have increased to more than 52 million. Their portion of the population will rise from 12.5 to 17.7 percent. The number of persons in the 65 to 74 age bracket will have grown by 72 percent, and those in each of the next two categories by less than 50 percent. The 80 and over cohort, however, increases by 75 percent, and the over 85 category jumps an astounding 120 percent.

In 2050, the total population of the United States is projected to decline for the first time since 1900, falling below 300 million. Those 65 and over will comprise 22.9 percent of total population, however. The two categories encompassing age 75 through 84 will decline noticeably, and the over 85 cohort will reach 5.1 percent of the population, compared to 1.2 percent in 1990.

**U.S. Population Pyramid, 1950-2030**




SOURCE: National Research Council, Transportation Research Board, ***Transportation in an Aging Society:Improving Mobility and Safety for Older Persons-Volume 1*** (Washington, DC: 1988), p. 21.

1 From U.S. Department of Commerce, Bureau of the Census, 1990_ of **Population (CPH-L-74, modified age** and race counts), **Table 1—Growth** of the Older **Population, Actual** and Projected: **1900-2050.**

As a consequence, the State's Office of Transportation created the Intercity Bus Capital Assistance Program (IBCAP) to purchase new intercity coaches that would be leased to the private carriers at rates 50 percent lower than commercial lease rates.

Six of the first 28 coaches ordered under IBCAP were equipped with lifts. At the time, the only lift available was an elevator-style lift, developed for a Canadian demonstration project (discussed below) using MCI coaches, and commonly referred to as the first generation MCI lift. All 28 coaches had a retractable first step, extra handrails, and public address systems. The first accessible service began in May of 1986 with six regional carriers.[30] In 1989, 22 more coaches were delivered, all accessible with second-generation elevator-style MCI lifts, and the program was expanded to include 4 more bus companies .31

The Massachusetts Port Authority obtained six accessible coaches, leasing them to Plymouth & Brockton to provide service to Logan Airport. Using UMTA funds, the Taunton Regional Transit Authority purchased one lift-equipped OTRB and the Brockton Area Transit Authority purchased six, leasing them to Plymouth & Brockton. The Greater Attleboro Regional Transit Authority made plans to purchase nine accessible OTRBs, to be leased to Plymouth & Brockton. As of mid-1992, 15 percent of the total OTRB fleet in Massachusetts was lift-equipped.

### Route Restrictions

Eighty percent of the routes traveled by buses purchased under IBCAP must be within the State of Massachusetts. This requirement is determined by total bus-miles operated in freed-route service, which allows bus companies to schedule accessible travel to limited destinations outside Massachusetts, as Peter Pan does with its route from Springfield, Massachusetts to Albany, New York.

Another restriction is that no more than 15 percent of the bus-miles can be operated in charter and tour service, with no charters to be operated during peak commuting times. Initially, all charter-miles were to be operated in Massachusetts, although this was revised to allow charters to go outside the State.

### Technology Issues That May Affect Demand

**The first-generation** elevator-style MCI lift on the accessible buses had problems associated with microprocessors, clearances, and loss of seating positions (see ch. 4). Second-generation MCI lifts addressed some of these issues. Overall seating capacity improved, from a displacement of six seats with both tie-downs occupied to a displacement of only four seats with both tie-downs occupied, although decreased baggage space remained a concern of the bus companies. However, significant maintenance problems are unsolved.

Passengers feel the effects of the imperfections of this system-sometimes quite literally. When the elevator platform settles, cold air from the baggage compartment rushes into the passenger compartment, and seals on the accessible door sometimes let in more cold air. Most of the 10 to 15 minutes involved in boarding a person with a wheeled mobility aid is taken up in the securement process. Securement is awkward and sometimes intrusive, creating difficulties for both the driver and the passenger. Some drivers complain that they are uncomfortable using the lifts to board persons in wheeled mobility aids; drivers also comment on lift reliability problems and their own lack of experience using the lifts. A few carriers have tried to limit such boardings to terminal end-points.

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30 These were Peter Pan Bus Lines, Plymouth & Brockton, American Eagle, Englander Coach, -then Line, and Interstate Coach.

31 The four companies were Big W Transportation, H&L Bloom, Inc., Brush Hill Transportation, and Gulbankian Bus Lines. Ecosometrics, Inc., op. cit., footnote 16, p. B-18.

### Usage

Despite marketing efforts (discussed below), usage has been low. While data are incomplete, ridership statistics indicate that few individuals had actually taken advantage of the lifts as of mid-1992:

- Peter Pan Bus Lines of Springfield, Massachusetts, the largest carrier in the program, reports 361 reservations for accessible service since 1985, resulting in approximately 722 uses of the lifts.
- Plymouth & Brockton, despite extensive cooperative efforts with MCCD, the Equal Opportunity Transportation Commission (EOTC), and the Cape Organization for the Rights of the Disabled, had approximately 50 lift-use reservations in 1991, out of a total ridership of approximately 1.25 million for that year.
- Englander Coach Lines, which stopped doing business in 1992, averaged less than one lift-use per month for the time periods in which it kept data.
- American Eagle had four fixed-route lift-uses in the first three-quarters of 1991, out of a total of 47,000 boardings. In its charter work, American Eagle had three lift-uses for that same time period, and found that its charter calls for accessible service tended to come from cruise lines.
- None of the carriers with data report a single daily commuter.

### Conclusions

In the debate over the ADA, industry sources cited the operational problems and the low demand in the Massachusetts project as reasons not to require a lift on every bus. But both the carriers and MCCD recognized that the operational problems with the lifts may have been a factor in low usage, as individuals using wheeled mobility aids shared with each other information about problems with the lifts, schedules, and drivers, thus discouraging greater use. Indeed, with the need for reservations, the potential for error, and the limited number of accessible coaches, the possibility exists of a traveler with disabilities, on a trip from Cape Cod to Springfield, having to spend the night in Boston. Advocates for accessible service emphasize that only 6 of the 226 OTRBs in the State were lift-equipped through 1989.

The carriers involved had a mostly positive attitude about providing accessible service; the main thing they wanted was better lifts, although a second priority was finding a means of retaining the seats displaced by use of the tie-down positions, especially on busy commuter runs. The restrictions on charter and tour use outside the State caused some carriers to feel they must reject opportunities for business, such as tours of New England or trips lasting longer than a weekend. It is therefore likely that this low usage says little about the possible demand for charter and tour accessible vehicles.

## Canada–The Newfoundland Demonstration Project

The Massachusetts program began with technology developed in Canada. Transport Canada has run two demonstration projects, one in Newfoundland and a second in Ontario. Because of the more complete data reviewed, OTA has opted to present the Newfoundland project, examining the genesis of the program, technical issues affecting demand, and actual usage. (For a discussion of Canadian support for its OTRB industry, see box 3-D.)

In the early 1980s, the Transportation Development Centre of Transport Canada began to study the development of accessibility technologies. Transport Canada's Advisory Committee on Transportation of the Handicapped had previously identified accessibility of intercity buses as a concern. A September 1981 report prepared the way for development of an accessible OTRB.

Between February 1985 and February 1988, Canadian National Rail operated a lift-equipped

## Box 3-D—The Canadian Experience

**As in** the United States, Canadian freed-route over-the-road bus (OTRB) service reaches more communities than all the other public transportation services combined;[1] accessible intercity coaches are seen as an important step in making Canada accessible for persons with disabilities. Although Canada does not have legislation similar to the Americans with Disabilities Act, the Canadian Government has acknowledged the need for accessible service, and several Provincial governments have conducted demonstration projects. However, as in the United States, Canadian intercity coach operators face tough financial conditions, and it is unclear if some carriers can afford to invest in new technologies.

In October 1991, the Transport Minister announced that over the next 5 years the Canadian Government would provide $24.6 million (Canadian dollars) in financial incentives to the transportation industry to provide accessibility for travelers. Of this sum, the government set aside $3.5 million for Canadian intercity bus operators to purchase or retrofit buses with level-change devices and other accessibility features. Similarly, the government provided $2.9 million to support fieldtesting, trials, and demonstrations of small-scale accessibility transportation technologies.[2]

In March 1992, the National Transportation Agency of Canada announced an inquiry into the accessibility needs of persons with disabilities, and methods by which access could be provided to intercity coaches. The agency has issued a draft national standard for accessibility, and expects to hear comments throughout 1993. The agency has proposed an equipment standard, which includes:

- ramps, lifts, or other level-change devices;
- two wheelchair spaces with proper securement equipment on each coach;
- movable arm rests for at least five seats on every coach;
- appropriate signage;
- high illumination levels;
- reduced height (less than 18 centimeters) for the first step onto the bus; and
- handrails and slip-resistant floors.

In addition, the proposed equipment standards reads: "Where no on-board restroom is accessible to persons in a wheelchair, the operator shall idenify, in its schedule, specific stops which will be made to permit these persons to use accessible facilities. "[3]

The intercity bus manufacturing companies in North America market to both countries, so both the U.S. and Canadian standards will affect the larger market in terms of accessibility technologies for intercity coaches.

1 Whereas both trains and airplanes each serve about 500 communities, intercity buses seine over 3,000 Canadian communities, many of them small towns. National Transportation Agency of Canada, '*Inquiry Into Canadian Motor Coach Services,'' discussion paper, March 1992, p. 2.

2 T-pen Canada, Press Release No. 190/'91, Oct. 21, 1991.

3 National Transportation Agency of Canada, op. cit., footnote 1, pp. 6-7.

MCI MC9 across Newfoundland as part of a demonstration project. The program involved driver training, public information, demonstrations to disability groups, a toll-free information and reservation number, and other efforts. Advanced reservations were encouraged but not required.

### Technical Issues Affecting Demand

The Newfoundland project's MCI demonstration vehicle used an internal elevator lift, which became known as the first-generation MCI lift. The two tie-downs eliminated eight seats; an accessible restroom was discussed but vetoed when it was decided that it would be hazardous to

use while the bus was in motion, a particular concern when heavy braking occurs. The accessible trips available were limited. They at frost included one weekly round-trip from St. John's to Port Aux Basques and back, and another weekly round-trip from St. John's to Grand Falls and back. In November 1986, this was changed to two weekly trips from St. John's to Port Aux Basques and back; the original schedule resumed in 1988.

The lift technology functioned well enough, but lift operations were so infrequent that even trained drivers forgot certain aspects of lift use. In addition, the high-technology aspects of the lift intimidated some drivers, and some of the safety sensors did not function.

#### Usage

For the 3-year period of the demonstration project, the evaluation report counts 130 one-way uses of the lift. Persons using wheeled mobility aids accounted for 128 of these uses; only 9 times did anyone opt to transfer from a wheeled mobility aid to a conventional seat. While most usage characteristics were similar to those of other riders, persons with wheeled mobility aids tended to take fewer long trips. For many of these individuals, the bus schedule was more important than the issue of accessibility-the project report states that despite preferring the accessible bus, persons needing the lift were more likely to deal with the inconvenience and discomfort of a nonaccessible bus than to adjust their schedules for the arrival of the lift-equipped OTRB. Among those using the lift, 55 percent of the trips were for social or recreational occasions, 32 percent for medical reasons, and 13 percent for education or work. In 1988, ridership of persons using the lift declined to 23 uses per year; by 1991, this number was down to 13 uses. Total ridership during that period declined as well, although much less rapidly.

#### Conclusions

Does a demonstration project that runs a route only once or twice a week present any basis for extrapolating to a fully accessible service schedule? The short answer is that it does not. As shown by the data, the Canadian operators learned that the timing of the bus was a key factor in the decision to travel. Problems with lift operation may also have had an impact. In addition, the population served by the project is quite small: in a province about 500,000 people, both Grand Falls and Port Aux Basques have populations under 10,000, and the St. John's greater metropolitan area barely exceeds 100,000. These factors, combined with the small area of the Province, make it unlikely that the data are relevant to the demand for nationwide accessible OTRB service in the United States.

## The Denver Regional Transit District Experience

Since 1987, the Denver Regional Transit District (Denver RTD) has purchased OTRBs to serve a number of routes to outlying cities. Denver RTD now has 102 OTRBs, 39 of which are equipped with Stewart and Stevenson lifts. One of the main routes using OTRBs connects Denver, Stapleton Airport, and Boulder. Accessible service accounts for 37 percent of total intercity service; weekend service is 100 percent accessible, and weekday service runs between O and 55 percent, depending on the route.

### Technology Issues Affecting Demand

Denver RTD primarily uses an external lift designed by Stewart and Stevenson Power, Inc., which has been installed on both MCI and Neoplan OTRBs. Experience with this lift has been positive; it is simple to operate and requires little maintenance. Denver RTD reports that in 1991 a total of 39 labor-hours were spent on maintenance of the 18 lifts used that year. Criticism of the external lift centers on its operation outside the bus, for it exposes to the elements both the driver and the passenger using

the lift, and it offers no enclosure for a passenger leery of its 5-foot elevation.[32]

### Usage

Early ridership on the lift-equipped OTRBs was low, at perhaps one or two lift-uses per month. Ridership by persons using wheeled mobility aids has grown steadily, however, as the overall accessibility of the fleet has improved. From November 1990 to October 1991, lift usage on routes with scheduled accessible service was 3,837, or 0.19 percent of total ridership. The heaviest lift usage has been on the route linking Denver, Boulder, and Stapleton Airport-with 2,885 total trips on a route that is 57 percent scheduled for accessible service, the rate is about eight lift-uses per day, or 0.28 percent of total ridership on that route.

### Conclusions

Like the other projects discussed here, the experience of the Denver RTD does not provide a look into the future of accessible fixed-route OTRB service. The Denver RTD is a transit operation, and its passengers use the service for different reasons than they would a longer haul bus service. However, the experience of the system offers some lessons.

First, from a technical standpoint, the lifts operate well and it appears that for the most part both the operators and the passengers are pleased with them. Second, ridership has increased over time, as more and more routes became accessible and as persons with disabilities became familiar with the system. Finally, the heaviest use of the lifts is to key locations: a large city (Denver), a large college town with a nearby military base (Boulder), and a major airport (Denver Stapleton).

## Charter and Tour Service

The experience with accessible charter and tour OTRB service in the United States is even more limited than with fixed-route service. Nothing in the way of a demonstration project has been done with charter and tour service, although some accessible buses purchased or operated with the help of public financing do run the occasional charter. Of the handful of private firms operating accessible tours, only two use their own accessible OTRBs (Evergreen Travel Service, Inc. in Lynnwood, Washington, and Sunrise Plaza, Inc., in Los Angeles, California-see ch. 2).[33] These numbers would seem to suggest that the demand for accessible charter and tour service is very low. In some European countries, however, many more tour firms operate accessible coaches. Indeed, this disparity between U.S. and European OTRB services forces many tour operators servicing the disability community to arrange most of their accessible tours abroad.

Why is accessible charter and tour service available in Europe and not in the United States? The European population of persons with disabilities is not appreciably different from that in the United States. Nor are the technologies for providing accessibility (e.g., lifts and ramps) less expensive—although some governments pay part of the costs for accessibility technologies on OTRBs. Most likely, the difference between the United States and Europe is that the demand for accessible service was recognized much earlier by segments of the European travel industry and therefore, by fostering the market for accessible

[32] OTA has heard these Cements from both bus operators and individuals with mobility disabilities. The point is usually raised by bus operators and usually discounted by people with disabilities as a small price to pay for accessibility.

[33] The bus companies participating in the Massachusetts Intercity Bus Capital Assistance Program can run charter and tour service with their accessible OTRBs, but they are under time constraints and they have received public funding. Similarly, a number of California firms under contract to local governments have the capacity to offer charter and tour service on accessible OTRBs, but they are under restrictions due to the nature of their contracts.

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charter and tour services, accessible travel has grown.[34] Consequently, although the lack of supply of accessible charter and tour service in the United States might be a function of the lack of demand, it could well be the case that the lack of demand is due to the lack of supply. (See box 3-E on marketing of charter and tour services.)

## Problems With Using Existing Ridership To Indicate Demand

The demonstration projects discussed above have tested the potential demand (and technologies required, see ch. 4) for accessible fixed-route OTRB service. As noted, usage of lift-equipped OTRBs in these demonstration projects has been quite low.[35] However, as discussed above, extrapolations from these data to estimate ridership by persons with disabilities for nationwide accessible fixed-route OTRB services may be quite inaccurate for several reasons.

- Since there have been only a few examples of accessible OTRB service, the overall experience with such service has been extremely limited.
- The accessible operations were limited in geographical extent and served only a few routes; many potential riders found that their destinations and scheduling needs were not addressed by accessible service.
- Although the Canadian demonstration projects collected good data on lift usage and ridership, the U.S. accessible systems have collected very little data.
- Little marketing accompanied the projects, so persons with disabilities often did not know that the service existed.



Stephen Garcia

*Yellow Pages advertisements are the most common marketing tools used by OTRB companies.*

- Much of the experience to date is based on an early generation MCI elevator-style lift, which was plagued with reliability problems.

## Marketing

Fixed-route bus companies tend to do little marketing. Some run an occasional advertisement, in which they may mention that they will assist riders with disabilities who make a special request. In addition, Greyhound has a toll-free number for persons seeking such assistance. Past this, however, OTA could find no efforts to reach or assist persons with disabilities in using the OTRB system.

Even with accessible fixed-route service, marketing efforts have been limited. The Massachusetts EOTC provided carriers with brochures on the availability of service through their program, and worked with MCCD to develop public service announcements and to communicate with disability groups. EOTC has made further efforts

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34 Although it may be relatively easy to arrange an accessible tour in certain European countries, OTA could learn of no accessible fried-mute OTRB service in Europe. So, for example, a person withdisabilities might be able to take a tour of Berlin and its sights, but would be unable to take a bus from Dusseldorf to Vienna. While the U.S. guide to fried-route bus schedules, *Russell's Guide, is 540* pages long, its European equivalent is a mere 40 pages. Instead, much European travel takes place on the extensive railroad system. Frederic D. Fravel, Econometrics, Inc., personal communication, July 1, 1992.

35 While some transit systems have seen ridership by individuals with disabilities increase dramatically once the entire system became accessible, transit service differs significantly from OTRB service. For example, individuals with disabilities might use transit services to go to work, a usage that would be less likely for a freed-route OTRB passenger.

## Box 3-E—Charter and Tour Marketing for Individuals With Disabilities

Most accessible leisure or vacation travel for Americans with disabilities is by private auto, accessible van, airplane, cruise ship, or Amtrak. Over-the-road bus (OTRB) travel is the least accessible and most difficult to arrange. The result is that most opportunities for accessible motorcoach tours for Americans with disabilities lie abroad, not in the United States. Americans with disabilities take their bus tours in Western Europe, Israel, New Zealand, Australia, and elsewhere. But overseas trips are expensive, and few individuals with disabilities, their family members, and traveling companions can afford them.

A few U.S. travel agents and tour operators have the disability community as their primary client base and advertise in publications such as ***Paraplegia News, Mainstream Magazine, The Itinerary, Sports and Spokes, Handicapped Travel Newsletter,*** and Accent ***on Living. One*** tour operator in Minnesota has been providing accessible tours for over 20 years.[1] Another in California runs an information network called Travel Industry and Disabled Exchange (TIDE), publishes a newsletter, "Tide's In," and maintains a mailing list of more than 1,100 wheeled mobility aid users.[2] Most of the operators rely on traditional travel business to offset the expense of the disability niche market.

OTA located 3 directories that list some 325 travel agencies and tour operators offering accessible travel opportunities for persons with disabilities. Many arrange trips for clients with specific disabilities, such as visual impairments, hearing impairments, or cognitive impairments. Some offer tours for individuals dependent on dialysis or for persons with diabetes, while others specialize in travel for people using wheeled mobility aids. A few handle tours accommodating the entire range of persons with disabilities. Only five tour operators/travel agents appear on all three lists.[3] One is the tour operator with the lift-equipped OTRB profiled in chapter 2, box 2-F.

A nonprofit organization in New York City, called the Society for the Advancement of Travel for the Handicapped, operates a worldwide clearinghouse of information on accessible travel conditions for persons with disabilities. It lists 35 travel agents in this country and 9 operating in Australia, Egypt, Greece, Israel, France, and Hungary.[4] Twin Peaks Press in Vancouver, Washington has published a directory of 300 travel agencies in the United States, 26 in Canada, and 46 abroad that arrange tours for individuals with disabilities.[5] The American Association of Retired Persons (AARP), in its book ***Touring by Bus at Home and Abroad,*** devotes one chapter to "The Traveler With Disabilities" and lists 10 travel agents in this country providing tour services for persons with disabilities.[6]

The tour network for persons with disabilities is rudimentary and scattered. Participants are primarily small businesses. In many cases, the involvement of a travel agent or tour operator in serving the disability community depends on the interest of a single employee who may leave at any time. The American Society of Travel Agents, representing some 12,000 approved travel agents, has established a 15-member Committee on Travel for the Disabled to raise the level of awareness of front-line travel agents about the travel needs of persons with disabilities. Several active participants in this informal tour network are members of the committee.

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1 Barbara Jacobson, owner, Flying Wheels Travel Service, Owatonna, MN, personal Communion, July 15, 1992.

2 Yvonne Nau, Nautilus Tours, he., Tarzana, CA, personal communication, Jan. 28, 1992.

3 Evergreen Travel Service, Inc. of Lynnwood, WA; Flying Wheels Travel Service Of Owatonna, MN; Nautilus Tours, Inc. of Tarzana, CA; New Directions, Inc. of Santa Barbara, CA; and Wheelchair Wagon Tours of Kissimmee, FL. A sixth, Whole Person Tours of Bayonne, NJ, would probably have made all three lists but has been inactive since late 1991.

4 Available through Society fo, the Advancement of Travel for the Handicapped, 347 Fifth Avenue, New York, NY 10016.

5 Available through the Disability Bookshop, P.O. Box 129, Vancouver, WA 98666-0129.

6 Diane C. Gleasner, *Touring by Bus at Home and Abroad* (Washington, DC: American Association of Retired Persons, 1990), pp. 95-103.

to enable persons with wheeled mobility aids to use paratransit throughout the State, easing travel to and from OTRB stations at both ends of the journey. MCCD, meanwhile, has developed and promoted use of accessible OTRBs within the State. Some of these funds have gone toward a statewide toll-free number that provides information about and reservations on accessible intercity buses and the corresponding paratransit connections. Most Massachusetts carriers, however, have done little beyond *Yellow Pages* advertisements to promote their accessible service.

The Canadian demonstration projects involved extensive marketing, including meetings and demonstrations with disability groups, media advertising, free rides, and publicity efforts. The free ride promotion was particularly effective. In the United States, transit systems tend to market OTRB accessibility as part of the information they provide regarding the overall accessibility of their systems. Denver RTD has a brochure describing its system, and its timetables include accessibility information. In California, the Golden Gate Bridge Highway and Transportation District has a user brochure discussing all of its accessible vehicles, including OTRBs.

## THE DIFFICULTIES OF PROJECTING DEMAND

One of the issues regarding ADA accessibility standards for OTRBs concerns demand versus need. Disability groups make a strong case that a significant portion of the population needs accessible OTRB service. On the other hand, bus company owners fear making capital expenditures they might not be able to afford in order to provide a service that maybe little used. Who is right? It is possible that both groups are; a given service might be needed by a particular segment of society, while the demand might still be small compared with the demand of the total population.

Need may seem relatively easy to quantify in the case of individuals with disabilities. Although a precise count of such persons does not exist—and the accuracy of such a count would be questionable because of the definitions used and the exclusion of temporary disabilities-the surveys cited earlier in this chapter present an approximate range. However, there is as yet no way to specify the frequency of supply required to fulfill this need. While the passage of the ADA requires that persons with disabilities eventually have universal access to OTRBs, previous studies have found that actual use of a new transportation mode by a given group seldom correlates with the behavior predicted in advance.[36]

Demand is the actual use of a service. Estimation of demand for transportation services requires data from the observed behavior of similar consumers making similar choices of services with similar attributes. In the case of accessible OTRB service, which has been offered only in a handful of demonstration projects, extrapolation becomes difficult, more abstract, and less reliable. Need almost always exceeds demand, and therefore complicates projections.[37]

### Demand Estimation Methodology

Because of the many problems with extrapolating demand estimates from current usage figures for both freed-route and charter and tour accessible service, OTA devised an alternative method to estimate the demand for accessible service, using both OTRB travel data available for the general population and the numbers of persons with disabilities in the total population. First, “trip rates’ are calculated for both fixed-route and charter and tour services. A trip rate is the average number of fixed-route or charter and tour trips taken by one person in the United States. These

36 Ecosometrics, Inc., op. cit., footnote 16, pp. 1-48 to 1-49.

37 Ibid., p. 1-49.

trip rates are then applied to total population estimates of persons with disabilities to obtain the number of trips that these persons might take.

### Estimating Trip Rates for OTRB Services

OTA estimated the fixed-route intercity per capita trip rate by taking the best estimate of U.S. fixed-route ridership and dividing it by the total population. Interstate Commerce Commission data from the largest fixed-route intercity carriers estimates 28 million passenger-trips in 1990. To account for ridership on the smaller carriers, an additional 10 percent was added to this figure for a total of slightly less than 31 million. This number was then divided by 249 million (the U.S. total population, as estimated by the U.S. Bureau of the Census) to obtain a national fixed-route intercity trip-making figure of 0.125 trips per-person annually .38

Estimating a trip rate for charter and tour service is problematic, because the nationwide data on charter and tour trips are incomplete. To ensure the greatest level of statistical confidence possible, the annual number of charter and tour trips in the United States was estimated in three ways.[39] First, the statistical summary, Transpor-*tation in America,* reported that in 1990, OTRBs carried 322 million passengers. Subtracting the 31 million freed-route passengers leaves 291 million passenger-trips on charter and tour OTRB services. Second, the 1983 American Bus Association (ABA) Annual Report estimated that 209 million passengers used charter and tour services in that year, Assuming an annual growth rate of 5 percent, there would have been 294 million passengers in 1990. Finally, ABA surveyed the 3,500 charter and tour firms. Of the firms that responded, the typical firm may carry between 82,000 and 92,000 passengers annually, resulting in 287 to 322 million trips nationwide. Choosing 291 million trips as the best estimate and dividing by the total population of the United States gives an average per capita trip rate of 1.17 trips.



National Federation for the Blind

*Persons with disabilities have family members or friends who might travel with them.*

### Adjusting for Differences in Travel Patterns of Persons With Disabilities

The 1977 UMTA study is the only national travel survey thus far to attempt to determine the travel characteristics of persons with disabilities.[40] This study interviewed a sample of persons with permanent or temporary disabilities, including those in institutions. It found that these

[38] One important note concerns the possibility of developing different per capita trip rates for different age groups and for urban versus rural populations. While such a breakdown of the national trip rate might be ideal, it is not feasible with the incomplete data available.

[39] Ecosometrics, Inc., op. cit., footnote 16, pp. 3-14 to 3-15.

[40] Grey Advertising, "Technical Report of the National Survey of Transportation for Handicapped People," prepared for Urban Mass Transportation Administration, October 1978.

persons took 35 percent fewer recreational trips than persons without disabilities. Most fixed-route and charter and tour passengers traveled to visit family or for other social or recreational reasons.[41] In accounting for how many trips they would have liked to take, the survey found that the overall trip rate for persons with disabilities would be 15 percent less than that of persons without disabilities if all transportation modes were accessible.

Although this study argues for a lower trip rate for persons with disabilities, considerable debate exists about the likely travel patterns of persons with disabilities on OTRBs if all such services were accessible. Some researchers suggest that trip rates for persons with disabilities must be less than those for the general populace due to the subpopulation of persons with disabilities who have overall lower mobility, or due to the low economic status of many persons with disabilities (i.e., they could not afford the trip).

However, other researchers cite the high correlation of disabilities with age, lack of access to automobiles, and lower incomes as a reason persons with disabilities might have higher than average trip rates.[42] At the same time, escorted tour trip rates may be higher due to the convenience of having a tour operator "scout ahead" to determine the accessibility of the tour route.[43] In particular, older persons with disabilities who also have higher incomes might avail themselves of accessible charter and tour service. What is not known is whether trip rates for persons with disabilities will most strongly reflect certain demographic characteristics, or the extent to which having a disability is a characteristic that overrides other factors.

Because of the conflicting analyses cited above, the following calculations include no adjustments for differences in the travel patterns of persons with disabilities. Nor does the trip rate account for additional travel by persons without disabilities who can now accompany friends and family who have disabilities onto OTRBs, a factor with potential to increase the estimated number of trips.

## Calculating the Number of OTRB Trips by Persons With Disabilities

To reiterate the demographic data above:[44]

- 1.4 million people use wheelchairs.
- 1.7 million people use walkers.
- 3.0 million people use any mobility technology devices,[45]
- Up to 14 million people have hearing impairments.
- 4.0 million people use hearing technology devices.
- 5.0 million people have sight impairments that make independent travel difficult.
- 1.1 million people are legally blind.
- 0.3 million people use vision technology devices.

These figures and the trip rates developed above are used to calculate the number of trips taken by persons for freed-route and charter and tour

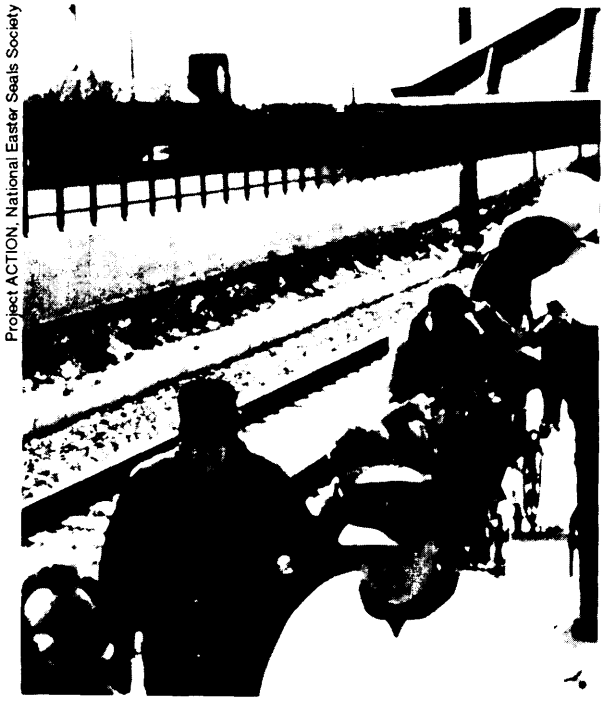
41 Frederic D. Fravel, "Intercity Bus Passenger Profile," paper presented at the Annual Meeting of the Transportation Research Board, Washington DC, January 1985; and Greyhound Lines, Inc., "Greyhound On-Board Passenger Profile Survey," unpublished document, August 1991.

42 Because of the lack of accessible OTRBs, travelers with disabilities have had to rely on other modes of transportation. For those who have traveled via other modes, the question must be asked as to whether they would switch to OTRBs. Since many persons with disabilities do not drive and thus more remote locations are difficult for them to reach, the large network of stops served by OTRBs compared with other modes of transportation may be an invaluable service to many persons with disabilities. With fixed-route bus service as a low-cost alternative, it is possible that low-income persons with disabilities will see accessible OTRB service as their best travel option. Remarks at Office of Technology Assessment Workshop, "Building an Accessible OTRB System," July 15, 1992.

43 Ibid.

44 These groups may overlap, because some persons may use more than one type of aid or may have more than one kind of disability.

45 This number includes persons using crutches, walkers, wheelchairs, scooters, and other mobility equipment, but not persons using leg braces and/or canes and walking sticks.


Project ACTION, National Easter Seals Society

*Actual demand for accessible service is difficult to predict.*

services. For fixed-route intercity service, if all OTRBs were accessible today, total trips made annually by persons with sensory and/or mobility impairments might include the following:[46]

- 180,000 trips by persons using wheelchairs.
- 210,000 trips by persons using walkers.
- 380,000 trips by persons using any mobility devices.[47]
- Up to 1.8 million trips by persons with hearing impairments.
- 500,000 trips by persons using hearing technology devices.
- 630,000 trips by persons with sight impairments that make independent travel difficult.
- 140,000 trips by persons who are legally blind.
- 33,000 trips by persons using vision technology devices.

Similarly, for charter and tour services, total trips made annually by persons with sensory and/or mobility impairments might include the following.[48]

- 1.7 million trips by persons using wheelchairs.
- 2.0 million trips by persons using walkers.
- 3.6 million trips by persons using any mobility devices.[49]
- Up to 16 million trips by persons with hearing impairments.
- 4.7 million trips by persons using hearing technology devices.
- 5.9 million trips by persons with sight impairments that make independent travel difficult.
- 1.3 million trips by persons who are legally blind.
- 0.3 million trips by persons using vision technology devices.

These numbers are only estimates. Estimating travel demand figures is notoriously difficult for services that have not yet been introduced. Travel preferences are often unique to the individual and only experience with a particular transportation

46 The following numbers do not include persons using leg braces or persons using canes or walking sticks, who might also require assistance, especially in the form of a lower first step, in boarding OTRBs. OTA calculates the number of fried-route trips made annually by persons using leg braces as 110,000 and the number of freed-route trips by persons using canes or walking sticks as 550,000.

48 The following numbers d. not include persons using leg braces or persons Using canes or walking sticks, who might also require assistance, especially in the form of a lower first step, in boarding OTRBs. OTA calculates the number of charter and tour trips made annually by persons using leg braces as 1.0 million, and the number of freed-route trips by persons using canes and walking sticks as 5.1 million.

49 This number includes persons using crutches, walkers, wheelchairs, scooters, and other mobility equipment, but not persons using leg braces and/or canes and walking sticks.

system can give credible estimates of future travel on that system.[50]

However, compared with the total number of OTRB passengers, there is no doubt that the annual number of additional trips by persons with disabilities is likely to be small. These riders may increase usage of OTRB services. But if the provision of accessible service requires bus companies to raise rates, certain passengers who are price sensitive may choose to ride other forms of public transportation, go by automobile, or not travel at all. Combined with the actual ridership of passengers with disabilities, this change in ridership might result in either a net increase or decrease. Indeed, since the ridership of OTRBs experiences large fluctuations for other reasons (due to changes in the general economy and points served by OTRBs), it will probably be impossible to discern if changes in ridership are due to accessibility requirements, even retrospectively.

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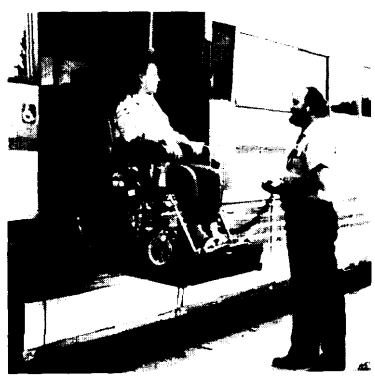
50 Demand forecasts rely heavily on previous usage data. U.S. Congress, Office of Technology Assessment, *Airport System Development,* OTA-STI-231 (Washington, DC: U.S. Government Printing Office, August 1984), pp. 159-185.

# Accessibility Technologies for Over-the-Road Bus Service

# 4

## FINDINGS

- Level-change devices can assist persons with mobility impairments in boarding and disembarking from over-the-road buses (OTRBs). As of late 1992, a number of vehicle-based lift technologies were available for OTRBs, and several such technologies were in the research and development phase. The capital costs for the available vehicle-based lifts range from $7,000 to $17,000. However, the Office of Technology Assessment (OTA) found only one station-based lift technology under development that appeared likely to meet Americans with Disabilities Act (ADA) standards (the cost estimate for this lift is $4,500). OTA found no ramp technology under development that would meet ADA standards.
- Bus modifications are necessary in conjunction with level-change devices to accommodate wheeled mobility aids onboard the bus. Modifications include wheeled mobility aid tie-down positions, folding seating units, movable arm rests, and an accessible door (modification costs are estimated at between $5,000 and $7,000).
- Currently several securement and restraint systems are available for persons using wheeled mobility aids on OTRBs. However, further review of the relevant movement standards is needed. In addition, OTA has not found any securement technology that prevents excessive movement by the wheeled mobility aid while also allowing the user to secure and release him or herself.



- OTRB manufacturers have developed two accessible restrooms, ranging in price from $5,000 to $35,000. Both result in a loss of seating capacity.
- At present, several technologies are available to assist persons with sensory and cognitive disabilities. The U.S. Department of Transportation (DOT) has issued lighting and contrast standards, but these do not fully address the communication needs of persons with sensory and cognitive disabilities. Most OTRBs have signage and public address systems; these and additional features could be used to meet the needs of persons with disabilities.
- Employee training is crucial for accessible OTRB service. While few programs are aimed at training OTRB company employees in the area of accessible service, several transit company training programs could be adapted for this purpose.

## TECHNOLOGIES TO ASSIST PERSONS WITH MOBILITY IMPAIRMENTS

This chapter describes current and potential technologies to make OTRB service accessible. These technologies can be classified into two categories: 1) those that assist persons with mobility impairments, and 2) those that assist individuals with sensory or cognitive impairments. While sensory and cognitive disabilities are very different, some technologies designed for those with sensory impairments also serve people with cognitive impairments. The chapter also describes how employee training might improve intercity bus accessibility.

Persons with mobility impairments can encounter a number of difficulties when using current intercity bus service. These diffiiculties include getting on and off the bus and using onboard restrooms and terminal facilities, including ticket counters, boarding areas, and restrooms. Several technologies are currently available or proposed to address these problems. In addition to methods designed for persons who use wheeled mobility aids, other technologies assist people with different types of mobility impairments.

### Carrying

Carrying is the primary method by which bus companies now assist travelers who cannot otherwise board an OTRB. One or more bus company employees hoist a person up the steps of an OTRB and into a passenger seat. Some bus companies use a boarding chair, a specially designed wheelchair narrow enough to be used onboard an OTRB. Passengers with disabilities are transferred on the ground from their personal wheeled mobility aids to a boarding chair, carried up the OTRB's steps in the boarding chair, wheeled down the aisle, and transferred again to a bus seat. The cost of a boarding chair is estimated at between $550 and $650.[1]

Most individuals who use wheeled mobility aids find that being lifted and carried for boarding or seat transfer is objectionable for reasons of safety, privacy, and dignity. Carrying might also be painful for people with certain disabilities, such as multiple sclerosis. In addition, there is risk of injury during the carrying process; bus employees might drop someone or strain themselves. Such accidents are likely to lead to increased workmen's compensation, litigation, and insurance costs. Since passengers must be separated from their wheeled mobility aids, there is also the possibility of damage to a wheelchair or scooter that is stowed. Indeed, some are so large and heavy that it is unclear where they might be kept.[2] If stored in the OTRB's baggage compartments, they might displace baggage or package express items.

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[1] Randy Isaac, Isaacs and Associates, Cottontown, TN, personal communication August 1992.

[2] Luggage compartments approximately 3 1/2 feet high are necessary to transport wheelchairs without folding or disassembling them. Scooters might require more space. Most luggage compartments are 33 1/2 inches high, or less than 3 feet.

## Ramps

Ramps provide a smooth, gradual surface for travelers to get from the ground into an OTRB. The Architectural and Transportation Barriers Compliance Board (ATBCB) considers a ramp accessible if it has a slope no greater than 1 to 12, or 12 inches horizontal for every 1 inch vertical rise (see app. 4-A, which details current ATBCB guidelines). This ratio allows most individuals who can operate their own wheeled mobility aids to wheel themselves up the ramp, and reduces the danger that they will roll backwards. With sufficient vertical clearance at the bus entrance and adequate grab rails, the ramp can also be used by individuals with all sorts of mobility impairments, not just those using wheeled mobility aids. As there are no mechanical or motorized parts in a ramp, reliability primarily depends on the strength of initial construction. Maintenance requirements are negligible, consisting mainly of periodic inspections to make certain that all parts are secure.

Ramps can be grouped into two categories: transferable and station-based ramps, Greyhound Lines, working with Handi-Ramp, Inc., of Mundelein, Illinois, has developed a transferable ramp (see photograph). The ramp has a slope of 1 to 8 (which does not meet current ADA standards) and is designed in five sections that can be disassembled and stored in the baggage compartment. The ramp parallels the side of the bus, and is 30-inches wide—too narrow to accommodate many wheeled mobility aids. A railing is provided on the side away from the bus, and the bus itself serves as a restraint on the inner side. At the door of the bus, the ramp is level with the passenger seating deck. A "bridge" platform spans the stairwell area entering the bus.[3] Ramp assembly time for two experienced operators could be less




Greyhound Lines, Inc.

*Greyhound tested this ramp to board persons with disabilities. It does not meet current ADA standards.*

*than* 5 minutes, though a single unpracticed operator might require as much as 20 minutes.[4] Cost estimates for the Greyhound ramp range from $3,500 to $4,500.[5] Since the ramp design does not call for modifying the bus to accommodate wheeled mobility aids, a boarding chair is necessary. Given the difficulties stated above and the requirement of a boarding chair, persons who use wheeled mobility aids might not readily accept such a ramp as a means of accessible service.[6]

Station-based ramps remain at the bus station. Prices for the several types of ramps proposed range from $4,000 to $7,500, depending on the construction materials. A problem with reliance on station-based level-change devices is that passengers with mobility impairments might be unable to disembark at an unscheduled stop. Although on-the-road breakdowns are not a

[3] Econometrics, Inc., ' 'Evaluation of Methods to Provide Accessibility to Over-the-Road Buses and Services,'' OTA contractor report, July 28, 1992, p. 58.

[4] Isaacs, op. cit., footnote 1.

[5] Randy Isaacs, director of State Government Affairs, Greyhound Lines Inc., personal communication, Nov. 5, 1991.

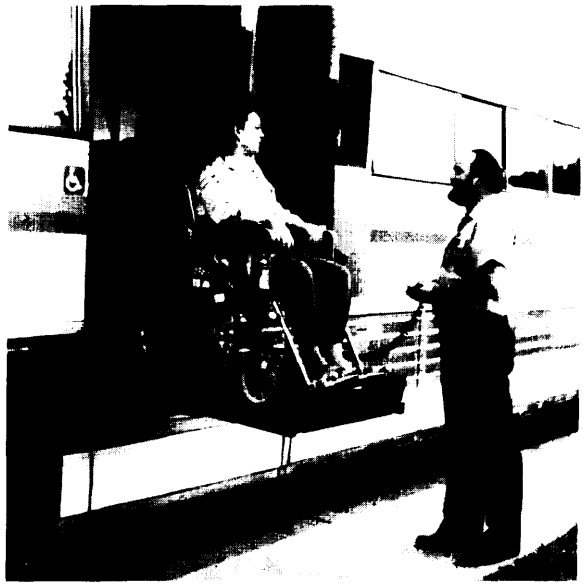
[6] Remarks at Office of Technology Assessment Workshop, ''Intercity Bus Access for Individuals With Disabilities," Mar. 17, 1992.

regular occurrence, they are not uncommon. In an emergency situation, if the OTRB were equipped with a collapsible ramp and boarding chair, a person with mobility impairments could more easily and safely exit the bus or transfer to a replacement OTRB.

## Lifts

OTA workshop participants have indicated that lifts in conjunction with bus modifications offer the highest degree of user acceptance. Several early generation lifts are currently used as boarding aids on intercity bus coaches. Lifts act as either manual or powered level-change devices. All lifts include a platform to raise and lower the occupant, a barrier to prevent the wheeled mobility aid from falling off the platform, and some form of side support for the user to grasp. However, lifts vary in operating costs, maintenance needs, and the degree to which other aspects of operation are automated (e.g., door closing and opening, barrier operation, and stowage). Lifts mounted inside the bus occupy space in the passenger area or the luggage compartment. In order to maintain adequate headroom at the door, some lifts displace overhead luggage space. Depending on the coach configuration, lift users may board the coach through separate entrances located along the side or at the back of the coach.[7]

With appropriate vehicle modifications, lifts allow individuals who use wheeled mobility aids to board, ride, and disembark from coaches without leaving their mobility aids. These bus modifications include tie-down positions (discussed below), foldup seating units, and an additional accessible door. Vehicle-mounted lifts, because they affect the structural integrity of the bus frame, can necessitate further structural modifications. It is estimated that these elements together constitute about $5,000 to $7,000 of the cost involved in the installation of a lift. In some cases, these bus modifications cause a loss of two to four passenger seats when persons using the tie-downs are onboard.



Stewart and Stevenson Power, Inc.

*A passenger leaves an OTRB using an exterior-style lift.*

OTA has identified three types of lifts: vehicle-based, station-based, and transferable lifts. Vehicle-based lifts are the most common. OTA examined six different vehicle-based lifts designed in the United States and Canada and three from Europe. Vehicle-based lifts are part of the bus and therefore can be used at all stops. Some models take up baggage space when stored, while others reduce seating capacity. Electrical vehicle-based lifts rely on power from the coach, allowing operation only when the bus is running. However, many models have emergency, manual pumps that allow for independent operation. Cost estimates for powered vehicle-based lifts fall between $12,000 and $24,000, including vehicle modifications.

Vehicle-based lifts have two basic styles, "elevator" lifts and "exterior" lifts. Elevator lifts operate within the bus; users access the lifts

[7] Transit bus lifts are usually at the front or middle entrances, so persons with wheeled mobility aids use the same doors as other passengers. OTRB lifts often use separate entrances toward the rear of the bus.

through side doors near the baggage compartments of the bus. Exterior lifts operate outside the bus; users enter the lift outside the bus and are raised to a door at the OTRB's deck level.

Station-based lifts are located at passenger terminals. OTA has found only one station-based lift, and it is currently in the development stage. Proposed by Adaptive Engineering Ltd. of Canada, the lift would be adapted from their Mobilift Model 4P(291 lift currently used by Amtrak (see photograph). The proposed lift is portable (although it currently cannot collapse to fit into a baggage compartment); one person can roll it to the side of the bus. It does not use either an electric motor or hydraulic devices to raise the lift platform, relying instead on a manual, hand-cranked cable lifting system. Maintenance requirements are minimal. Cost estimates for the manually powered lift range from $4,000 to $5,000, without bus modifications.[8]

Transferable lifts can be shifted from one bus to another, In 1992, no transferable lifts were in operation on OTRBs. The station-based lift discussed above could perhaps be adapted to fit in the baggage bay of an OTRB, although it would displace a considerable amount of baggage space. To deal with this problem, Adaptive Engineering has proposed a new type of transferable lift, referred to as the ''backpack" lift. The lift would be housed on the back of the bus, above the bus' rear bumper. When needed the backpack lift would slide along rails to the accessible side door. Before such a lift could be developed, however, several design problems must be solved, including: a method for negotiating the lift around the comer of the bus; a casing that protects the lift from harsh road and weather conditions; and a way to quickly and easily move the lift to allow engine maintenance. Because transferable lifts are still only a proposed technology, no reliable cost estimates exist.


Adaptive Engineering, Ltd.

*This station-based lift, while designed for use on rail systems, may be adapted for OTRBs.*

Some current lift designs pose problems for persons who use aids such as canes and crutches. Often, doorposts and other barriers are too low to allow these travelers to stand while exiting the lift, requiring them to crouch or duck in order to avoid bumping their heads, Therefore, the doorway must be high enough to accommodate these passengers. Some manufacturers have also added features to their lifts that would allow users to sit, rather than stand, during operation.

Data on the reliability of lifts is hard to come by, primarily because the technology has been employed in only 350 buses in the United States, most of which use early generation lifts.[9] However, some information is available from demon-

[8] Endre Pataky, export *manager,* Adaptive Engineering Ltd., personal communication, July 1992.

[9] Experience with lifts indicate that they are becoming more reliable with each successive generation. Manufacturers are ironing out problems, determining maintenance requirements, and standardizing the production process. In addition, bus drivers are learning better how to operate the lifts.

stration projects in Canada and experience in the United States (see ch. 3). Not surprisingly, different types of lifts have different reliability records. In general, the simpler the design, the less that goes wrong. Some lifts seem to be plagued by high maintenance costs and extended downtime, especially early generation elevator-style lifts. Others simply require routine checking of fluid levels. Reliability may be affected by exposure to road and harsh weather conditions.

Driver inexperience in operating the lifts can also lead to problems. The driver assumes several responsibilities, including communicating with individuals with a variety of impairments, operating the lift, and in some cases fastening the securement and restraint system once the passenger is inside the coach. (Related training is discussed later in this chapter). In some demonstration projects, drivers operated the lifts only a few times each year. Because of their limited experience with the lift, many drivers had difficulties recalling the correct procedures.



Project ACTION, National Easter Seals Society

*Drivers must often assist passengers securing their wheelchairs.*

## Securement, Restraint, and Other Issues

A requirement common to all accessible OTRBs is the provision of adequate space for wheeled mobility aids, and restraint of the mobility aid and passenger, inside the bus. Securement systems must restrain the wheeled mobility aid's movement so that it does not break free or collapse and injure someone or sustain damage itself.[10] Wheeled mobility aids that are not properly secured during an accident or even normal driving conditions (e.g., during fast turns or quick braking) pose serious risks to both the occupant and other passengers. The ATBCB Americans With Disabilities Act Accessibility Guidelines for Transportation Vehicles call for securement systerns on vans and transit buses to limit the movement of wheeled mobility aids to no more than 2 inches in any direction under normal vehicle operating conditions.[11] However, because intercity coaches often travel at faster speeds than transit buses and vans, a stricter standard might be necessary.

Securement system design is complicated because there are over 500 different types of wheeled mobility aids.[12] (For a drawing of a typical wheelchair, see figure 4-l.) Common issues facing designers include:

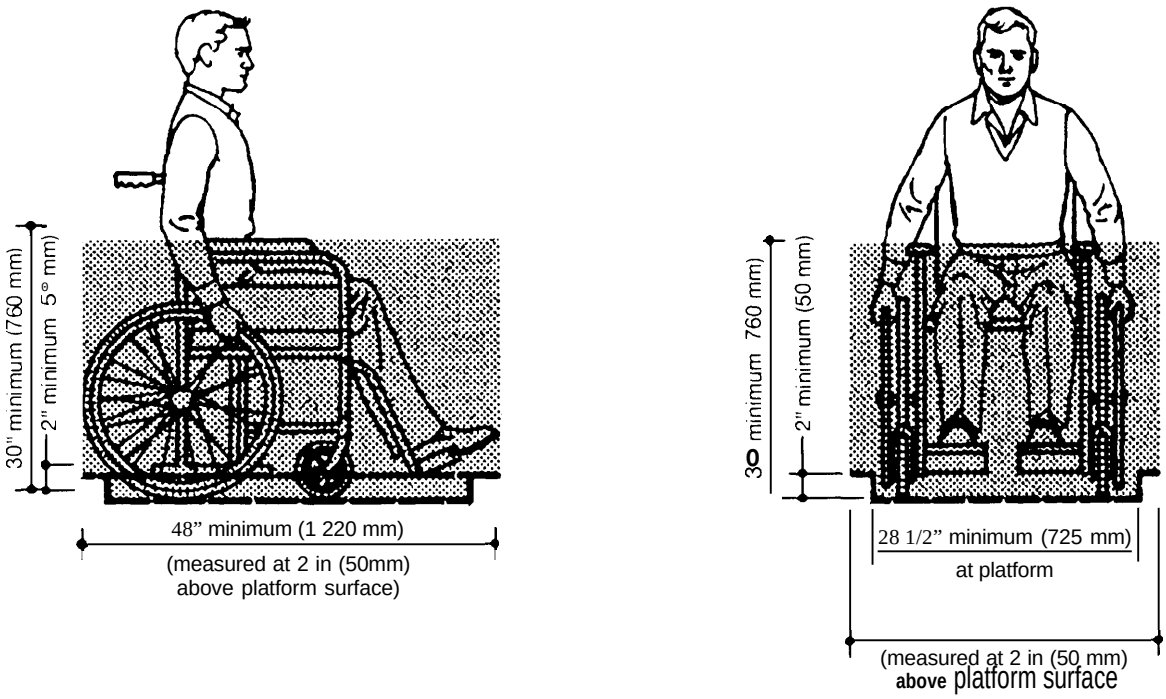
- Wheeled mobility aids are not meant to take stress from the directions that restraint systems might impose;
- Three-wheeled scooters have different stability characteristics from conventional four-wheel designs;
- Wheelchairs and scooters have a variety of wheel designs with differing thickness, diameter, and spoke characteristics, making it difficult to design a uniform wheel clamp;

10 Because wheeled mobility aids are not designed to be used as intercity coach seats, they are susceptible to damage during severe driving conditions. Norman Littler, coordinator for Regulatory Relations, MCI, personal communication Aug. 19, 1992.

11 56 *Federal Register* 45540 (Sept. 6, 1991), Architectural and Transportation Barriers Compliance Board, Americans With Disabilities Act Accessibility Guidelines for Transportation Vehicles; Final Guidelines, 36 CFR Part 1192, Sub Part B, 1192.23 (5).

12 Katherine Hunter-Zaworski, assistant professor, Transportation Institute, Oregon State University, personal communication, Dec. 14, 1991.

**Figure 4-I—Typical Wheelchair Dimensions**




SOURCE: 56 ***Federal Register 45576*** (Sept. 6,1991 ), Architectural and Transpiration Barriers Compliance Board, Americans With Disabilities Act Accessibility Guidelines for Transportation Vehicles; Final Guidelines, 36 CFR Part 1192.

- Opinion is split on whether the person should be secured as well as the wheeled mobility aid and whether they should be secured together or separately;
- The ideal securement system would allow for quick entry and exit, preferably allowing the user to operate the system without assistance;
- Some travelers with disabilities cannot secure themselves, regardless of system design; and,
- Passengers and drivers are sensitive about violations of their personal space, as might occur when the driver must assist in the securement procedure.

Thus, it is difficult to develop a securement system that can adapt to all types of wheelchairs and scooters and is acceptable to all users and drivers. OTA has not found any securement systems that both adequately limit wheeled mobility aid movement and enable the user to restrain and release him or herself.

Currently, there are two main types of securement devices: the belt design and clamp design. In 1992, urban transit service and accessible OTRBs used both systems. Belt systems are usable on the majority of wheelchairs and have proven crashworthy. Crash tests conducted on the Q-Straint belt design securement system have shown that in crashes of up to 20gs, wheelchairs moved less than 4 inches .13 However, drivers who are not properly trained or do not use the system routinely might require as much as 15 minutes to secure a wheeled mobility aid and still might not

[13] In addition, the Q-Straint system meets the ATBCB requirement that chairs not move more than 2 inches under normal driving conditions.

secure it properly.[14] *The Q-Straint* belt securement system costs approximately $400 per unit.[15]

The clamp securement system uses a clamp that locks onto the rear wheels of the mobility aid; the front is fastened with straps. The advantage of the clamp system is the ease of attachment, allowing some persons with mobility impairments to secure themselves.[16] Clamp systems do not work on all types of wheeled mobility aids, however, because of the varied widths of wheels. In addition, mobility aid wheels are not as strong as the frames, and therefore run a higher risk of collapsing during a crash.

One proposed solution to the problem of diversity among wheeled mobility aids is the use of a uniform attachment device. The device could be fastened to a wheeled mobility aid in order to make it compatible with a standard securement device inside the bus,[17] reducing the time needed for securement.[18] To maximize user acceptance, any add-on feature should be inconspicuous, simple, and inexpensive.[19]

A separate but related issue is the securing of the passenger. Many wheeled mobility aids do not offer as much back, neck, or head support as intercity bus seats, which are taller and provide headrests. In an accident in which an individual's head is snapped backward, people seated in wheeled mobility aids might be more likely to sustain neck or head injuries. Furthermore, some people with disabilities might not be able to use their arms to protect themselves in a crash.[20] All securement systems examined by OTA provide optional restraint devices, such as lap and shoulder belts, but no means of supporting the occupant's head and neck.

## Technologies for Persons Not Using Wheeled Mobility Aides

There are several coach enhancements that can improve the accessibility of OTRBs for persons who have mobility impairments but do not use a wheeled mobility aid. Many of these enhancements are already required by DOT.[21] (For an overview of current accessibility regulations, see box 4-A.) These include slip resistance standards for aisles, steps, and floors; knuckle clearances for hand rails; lighting and contrast standards; and minimum door widths. The 32-inch-wide door allows a male at the 95th percentile in height using two crutches to enter.[22]

Another necessary modification would be the installation of foldup arm rests, allowing people with mobility impairments who do not use wheeled mobility aids easier access to OTRB seats. Other modifications currently offered on OTRBs include retractable first step and kneeling features. A retractable first step reduces the step's

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14 William Bauer, executive director, Cleveland, Ohio Services for Independent Living, personal communication, Aug. 18, 1992.

15 Dave Kessler, manager of Bus Bidding, Flxible Corp., personal communication% Aug. 18, 1992.

16 The individual can back the wheeled mobility aid into the clamp, which automatically locks, and then fasten the front straps.

17 Katherine M. Hunter-Zaworski, Transportation Institute, Oregon State University, "OSU Offers 'Trailer-Hitch' Approach to Solve Securement Problems," Project ACTION Update, National Easter Seals Society, fall 1991, pp. 4-5.

18 A uniform attachment can be used in conjunction with both the belt and clamp securement systems. The Services for Independent Living in Cleveland is developing a clamp-style securement system that uses a universal attachment. The system has held a wheelchair to within 1 1/2 inches in a 20g test collision.

19 William Bauer, executive director, Services for Independent Living Cleveland, OH, "Project Develops Prototypes of Self-Securement Systems," Project ACTION Update, National Easter Seals Society, fall 1991, p. 6.

20 Bauer, op. cit., footnote 14.

21 56 *Federal Register* 45771 (Sept. 6, 1991), Part 38, Subpart G, Sec. 151-157.

22 It is Motor Coach Industries Limited's position that accommodating the 32-inch standard could require moving the pillar behind the door rearward, forcing the front axle rearward, displacing air conditioning equipment, and forcing reconfiguration of the front third of the bus in order to maintain proper axle loading, pavement wear, and other operating characteristics. Joseph M. Dabrowski, vice president for Engineering, Transportation Manufacturing Corp., personal communication Mar. 17, 1992.

## Box 4-A-Current Bus Accessibility Regulations

In 1991, the U.S. Department of Transportation (DOT) issued rules under the Americans with Disabilities Act (ADA) regulating accessibility standards for publicly owned and operated transit buses, privately owned and operated over-the-road buses (OTRBs), and privately owned OTRBs operated under public contract.

The regulations governing transit buses cover:

- doors, steps, and thresholds,
- priority seating signs,
- interior circulatiion, handrails, and stanchions,
- lighting,
- fare boxes,
- public information systems,
- stop requests, and
- destination and route signs.[1]

In addition, the regulations included a mobility aid accessibility section, mandating that transit buses provide a' 'level-change mechanism or boarding device. " The regulations state:

> All vehicles covered by the subpart shall provide a level-change mechanism or boarding device (e.g., lift or ramp) complying with paragraph (b) or (c) of this section and sufficient clearances to permit a wheelchair or mobility aid user to reach a securement location. At least two securement locations and devices, complying with paragraph (d) of this section, shall be provided on vehicles in excess of 22 feet in length.[2]

Regulations controlling privately owned and operated OTRBs took effect in 1991. These regulations apply to doors, steps, and thresholds; interior passenger circulation, handrails, and stanchions; and lighting.[3] In addition, they mandate that OTRB operators provide accessible service and arrange for a passenger with disabilities to be carried aboard if no other type of boarding aid is available. OTRB operators may require up to 48 hours advance notice for providing boarding assistance.[4] These regulations maybe augmented after DOT review of this study. Regulations governing boarding aids have yet to be formulated. DOT will issue boarding aid regulations after review of this study, and these regulations will take effect in 1996 for large bus companies and 1997 for small bus companies.[5]

One exception to the regulations covering OTRBs applies to publicly owned OTRBs and privately owned OTRBs under contract to a public entity. These OTRBs must comply not only with the regulations governing privately owned and operated OTRBs, but also with the mobility aid accessibility rules regulating transit buses, i.e. they must provide a boarding aid such as a vehicle-based lift or rarnp.[6]

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1 56 *Federal Register* 45757-45760 (Sept. 6, 1991), U.S. Department of Transportation, Transportation for Individuals with Disabilities; Final Rule, Part 38, Subpart B.

2 Ibid., Sec. 38.23, paragraph (a).

3 56 *Federal Register* 45771 (Sept. 6, 1991), U.S. Department of Transportation, Transportation for Individual with Disabilities; Final Rule, Part 38, Subpart G.

4 56 *Federal Register* 4564045641 (Sept. 6, 1991), U.S. Department of Transportation, Transportation for Individuals with Disabilities; Final Rule, Part 37, Subpart G, Sec. 37.169.

5 *Federal Register*, op. cit., footnote 3. The President can delay implementation of each set of final regulations for 1 year.

6 56 *Federal Register* 45626 (Sept. 6, 1991), U.S. Department of Transportation, Transportation for Individuals with Disabilities; Final Rule, Part 37, Subpart A, Sec. 37.23, paragraph a; and 56 *Federal Register 45625* (Sept. 6, 1991), U.S. Department of Transportation, Transportation for Individuals with Disabilities; Final Rule, Part 37, Subpart A, Sec. 37.7, paragraph c.

height to approximately 8 inches, down from 16 or 17 inches.[23] Kneeling options reduce the frost step height by 3 to 5 inches. In addition, some OTRBs carry a step box, which adds an additional step. Without reductions in step height, many persons who could otherwise climb steps cannot board.

Aisle width is another possible obstacle. The standard 14-inch aisle width accommodates only certain boarding chairs and imposes severe restrictions on users of walkers, crutches, or canes. Given exterior coach width limitations of 96 or 102 inches, however, increasing aisle widths along the entire length of the coach would almost certainly reduce seating capacity.




*As of early 1993, all accessible OTRB restrooms displace passenger seating.*

## Accessible Restrooms

The authors of the ADA were uncertain about the availability of accessible OTRB restrooms or the feasibility of designing one without incurring a significant loss of seating capacity. Restroom access will be necessary if OTRB service is to be truly accessible, and some manufacturers have begun designing onboard accessible restrooms.

OTA has identified two accessible restroom designs. One design is currently available as an option on some Neoplan coaches.[24] Like most conventional restrooms, it is on the same level as the passenger deck, in the back of the bus. The Neoplan design differs from a conventional restroom in that the dimensions are slightly larger. The accessible restroom permanently displaces three seats and requires the narrowing of one seat by 3 inches. The location of the lift entrance is a few feet forward of the restroom, so that persons who use wheeled mobility aids need only back a short distance to the restroom entrance. The Neoplan's dimensions provide just enough clearance to allow a wheeled mobility aid to enter, and use of the toilet requires a relatively agile passenger. The estimated cost for Neoplan's accessible restroom is roughly $5,000, which can be compared with the price of a nonaccessible restroom at $3,300.[25]

The other accessible restroom is a prototype developed by MCI and installed on its 45-foot demonstration coach. Developed in conjunction with MCI's 4-Link lift, the restroom and the lift are fully integrated. A movable partition separates the two so that the space needed for entering the coach from the lift is borrowed from the restroom as needed. The lift entrance is located behind the rear axle. The restroom takes up the entire width of the coach and is quite spacious compared to the Neoplan design. Ample room, handles, and grasps inside the restroom provide for maximum maneuverability and a wide range of agility. Seven seats are lost with the lift and accessible restroom. A potential operational problem is that the toilet is mounted on the left side of

23 In Massachusetts, State utility regulators ordered the retractable first steps on State-assisted buses deactivated because the additional width of the deployed step caused the bus width to exceed the State regulations. As of early 1993, it was unclear whether these regulations are still were in effect for OTRBs.

24 Neoplan is a German manufacturer of OTRBs, with facilities in Colorado.

25 Interview with Harvey F. Dick, senior vice president of Operations, Neoplan USA Corp., Nov. 21, 1991, in Ecosometrics, Inc., op. cit., footnote 3.

the coach, rather than the right, as is customary. Many dumping stations can accommodate only the conventional right rear restroom location.[26] MCI has estimated that a 45-foot coach with the lift and restroom package would cost $50,000 more than a standard 40-foot coach,[27]

One problem with accessible restrooms is that the person using the wheeled mobility aid must release the tie-down restraints, either back up or turn to gain entrance to the restroom, and open the door. Undoing the restraints might be impossible for the passenger, requiring the aid of the driver or an attendant. If the driver is called on, the bus must be stopped.

## Reservation Systems

One approach to ensuring accessible service is to have persons with special needs notify bus companies in advance of their desire to travel. Technologies that could be helpful include:[28]

- 24-hour telephone or modem lines for reservations and information;
- automatic vehicle location systems to provide bus location information to fleet management;
- electronic databases for geographical, scheduling, and fare information;
- computerized methods for fleet routing and dispatch; and
- two-way voice or data communications between vehicles and the dispatch center.

As of early 1993, few intercity bus companies had reservation systems. In 1991, Greyhound began the first stage of a computerized fleet allocation, passenger reservation, and yield management system.[29] The new system will allow customers to call the 200 largest Greyhound stations to reserve tickets for specific times and dates, and to receive fare and schedule information for Greyhound and all interlining carriers. In addition, customers will be able to pick up tickets at non-Greyhound locations, such as convenience stores, or receive tickets through the mail.

Other intercity bus companies use less sophisticated reservation systems. Martz Trailways in Pennsylvania, for instance, maintains a noncomputerized reservation system. Users telephone one of six locations to reserve bus seats. Bus employees record their name and bus seat on a standardized form. Approximately 80 percent of the company's regular riders use the reservation system .30

Reservation systems could be used by individuals with disabilities to alert bus companies that accessible service will be necessary. However, under the ADA, bus companies cannot require

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26 Ibid., p. 145.

27 Ibid., p. 145.

28 Paratransit operators and public and private transportation fleets already use many of these technologies, but they have not yet spread to intercity bus service.

29 The fleet allocation portion of the system allowed Greyhound to more efficiently schedule its bus fleet through an increased use of 'hubs and spokes' and the identification and elimination of unprofitable routes and schedules. Greyhound targeted the passenger reservation and yield management portion of the system to be implemented by mid-1993. Greyhound Lines, Inc., *Greyhound Company Newspaper,* January/February 1993. The yield management portion of the system should enable Greyhound to monitor reservation levels on a real-time basis and, depending on those levels, increase or decrease the number of discount and full fares available on specific schedules in order to maximize revenues, re-route passengers when seat availability is restricted, and generate logs that list inbound and outbound passengers by name.

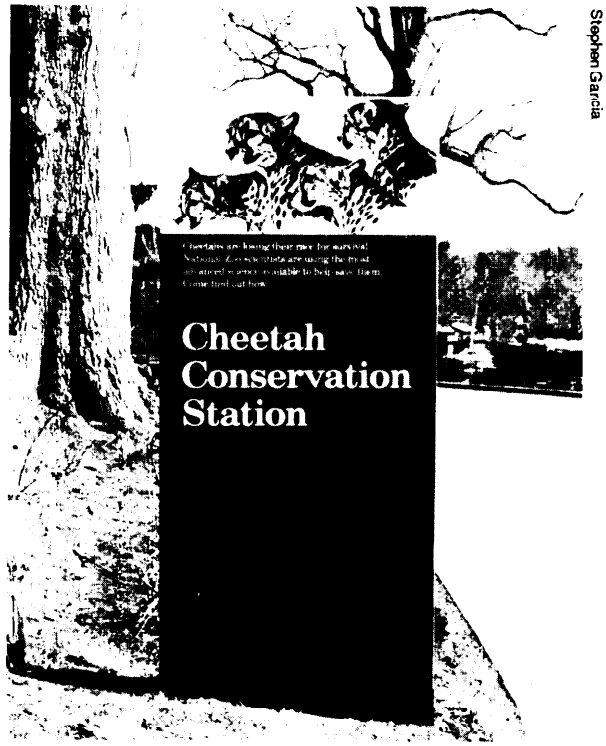
313 Frank Henry, president, Frank Martz Coach Co., personal communication, June 1992.

persons with disabilities to use a reservation system if persons without disabilities are not also required to do so[31] (see ch. 1). In addition, if and when reservation systems are widely used, fleet personnel must be carefully trained to ensure proper coordination of equipment and schedules, particularly when more than one carrier is involved.

## TECHNOLOGIES TO ASSIST PERSONS WITH SENSORY AND COGNITIVE DISABILITIES

Technologies for people with sensory and cognitive disabilities are aimed at delivering information to people who otherwise might have difficulty receiving it. People with vision or hearing impairments might have trouble reading signs or hearing instructions. People with cognitive impairments might have difficulty making decisions about which bus to board or where to get off. Several of these technologies serve individuals from both groups.

OTA has found that relatively little technology is being developed specifically to assist persons with sensory and cognitive disabilities to use OTRBs. A wide range of specialized equipment is under development for urban transit operation, and much of it could be applied to OTRBs. However, urban and intercity bus service differ in many ways, so all technologies might not apply equally. Some advantages for intercity service are that freed-route intercity bus tickets are always bought from a ticket agent or driver rather than through a machine, tickets are printed with origins and destination, and these tickets are collected and examinedby the bus driver. These practices provide a check to ensure that individuals with sensory or cognitive impairments get on the proper bus, and get off at their destination.[32]




Stephen Garcia

*This sign at the National Zoo in Washington, DC combines large graphics, color-coding, and pictures to direct visitors to the exhibit.*

### Signage

DOT requires the use of accessible signage in buildings and facilities, including bus stops and terminals (see figure 4-2).[33] Signage, both on the bus and within stations, can help people with sight, hearing, and cognitive impairments. Large

31 Specifically, Section 302(b)(1)A of the ADA prohibits denial of full and equal enjoyment of goods, Sink% facilities and privileges, advantages, or accommodations. This section is made applicable to OTRB operations by Section 304(b)(2). In addition, Section (304)(b)(l) prohibits a private entity that is primarily engaged in transporting people from discriminating, including establishing eligibility criteria that screens out persons with disabilities from full enjoyment of the transportation service. Thus, if the reservation system is the sole means for a disabled passenger obtaining transportation, it would not be permitted under the ADA.

32 Ecosometrics, Inc., op. cit., footnote 3, p. 33.

33 DOT regulations include rules on character proportion, character height, raised and braille characters and pictorial symbols signs, finish and contrast, mounting location andheight, and symbols of accessibility. 56*Federal Register* (Sept. 6, 1991), Department of Transportation Transportation for Individuals With Disabilities; Final Rule, Appendix A to Part 37—Standards for Accessible Transportation Facilities, p. 53,4.30.04.30.7.

and more extensive signs, high contrast signs, and tactile maps (i.e., maps that can be read like braille) can present information to people with disabilities. Placement of braille signs in uniform locations within stations might make it easier for individuals with vision impairments to locate them. Simplifying signs, and using pictures and symbols where feasible, might specifically aid people with cognitive disabilities.[34] In addition, color coding signs, maps, tickets, buses, and stations might make it easier for all people, but especially those with certain cognitive impairments, to follow instructions.

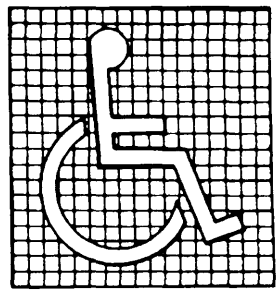
## Public Address Systems

DOT requires that transit buses in excess of 22 feet be equipped with either a driver-operated public address system or recorded or digitized human speech messages, to announce stops and provide other passenger information within the vehicle.[35] People with vision and cognitive disabilities might benefit from this technology, as well as individuals with limited hearing impairments. Public address systems could be used both onboard the OTRB and within bus stations. OTRBs generally include public address systems as standard equipment, so a new requirement would not necessarily result in increased costs. An external speaker would require modifications, but the costs would be minimal.[36]

## Telecommunications Devices for the Deaf (TDD)

TDDs serve as telephones for individuals with hearing impairments by allowing users to send and receive written messages. Presently, ATBCB guidelines for new stations mandate that if bus stations house interior pay phones, there must

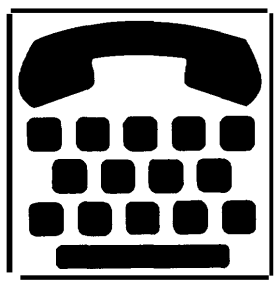
**Figure 4-2—Symbols of Accessibility y**



Proportions for International symbol of accessibility



Display conditions International symbol of accessibility



International TDD symbol



International symbol of access for hearing loss

KEY: TDD - telecommunication device for the deaf.

SOURCE: 56 FederalRegister45697 (Sept. 6, 1991), U.SDepartment of Transportation, Transportation for Individuals With Disabilities: Final Rule, 49CFR Part 37, Appendix A to Part 37—Standards for Accessible Transportation Facilities.

34 Shari Gelman, headmaster, Ivymount School, personal communication, Aug. 5,1992.

3556 *Federal Register* 45760(Sept.6,1991), U.S. Department of Transportation, Transportation for Individuals with Disabilities; Final Rule, Part 38, Sub Part B-Buses, Vans and Systems, Sec. 38.35, Public Information System.

36 Costestimates for an onboard public address system range from between $150 to $300, not including installation. Mary Fran Kelly, executive specialist, Midwest Electronic Industries, Inc., personal communication, Aug. 28, 1992.




*TDD equipment enables persons with hearing impairments to use the telephone.*

also be at least one interior public TDD.[37] Furthermore, the ADA requires telecommunications companies to provide telecommunications relay services for persons with hearing and speech impairments.[38] Individuals with hearing and speech impairments will therefore be able to call bus companies for information on services.

## Crawling Messages and Video Monitors

Crawling messages-electronic signs that scroll information across a screen-and video monitors, similar to those currently used in airports, might also display messages or scheduling information within bus terminals. ATBCB's guidelines mandate that if public address systems are offered to convey information, a means of conveying the same information to persons with hearing impairments must be provided.[39] This provision could be satisfied at least partially through employees who are trained to communicate with persons with disabilities.

## Other Technologies

Closed circuit television (CCTV) and computer magnification systems enlarge printed information so that it can be read more easily. These systems might be employed in bus stations to magnify system maps or other schedule information. Cost estimates range for CCTV from $2,300 to $3500. Computer magnification systems, which consist of hardware and software to magnify information on computers, add approximately $3,000 to the price of a personal computer. However, in the use of computer magnification systems, the user still must ask an agent for information, wait while it is called up, and remember it. As long as ticket agents are available to provide this kind of verbal or written information, the advantages of CCTV/computer magnification appear limited.[40]

Assistive listening devices (ALDs) help individuals hear speech in group situations, where the combination of background noise, distance, and poor acoustics make it difficult to distinguish or understand speech. ALDs consist of a transmitter carried by the driver and a receiver carried by the user. There are basically three types of ALDs: induction loop systems, narrow-band FM sys-

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37 56 *Federal Register* (Sept.6,1991), U.S. Department of Transportation Transportation for Individuals With Disabilities; Final Rule, Part 37, Sec. 10.3 (12)(a).

38 Telecommunications relay services are telephone transmission services that enable individuals with hearing or speech impairments to communicate by wire or radio in a manner that is functionally equivalent to communications by an individual who does not have a hearing or speech impairment. Public Law 101-336, Sec. (401)a.

3956Federa/Register (Sept.6, 1991), U.S. Department of Transportation Transportation for Individuals With Disabilities; Final Rule, Part 37, Sec. 10.3 (14).

40 Ecosometrics, Inc., op. Cit., footnote 3, p. 35.

terns, and infrared.[41] Cost estimates for ALDs range from $300 to $5,000, depending on the type of technology used and the number of receivers carried on the bus. A potential operational problem involves issuing, retrieving, and electrically charging the receivers.[42]

## TRAINING TO FACILITATE ACCESSIBLE SERVICE

Proper training of bus company employees is an essential part of accessible service, and is already required by DOT. Employees must be able to interact with passengers and operate accessibility equipment.

The OTRB industry thus far has directed little effort toward creating accessibility training techniques or materials.[43] It is quite possible, however, that the industry could adapt the experiences and programs of the public transit industry in developing their own accessibility training courses.[44] Many urban transit systems use training programs that include information on facilitating accessible service. These programs instruct drivers and other employees on ADA requirements, passenger assistance methods, lift operation, and sensitivity training. The Denver Rapid Transit District, for example, has a full day of training on these issues, as does Seattle Metro.

Plymouth & Brockton is one of the few private OTRB firms with an accessibility training program, partly funded by the State government. Plymouth & Brockton is a private firm located in Plymouth, Massachusetts, operating intercity, commuter, airport, and charter and tour services. Their accessibility training program lasts 7 to 8 hours and is one component of a larger employee training course that takes 40 to 60 hours. The training includes classroom, video, role playing, and hands-on instruction in operation of the vehicle-based MCI lift and separate securement system, as well as some sensitivity training. All employees who might come into contact ***with*** either lifts or persons with disabilities take the course. It seldom takes more than 20 to 30 minutes to teach a bus driver how to operate a given lift and securement system.[45] In addition, bus drivers carry their own resource manual, with sections on lift trouble-shooting, operation of the lift, lift load limits, emergency situations, safety, and sensitivity.[46]

Although it falls on the transit authorities and bus companies to develop their courses,[47] most lift manufacturers supply operating instructions in the form of written or video materials to bus companies, and some lift manufacturers train bus company mechanics. For example, Lift-U conducts 8-hour training sessions to teach bus company mechanics lift terminology theory of lift operation, and how to use the manual.[48]

Sensitivity training teaches operators to help individuals with disabilities in a way that affirms the dignity of the person being assisted.[49] Train-

41 The only known installation of an assistive listening device onboard an OTRB was by MCI. In 1986, MCI installed a FM system, purchased from Telex Communications, Inc., on two MCI MC 102A3 coaches for Charterways, Inc. MCI found that the technology worked well.

42 Econometrics, Inc., op. cit., footnote 3, pp. 38-41.

43 Ibid., p. 161.

44 However, special attention must be paid to the differences between transit and OTRB company employee responsibilities. Private OTRB employees perform many of the information, ticket-selling, and personal assistance functions. Therefore, unlike its counterpart in the transit industry, OTRB employee training must reflect these added responsibilities.

45 Richard Summers, Division A, Southern California Rapid Transit District, personal communication, Aug. 21, 1992.

46 John Green, Plymouth & Brockton, personal communication, Aug. 20, 1992.

47 Joe p_ine, customer service representative, Lift-U, personal communication, Aug. 21, 1992.

48 Ibid.

49 Econometrics, Inc., op. cit., footnote 3, P. 166.

ing programs begin with information on different disabilities and their effects on the individual's ability to use bus service. The programs aim to develop bus drivers' understanding of individual needs. These programs are often run for transportation operators by disability groups, to familiarize bus employees with people with disabilities. Some programs help drivers experience situations like those a passenger with a disability might face. For example, trainees in Denver are taken downtown, blindfolded, and given the task of locating a certain bus and getting to a destination. Other programs place trainees in a wheelchair and assign them a particular bus trip, While these experiences do not replicate those of persons with disabilities, they increase sensitivity.

For OTRB service to be accessible, tour guides, station staff, ticket clerks, commission agents, telephone information staff, and dispatchers must be trained in ADA requirements and company policy for meeting those requirements.[50] Charter and tour operators will require especially rigorous training. The bus operator, in addition to having to deal with the level-change and securement systems, might be called on to assist people moving around at the destination and at rest stops. In addition, charter and tour drivers will most likely deal with persons with disabilities for longer periods of time, and might need to assist several individuals simultaneously.[51]

One problem identified in OTRB accessibility demonstration projects is that drivers who infrequently use accessibility technologies forget their training and have difficulty recalling procedures. Periodic refresher courses could alleviate this problem. Most current transit programs require refresher training of at least 6 hours once every 3 years, to cover changes in requirements and technologies.[52] Another approach is to have drivers regularly operate the lifts. This prevents operators from forgetting how to use technology and ensures the technology is functioning properly.[53]

Another aspect of accessibility training is user training. Persons with restricted mobility might be more comfortable trying bus travel if they know what to expect. A number of user training programs have been developed and implemented by urban transit systems, several under Project ACTION.[54] These programs are often run with a local Center for Independent Living, rehabilitation center, or other local disability group.[55] For example, Plymouth & Brockton has conducted some user training in conjunction with the Massachusetts Coalition for Citizens With Disabilities. Training included informing participants as to how drivers are trained, demonstrating how the lift functions, and explaining the lift's safety features.[56] Alternative training strategies might be considered for OTRB service, including video or individual onsite training for persons who have expressed an interest in using the bus. However, user training could not under any circumstances be a prerequisite for travel on an OTRB.

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5° Ibid., p. 168.

51 Ibid., p. 164.

5' Ibid., p. 167.

53 John Winski, director, Massachusetts Coalition of Citizens With Disabilities, personal communication, Aug. 6, 1992.

54 Project ACTION stands for Accessible Community Transportation In Our Nation. The project, funded by the Federal Transit Administration and managed by the National Easter Seals, was created to enhance relations between transit providers and individuals with disabilities.

55 Ecosometrics, Inc., op. cit., footnote 3.

56 Beverly Stewart, safety supervisor, Plymouth and Brockton, personal communication, Aug. 21, 1992.

# Appendix 4-A: Requirements for Vehicle-Based Lifts, Ramps, and Securement Systems

The U.S. Department of Transportation (DOT), in the Americans With Disabilities Act Accessibility Guidelines for Transportation Vehicles, reserves decisions on the standards for mobility aid accessibility pending the outcome of this OTA study. However, DOT regulations require that over-the-road buses purchased by public transit entities or operated under contract to public transit entities (under certain circumstances) comply with mobility aid accessibility requirements for transit buses. This appendix summarizes the regulations governing vehicle-based lifts, vehicle-based ramps, and onboard securement systems.

## Vehicle-Based Lifts

- The lift shall be designed to support a load of at least 600 pounds.
- The lift platform shall be equipped with barriers to prevent a mobility aid from rolling off, and the platform shall not bend more than 3 degrees when loaded with 600 pounds.
- No part of the platform shall move at a rate exceeding 6 inches per second while lowering or lifting an occupant, and shall not exceed 12 inches per second while deploying or stowing (even if the power or equipment fails).
- Platforms on lifts shall be equipped with handrails on two sides, and the platform surface shall be slip-resistant.
- Lifts shall accommodate persons using walkers, crutches, canes, or braces, or who otherwise have difficulty using steps.
- The lift shall permit both inboard and outboard facing of the occupant.
- The controls shall be interlocked with the vehicle systems, to ensure that the vehicle cannot be moved when the lifts are not stowed and that the lift cannot be deployed unless the interlocks or systems are engaged.
- The lift shall deploy to all levels normally encountered in the operating environment.
- The lift shall incorporate an emergency method of deploying, raising, and stowing if electrical power fails,

## Vehicle-Based Ramps

- Ramps 30 inches or longer shall support a minimum load of 600 pounds.
- The ramp surface shall be continuous and slip resistant and shall be at least 30 inches wide.
- Each side of the ramp shall have a barrier at least 2 inches high.
- If the height of the vehicle floor from which the ramp is deployed is greater than 9 inches above a 6-inch curb, a slope of 1 to 12 shall be achieved.
- Stowed ramps must not impinge on a passenger's mobility aid or pose any hazard to passengers in the event of a sudden stop or maneuver.

## Securement Systems

- Securement systems shall restrain a force in the forward direction of up to 2,000 pounds per securement leg or clamping mechanism, and a minimum of 5,000 pounds for each mobility aid.
- The securement system shall limit the movement of an occupied wheelchair or mobility aid to no more than 2 inches in any direction under normal vehicle operating conditions.
- The securement systems shall secure common wheelchairs and mobility aids and shall either be automatic or easily attached by a person familiar with the system and mobility aid and having average dexterity.
- For each securement device provided, a passenger seat belt and shoulder harness shall also be provided for use by wheelchair or mobility aid occupants.
- The securement system shall be placed as near to the accessible entrance as practicable and shall have a floor area of 30 inches by 48 inches.
- In a vehicle in excess of 22 feet in length, at least one securement device shall secure the wheelchair or mobility aid facing toward the front of the vehicle.
- When not being used for securement, the system shall not interfere with passenger movement, shall not present any hazardous condition, shall be reasonably protected from vandalism, and shall be readily accessed when needed for use.
- For each securement device provided, a passenger seat belt and shoulder harness, complying with all applicable provisions of 49 CFR part 571, shall also be provided for use by the wheeled mobility aid occupant.

SOURCE: 56 *Federal Register* 45560-45562 (Sept. 6, 1991), Architectural and Transportation Barriers Compliance Board, Americans With Disabilities Act Accessibility Guidelines for Transportation Vehicles; Final Guidelines, 36 CFR Part 1192, Subpart B.

# Appendix A: Reasonable Cost Estimates for Implementing Accessible Over-the-Road Bus Service

The congressional debate on accessibility requirements for over-the-road buses (OTRBs) under the Americans with Disabilities Act (ADA) included conflicting cost estimates for implementing accessible OTRB service. Indeed, it was in large part the confusion over cost figures and the availability of accessibility technologies for OTRBs that prompted Congress to instruct the Office of Technology Assessment (OTA) to conduct this study. [1]

This appendix discusses the costs of implementing accessible OTRB service. OTA develops cost estimates first for equipping a single bus or station and then for an entire OTRB fleet (including allowances for the operator to choose which type of level-change device to implement, i.e., vehicle-based or station-based). Finally, the issues of borrowing funds and appropriate discounting over time are discussed. All cost estimates are based on 1992 data.

## Costs of Implementing Accessibility Technologies for One OTRB

OTA classifies the costs of equipping one OTRB into three categories:

1. Capital costs (including the cost of the level-change device, any major repairs involving replacement parts that may be needed as the device ages, and modifications to the OTRB);
2. Maintenance (including routine cycling of the lift and maintenance checks); and
3. Lost revenue (possibly resulting from lost seating or baggage and package storage capacity).

OTA created a spreadsheet model in which these costs were calculated for a single OTRB (whether equipped for use with vehicle-based or station-based level-change devices). In this section, each of these costs will be discussed, as well as those not encompassed by the model. A range of values for the component costs is then presented, and total costs compiled for one OTRB.

### Capital Costs

Level-change devices fall into two categories: 1) station-based level-change devices that serve multiple buses at one station, and 2) vehicle-based level-change devices that travel with the OTRB, generally in the luggage compartment or on the passenger deck. Retrofitting, the adaptation of an existing OTRB to

[1] The Committee report for the Americans with Disabilities Act states: "During its hearings on the legislation the Committee heard conflicting testimony on the cost and reliability of wheeled mobility aid lifts or other boarding assistance devices with regard to their use on over-the-road buses. Therefore, before mandating these or any other boarding options in the Act, a thorough study of the access needs of individuals with disabilities to these buses and the cost-effectiveness of different methods of providing such access is required by the Act." U.S. Congress, House Committee on Education and Labor, *Legislative History of Public Law 101-336, The American with Disabilities Act*, Committee Print, Serial No. 102-A, December 1990, p. 249.

make it accessible, is not required by the ADA, so throughout the cost modeling it is assumed that buses will be made accessible when they are purchased or leased (see ch. 1).[2]

For several reasons, ramps are not modeled as the primary level-change devices. First, in late 1992, the only ramp in production or development was designed prior to the passage of the ADA, by Greyhound, and is not likely to meet current ADA standards unless redesigned. Second, it is often difficult to install and use a station-based ramp, given the close proximity of OTRBs parked at stations; thus, the use of ramps may often be infeasible.

In addition to routine maintenance (discussed below), some lifts require overhauls that involve extensive replacement of parts. Such overhauls are much like the major repairs that many automobiles require halfway through their overall lifetimes (e.g., replacing major engine components). OTA considers these overhauls to be capital costs.

Associated with traveler-ready OTRBs (i.e., accessible OTRBs equipped for use with station-based level-change devices) is the use of ramps and boarding chairs in case of emergency. Although on-the-road OTRB breakdowns are not a regular occurrence, they are not uncommon. In this event, the U.S. Department of Transportation (DOT) may require that traveler-ready OTRBs carry a collapsible ramp and boarding chair in order to take persons with mobility impairments off the OTRB or to transfer them to a replacement OTRB. This ramp would not necessarily have to meet ADA requirements for ramps used as routine level-change devices, but it must be safe, reliable, and easy to use. Costs of such an emergency ramp were included in calculations where appropriate.

Whatever the level-change device, an OTRB itself must be fully accessible. These bus accessibility features include two wheeled mobility aid tie-downs (with folding seats for use when the tie-downs are not occupied), an additional door (or a wider main door with additional structural support), the means to communicate with people who have sensory and cognitive impairments, and movable arm rests. Some of the analyses also included accessible restrooms, which were considered an additional bus modification.

### Maintenance

As with any mechanical device, station- and vehicle-based lifts require regular service and maintenance. In addition to repairs, this service includes cycling of the lift in order to keep it working properly and to keep operators familiar with its use. Because regular maintenance costs increase over time due to wear and tear on the equipment, OTA assumes that these costs will rise at a predictable rate.

The time required to cycle lifts poses a cost of lost time for drivers/lift operators. The calculations capture this cost through estimates of the time required to cycle the lift and hourly driver wages.

### Forgone Revenue

The costs of forgone revenues fall into two categories: those from lost baggage capacity and those from lost seating. If a vehicle-based level-change device or an emergency ramp is carried in the baggage compartment, there will be a loss of baggage space. In some instances, this loss of baggage space could force the OTRB carrier to turn away potential package express customers (posing a cost of forgone revenue) or to make arrangements for baggage left behind, If a level-change device is carried on the passenger deck, or when the use of a wheeled mobility aid tie-down displaces seats, seating capacity is reduced. This reduction may lead to loss of revenue.

A technology under development would allow the vehicle-based lift to ride on the outside of the bus (see ch. 4). If this technology becomes available to OTRB operators, it will result in no loss of revenue due to lift storage.

Because station-based lifts incur no forgone revenue from displaced baggage and seating capacity, only the revenues gained or lost from tie-down usage bear consideration. While at first glance it may appear that station-based lifts are inappropriate for specific stations, OTRB operators might wish to project the costs of forgone revenue on the affected routes when developing their implementation strategy.

Package and Baggage Capacity-Some debate exists over the financial impact of lost baggage and package space. Most bus companies offer a range of package express services at various prices, from "next-bus-out" (literally the package goes out on the

[2]The model also does not include the costs of implementing accessibility technologies when a vehicle is remanufactured.

next bus to the destination-this is the most expensive service), to overnight delivery, to regular package delivery. Thus, among the package express services, there is some flexibility to accommodate full baggage compartments. Only with next-bus-out delivery would there be a problem with a full baggage compartment, and then only if there were no packages in the compartment that could be taken out (e.g., regular delivery packages) to make room for the next-bus-out package. In addition, it is common for bus companies to make arrangements for baggage that must be left behind when baggage compartments fill up, Thus, additional charges for baggage left behind due to the displacement of baggage capacity by a lift arise if the baggage left behind was only that displaced by the accessibility equipment. Otherwise, this baggage would simply be added to the rest of the baggage held over for transport by other means, presumably at a small incremental cost.

Seating Capacity-Seating loss occurs in two ways: 1) when wheeled mobility aid tie-downs are occupied (in early 1993, the only tie-down technologies available required that up to four standard seats be flipped up-and thus rendered unusable—when a wheeled mobility aid tie-down is occupied); and 2) when seats are permanently displaced by a lift stored on the passenger deck. However, there are questions as to how much the lost seating capacity actually translates into a loss of revenue for OTRB operators. The losses are not proportional. For example, there is no revenue loss at all unless an OTRB is nearly full and prospective passengers are denied seating. Even then the revenue from these prospective passengers might not be lost to the system, for they may opt to wait for the next bus. Other mitigating factors include:

- The behavior of OTRB travelers—in particular, the choice by a traveler, when faced with a full bus, whether to travel on another transportation mode (e.g., by train or airplane), to ride at all, or to wait for the next OTRB. Most passengers choose OTRB travel for economic reasons, not for reasons of convenience or comfort (see ch, 2), and it is unlikely that they would choose to travel by another transportation mode. However, it is difficult to quantify how many people may wish to cancel a trip; it is expected that at least some individuals will wait for the next bus, with no loss in revenue to the OTRB operator. Indeed, some may have no choice if they are at a connecting station or awaiting a trip home. If a reservation system were in place, travelers would know in advance when to show up and, as with airline travel, would make accommodations for OTRB schedules. Therefore, taking into account the potential behavior of OTRB travelers reduces the impact of lost seating due to accessibility technologies.
- The provision by the bus company of a second OTRB. Several bus companies claim that if a bus fills up and many people still wish to travel, at that time a second bus will pull up. Thus, if the accessibility features of an OTRB cause the loss of two to eight seats, but *more than that number* were denied access to the first OTRB, a second bus would be needed to accommodate them all in any case.

Therefore, without knowledge of the frequency of a "full bus,' the number of passengers turned away, and how many of these potential passengers choose to go home or to travel on another transportation mode rather than wait for the next bus, it is virtually impossible to calculate accurately the loss of revenue due to lost seating capacity.[3]

However, under most conditions, wheeled mobility aid tie-downs increase the revenue of OTRB operators. Tie-downs serve passengers previously unable to use the OTRB system, and every time the tie-down is used it generates passenger revenue. (When a tie-down is not in use, it displaces no seats and thus no revenue is lost). Only when the bus is full will the displaced seating result in lost revenue. For example, if the tie-down is used 10 times in a year, it will generate 10 fares, Assuming that the bus is full to capacity 10 percent of the time, lost seating will occur on average during only 1 of the 10 tie-down uses. In that case, up to 4 fares will be displaced, leaving at least 6 fares gained by the 10 uses of the tie-down.

Additional Factors-Several additional observations can be made about package and seating displacement:

. On routes where OTRBs travel frequently, it is more likely that the next bus *will be* able to accommodate much of the spillover from a full

[3] OTA attempted to gather such information from several bus companies, but it was not available.

bus, in baggage, package, and seating capacity, Under these conditions, OTRB operators may develop methods to cope with the problems raised by a full bus.

. On routes where OTRBs travel infrequently, it is much less likely that the bus will be full, due to low ridership at these stations. However, if the bus is full, it will be more difficult for OTRB operators to encourage passengers to use the next bus, or to accommodate baggage and packages that must be left behind,

Therefore, on routes that are served by a number of buses, OTRB operators may minimize forgone revenue costs through additional planning and operational methods. However, OTRB operators on routes with a small number of buses traveling in a given day may have less of a chance of those buses being full; if they are, these carriers may have less flexibility to accommodate for lost baggage and package space and lost seating capacity.

### Costs Not Included in the Model

This analysis excludes many costs of implementing accessibility technologies on OTRBs. They include training costs; additional fuel charges; costs due to changes in travel times to accommodate lift uses; insurance costs; and loss of passengers sensitive to price, time, and/or crowding.

Training of company personnel is an important feature in the implementation of any accessibility technology. However, private entities operating fixed-route service with any type of vehicle are currently required by the ADA to train personnel to proficiency in how to treat individuals with disabilities with dignity, respecting differences among such persons. These firms will incur training costs irrespective of any changes in the implementation of accessibility technologies, so this analysis includes no training costs. In fact, in the future, when level-change devices are provided for every OTRB, training need no longer consider in such great detail how to carry persons with disabilities up and down OTRB stairs and into seats. Therefore, once DOT regulations are fully implemented, it may be less expensive to train company personnel.

Because level-change devices weigh up to 600 pounds, they decrease the fuel efficiency of an OTRB. In addition, increased idling time to operate a vehicle-based lift may contribute to higher fuel expenditures. OTA found additional fuel costs impossible to quantify, but expects them to be negligible over the lifetime of the OTRB when compared with other costs included in the model.

Scheduling changes or extra time maybe necessary to allow deployment of level-change devices at stations, as well as to add stops at accessible restrooms. While the costs of minor extensions of route times are not expected to be large, they are unquantifiable, and will remain so even as accessibility technologies are introduced.

The costs of insurance rate adjustments will become known as accessibility technologies are introduced, but they are impossible to predict. The implementation of technologies to assist persons with sensory, cognitive, and mobility impairments that do not require the use of a wheeled mobility aid are expected to affect insurance rates very little. Indeed, since most insurance claims are due to falls down the front steps, a lower initial step and additional handrails could decrease the likelihood of claims.

The implementation of technologies for persons who need assistance while boarding an OTRB may affect insurance rates more significantly. However, since carrying is most certainly more dangerous to all parties involved than is the operation of a lift or ramp, it could be reasoned that the introduction of lifts and ramps should not affect rates dramatically.[4] Nevertheless, because it is likely that more persons with disabilities will be riding OTRBs as they become more accessible and because the safety and effectiveness of new technologies must be gauged, insurers may increase their rates for some time until there is more experience with new technologies (see ch. 2). Until then, it is impossible to forecast accurately the additional insurance costs for accessible OTRBs. Therefore, OTA does not include these costs in its

[4] Carrying has been the primary method for persons with severe mobility impairments to board an OTRB. Since OTRB ridership by persons who use wheeled mobility aids is not expected to increase until the introduction of level-change devices and securement positions, the passage of the ADA and the interim regulations for OTRB accessibility have not yet caused a fluctuation in the insurance rates for OTRBs. Jack Burkert, senior vice president, Lancer Insurance Co., Arlington, VA, personal communication% May 1992.

analyses, but notes that they may be significant for some companies, especially in the short term.

OTRB service, especially intercity service, is a low-cost option for public transportation, and OTRB passengers are in general very sensitive to price increases. If the cost of accessibility technologies results in higher fares, then overall ridership might be affected. In particular, while there may be an increase in ridership by passengers with disabilities, there may also be a decrease in the present cohort of riders if passengers decide not to take the bus due to increasing fares. It is difficult to judge how these two factors will affect overall ridership, since the estimates of the number of passengers with disabilities are only ballpark figures, and the potential for price increases at various levels and the effect of such increases on ridership are unknown.[5] At the end of this appendix, this effect is discussed further.

Finally, as persons with disabilities ride on more OTRBs, some OTRBs may be more crowded, and boarding times may increase. A result of the increased load factor and the possible lengthening of some trips could be that some passengers would view the OTRB system as a less desirable form of transport and choose other forms of transportation. While OTA recognizes that this is a potential effect of increased accessibility, this effect is impossible to quantify with available data and OTA does not include it in its analysis.

### Cost Data for Fixed-Route Service

Discussed below are each of the items of data in the cost model, their source(s), and, where appropriate, the reason they are incorporated in the model. The figures stated represent 1992 cost values and, in a few cases, a range of values is presented. (For more discussion of the specific technologies mentioned below, see ch. 4.)[6] For some of the variables, no data exist and OTA had to estimate values based on reasonable assumptions.

- **Capital costs of a vehicle-based lift. The Ricon** Mirage lift, used in OTRBs in Great Britain, is available in the United States for $7,000. More expensive lifts cost up to $17,000 (e.g., the Lift-U III or the MCI 4-Link lift). An intermediate-priced lift is the Stewart and Stevenson Powerlift, costing $8,500 to $12,500. All lifts evaluated by OTA vary in the number of seats and amount of baggage space displaced.[7]

  Although all vehicle-based lifts evaluated by OTA could potentially meet ADA standards, it is conceivable that an OTRB buyer would prefer to purchase one of the more costly lifts for reasons not of function, but as a result of placing a different weight on operational or other factors. Thus, OTA does not always assume that OTRB buyers would choose the least expensive lift option.
- Capital costs of a station-based lift. Adaptive Engineering, Inc., estimates the cost of a station-based lift at $4,500. Adaptive Engineering makes a station-based lift for use with trains and is modifying that lift for use with OTRBs.[8] It was assumed that no maintenance overhaul on the lift is necessary.[9]
- Incremental **cost for outfitting a bus with nonlift accessibility features.** OTA assumed the cost of purchasing a bus with two wheeled mobility aid tie-downs, an additional door (or a wider main door, wide enough to accommodate a person using a wheelchair, scooter, walker, or crutches), the means to communicate with persons who have sensory and cognitive impairments, and movable arm rests, at $5,000 to $7,000

[5] OTA has found two studies that estimated the demand elasticity in OTRB travel: Don H. Pickrell, "Appendix B, Models of Intercity Travel Demand," *Deregulation and the Future of Intercity Passenger Travel,* John R. Meyer and Clinton V. Oster, Jr. (eds.) (Cambridge, MA: MIT Press, 1987), pp. 257-9; and Michael W. Babcock and H. Wade German, "A Model of the Demand Elasticity for Intercity Bus Travel," *Proceedings-Twenty-Fifth Annual Meeting of the Transportation Research Forum,* Transportation Research Board (cd.), vol. 25, No. 1, 1984, pp. 187-193. However, both studies were based on data from the mid-1980s, and circumstances in the OTRB intercity industry have changed since that time, especially with respect to numbers of points and passengers served and price structures.

[6] All cost data, unless explicitly stated otherwise, are from Econometrics, Inc., "Evaluation of Methods to Provide Accessibility to Over-the-Road Buses and Services, ' OTA contractor report, July 31, 1992.

[7] As of early 1993, Neoplan offered an OTRB with a vehicle-based lift as a standard feature. As ADA regulations go into effect, more companies might include lifts as standard features.

[8] As of late 1992, this is the only station-based lift to come to the attention of OTA.

[9] Adaptive Engineering, Inc., claims that no overhauls will be necessary for the lift over its lifetime.

(above that of a conventional OTRB). As discussed above, this cost is not for retrofitting an OTRB, but rather the additional cost to purchase a new bus that is accessible, with either station-based or vehicle-based level-change devices.[10]

- Incremental **cost for a vehicle-based lift stored externally. In** late 1992, a device to externally store a vehicle-based lift was in the preliminary stages of development by Adaptive Engineering, Inc. The best estimate of the incremental cost to house the lift on the exterior of the bus was $1,000. **The** use of an external lift storage device would eliminate baggage or seat loss generated by stowage of the lift. However, several problems are yet to be addressed by this proposed technology, including protection of the lift from extremes of heat and cold, and from dirt and dust accumulation. Such protection might increase the cost of the housing, but no estimates are available.
- **Cost of a vehicle-based emergency ramp and boarding chair.** As discussed above, DOT may require all OTRBs without a vehicle-based lift to carry an emergency ramp. Best Diversified Products sells its ramp for $750 and a boarding chair for $550.
- Cost of an accessible restroom. In late 1992, two accessible restrooms were in production or development: one produced by Neoplan that costs $2,000 in additional bus modifications and permanently displaces three seats; and a prototype made by MCI for a 45-foot coach that is estimated to cost $30,000 in additional bus modifications and permanently displaces seven seats (note that no additional seats are lost due to tie-down occupancy with the MCI restroom). These costs are in addition to lift costs and the costs of other vehicle modifications.
- Rate of maintenance cost increases **per annum.** As lift equipment ages, it is assumed that maintenance costs will rise due to parts wearing out and so forth. From industry and government estimates, OTA derived a rate of 2 percent.[11]
- **Maintenance costs for a bus-based lift in the first year of its operation. This** figure provides the basis from which annual repair costs are calculated. Estimates were derived from pilot project, government, and industry data.[12] The model assumes that the less expensive lifts (e.g., the Stewart and Stevenson and the Ricon Mirage lifts) have $100 first-year repair costs, However, it is assumed that the expensive lift, costing $17,000, has first-year repair costs of $150.
- **Repair costs for a station-based lift in the first year of its operation.** This figure is the analog to the associated figure for vehicle-based lifts. The model assumes a $85 first-year repair cost for the $4,500 lift.
- Life of lifts until an overhaul is needed. As discussed above, it is expected that some lifts will have to undergo an extensive overhaul in order to extend their operating life. The model assumes that the lift can be overhauled once before it must be permanently retired and that the overhaul takes place halfway through the expected lifetime of the equipment. It is further assumed that annual maintenance costs follow the same pattern after the overhaul as they do following the purchase of a new lift. For the manual Stewart and Stevenson lift, available information indicates that no overhauls are necessary. However, for the other vehicle-based lifts, overhaul costs were incorporated into the model.
- Overhaul **costs for station-based and vehicle-based lifts. The** model assumes overhaul costs, when existent, to be one-half of the current cost of a lift excluding vehicle modifications. Due to technological improvement (at 1.5 percent per year above inflation, from historical lift prices), the price of the lifts will fall overtime. Therefore, the cost to overhaul one lift will be less than one-half of its purchase price 10 years earlier.
- **Cost of** OTRB shipping of packages. This figure provides the basis for calculating the cost of lost revenues due to displaced baggage and

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10 The costs of retrofitting an existing OTRB are quite similar, however. Bill Hodgson, sales representative, Stewart and Stevenson Power, Inc., Commerce City, CO, personal communication, August 1992.

11 Brian Guthrie, partner, Science and Technology Division, Hickling Corp., Ottawa, Ontario, Canada, personal communication, Sept. 10, 1992.

12 For example, the Denver Regional Transit District reports that its Stewart and Stevenson lifts have each required less than $100 in annual maintenance since they have been in operation.

packages. From available bus parcel industry data, OTA derives a cost per-mile per-100-pounds shipped of 7.5 cents. The model assumes that a vehicle-based lift is comparable to a package of 500 pounds and that the emergency ramp and boarding chair are a package of 200 pounds. The Ricon Mirage and Lift-U III lifts are stored in the baggage compartment and thus may displace luggage and packages. However, the Stewart and Stevenson lift is stowed on the passenger deck and therefore does not occupy baggage space, although it will permanently displace two passenger seats. In addition, a probability estimate was added to the calculations, representing the frequency of an overcapacity baggage compartment.

. **Frequency of an overcapacity y baggage compartment. No** data are available on how frequently baggage compartments are full. Assuming that, if baggage compartments are filled, arrangements are made to transport excess baggage, OTA hypothesizes that the frequency of a full baggage compartment where such arrangements are not already being made is roughly 1 percent.[13]

. **Cost of a passenger ticket (no advance purchase). This figure** provides the basis for estimating the cost of forgone revenue from lost seating when a wheeled mobility aid tie-down is occupied or when seats are permanently displaced. From industry passenger ticket information, the cost per-mile per seat is $0.085. The model assumed a joint probability estimate of when a wheeled mobility aid tie-down will be used and the bus is full. Only then may a passenger have to be turned away and the cost of forgone revenue be incurred.

. **Frequency of a full OTRB.** Assuming full capacity on Friday nights, Sundays, and close to holidays, OTA estimated the frequency of a full OTRB at 10 percent.

- **Frequency of a wheeled mobility aid tie-down being occupied.** OTA assumes the frequency of a tie-down being occupied is 5 percent. This figure is derived from estimates of the rate at which persons using wheeled mobility aids will ride OTRBs (0.5 percent, see ch. 3) and of the average occupancy of an OTRB (10 to 15 people).
- **Frequency that a passenger will decide to cancel an OTRB trip when faced with a full bus.** As discussed above, there are few data with which to address this point. OTA assumes that one-third of the passengers will decide to cancel their trips rather than wait for the next bus.

. Time **per week to cycle lift.** It is suggested by manufacturers that the lifts be cycled on a regular schedule, on average, once per week. Under normal conditions, it takes 10 minutes to cycle a lift. The time spent by drivers/operators cycling the lift represents a cost to the industry.

. Hourly **wage for bus drivers. This** figure is used to calculate the implicit cost of cycling lifts. Based on estimates by industry experts, the average hourly wage for drivers is $14.00.

. **Life of OTRBs.** Based on industry experience and forecasts, OTRB manufacturers predict that new OTRBs will operate for 20 or more years. Although OTRB operators may sell their equipment earlier, it is expected that they will recoup the current value of the level-change device in the sale. While OTA recognizes that the resale market may not value the lift at its full worth, it is impossible to predict the value that will be placed on it. In addition, some purchasers of used OTRBs, such as charter and tour companies, will require level-change devices.

. Life **of station-based and vehicle-based lifts.** From industry experience and forecasts, the expected lifetime for various lifts is 20 or more years.

. Number of miles traveled by an OTRB **per year.** Most OTRBs are expected to travel at least 1.5 million miles during their lifetimes. Over 20 years, this translates into 75,000 miles per year.

### Results for OTRBs in Fixed-Route Service

**The** model took into account all of the data discussed above and calculated the total cost over the next 20 years of one accessible OTRB. Several scenarios were used. (See table A-1 for a summary of the results.) One scenario assumed a lift similar to the

13 Baggage also can be stored in the passenger compartment, providing further flexibility to OTRB carriers in dealing with a full baggage compartment.

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**Table A-l—Reasonable Estimates of Cost Outlays for Implementing Various Accessibility Devices and Accessible Restroom Options on an OTRB [a]**

| | Low-cost traveler-complete OTRB | Medium-cost traveler-complete OTRB | Traveler-complete OTRB with externally mounted lift | High-cost traveler-corn-plete OTRB | Traveler-ready OTRB and lift[b] | Low-cost accessible rest room with lift | High-cost accessible restroom with lift |
|---|---|---|---|---|---|---|---|
| Lift | $7,000 | $10,000 | $11,000 | $17,000 | $6,700 | $7,000 | $10,000 |
| Vehicle modifications | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 | 7,000 | 35,000 |
| Overhaul | 3,000 | 0 | 0 | 7,300 | 0 | 3,000 | 0 |
| Maintenance | 4,600 | 4,900 | 4,900 | 5,700 | 2,700 | 4,600 | 4,900 |
| Forgone revenue due to lost baggage | 5,600 | 0 | 0 | 5,600 | 2,200 | 5,600 | 0 |
| Revenue lessor (gain) due to seating changes | (5,500) | 3,000 | (5,500) | (5,500) | (5,500) | 7,200 | 24,000 |
| Total | $19,700 | $22,900 | $15,400 | $35,100 | $11,100 | $34,400 | $73,900 |
| Cents per mile | 1.3 | 1.5 | 1.0 | 2.3 | 0.73 | 2.3 | 4.9 |

NOTE: This table does not include the cost of an emergency ramp unless noted otherwise.

[a] See text.
[b] This figure represents 1.2 of the price of a station-based lift (see text) and the cost of an emergency ramp and chair.

SOURCE: Office of Technology Assessment, 1993.

Ricon Mirage vehicle-based lift with a $7,000 capital cost, $5,000 bus modification cost, $100 **first-year** maintenance cost, overhaul costs, and some baggage displacement (no seats are displaced by the lift itself). All other figures were assumed to be the values presented above. The additional capital and operating costs of this OTRB are on average $20,000 more over 20 years, which translates to 1.3 cents per bus-mile. As with all of the scenarios, if the bus modification costs were $7,000, the cost per mile would increase by 0.13 cents. (Note that none of the figures quoted in this section are discounted. Discounting is discussed below.)

A second scenario assumed a lift similar to the Stewart and Stevenson lift, which requires $10,000 in initial capital costs, $5,000 in bus modification costs, $100 first-year maintenance costs, no overhaul costs, and two permanently displaced seats. It costs on average $23,000 more over 20 years for the additional capital and operating costs for this OTRB, which translates to 1.5 cents per bus-mile.

A third scenario assumed an intermediate price lift that is mounted externally, which incurs a $10,000 initial capital cost for the lift, plus $1,000 to mount the lift externally, $100 first-year maintenance costs, no overhaul costs, and no seats permanently displaced. It costs on average $15,000 more over 20 years for the additional capital and operating costs for this OTRB, which translates to 1.0 cents per bus-mile.

A fourth scenario assumed an expensive vehicle-based lift requiring $17,000 in initial capital costs, $150 **first-year** maintenance costs, overhaul costs, and baggage displacement. It costs on average $35,000 more over 20 years for the additional capital and operating costs for this OTRB, which translates to 2.3 cents per bus-mile.

A fifth scenario assumed an inexpensive, $4,500 station-based lift with $85 first-year maintenance costs and no overhaul costs. Since it is recommended in chapter 1 that DOT require OTRB operators to employ traveler-ready OTRBs only when all route stops are equipped with station-based level-change devices, OTA has calculated the average number of stations that must be equipped with station-based level-change devices per bus in OTRB fixed-route service. Assuming 5,000 buses in the total pool of vehicles used to provide fixed-route service and 6,000 freed-route

stops, the average number of stations that must be equipped per bus is 1.2. (Scenarios with both station-based and vehicle-based level-change devices are discussed below in the presentation of the systemwide calculation s.) It costs on average $11,100 moreover 20 years to operate this OTRB, which translates to 0.7 cents per bus-mile. An emergency ramp is included in the price (which accounts for an overall cost per bus-mile of 0.1 cents) .14

A sixth scenario assumed the installation of an accessible restroom similar to the Neoplan restroom ($2,000, three seats displaced) with a lift similar to the Ricon Mirage Mt. It costs on average $34,000 more over 20 years to operate this OTRB, which translates to 2.3 cents per bus-mile. These figures can be compared to those for the Ricon Mirage lift alone at 1.3 cents per mile.

A seventh scenario assumed the installation of an accessible restroom similar to the MCI restroom ($30,000, seven seats displaced) with a lift similar to the Stewart and Stevenson lift.[15] It costs on average $74,000 more over 20 years to operate this OTRB, which translates to 4.9 cents per bus-mile. These figures cart be compared to those for the Stewart and Stevenson lift alone at 1.5 cents per mile.

Thus, in summary, the additional costs to purchase and operate a traveler-complete OTRB (i.e., an accessible OTRB with a vehicle-based lift) are generally 1.3 to 2.3 cents per bus-mile (and might go down to 1.0 cents per mile if the externally mounted lift becomes available), while additional costs for a traveler-ready OTRB and a proportional number of station-based lifts (with emergency ramps) are 0.6 cents per bus-mile, Accessible restrooms increase the costs by 1.0 to 3.4 cents per bus-mile.

### Results for OTRBs in Charter and Tour Service

For charter and tour service, the demand for accessible service determines the number of accessible OTRBs required. However, even with the demand figures for accessible charter and tour service derived in chapter 3, the resulting requirements for OTRB purchases are impossible to gauge since the impacts on a specific company are dependent on local demand. In addition, very little operational data exist for charter and tour companies.

If a charter and tour company purchases a new bus with a vehicle-based lift and an accessible Neoplan restroom, the additional cost over the 20 year lifetime of the bus might run $17,000 for capital expenditures, and $4,600 for maintenance costs. Since this bus can be expected to run an average of 1.5 million miles over its 20 year lifetime, the cost per bus-mile would be 1.4 cents per mile.

However, this figure does not include costs due to forgone revenue. Due to the complexity of charter and tour pricing schemes, OTA is unable to place a value on lost seating and baggage capacity. Thus, it is impossible to calculate the costs due to revenue losses. However, they are expected to be greater per bus than for fixed-route companies, since charter and tour companies operate OTRBs at capacity for a higher percentage of the time than do freed-route operators.

#### Sensitivity y Analysis

In order to determine the sensitivity of these costs to changes in the model variables, a sensitivity analysis was performed. This procedure consisted of changing each variable over a range of values and examining the effect on total costs. From two base models (the first and fifth scenarios above, i.e., the Ricon Mirage lift and the low-cost station-based lift), only one variable was changed at a time; all other variables were held constant. The range for each variable was determined on a case-by-case basis. No attempt was made to rank the variables in order of the effect on the total cost calculations of varying each one. Rather, variable ranges were chosen to illustrate the potential effects on total cost of changing the input variables, The results are summarized in table A-2.

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14 Another scenario assumed an expensive, $7,)()() station-based lift with $120 first-year maintenance costs, and overhaul costs of one-half the current price. (Note that no such station-based level-change device is currently in development.) The ratio of stations to OTRBs is assumed to be the same as above. Thus, it costs on average $14,000 (undiscounted, see below) moreover 20 years to operate this OTRB, which translates to 0.9 cents per bus-mile. Again, an emergency ramp adds $1,300 to the price in the first year, which increases the per bus-mile cost by 0.1 cents.

15 MCI plans to produce its 45-foot accessible coach with an accessible restroom and an option for a Stewart and Stevenson Powerlift. Norman Littler, coordinator, Regulatory Relations, MCI, Ltd., Winnipeg, Manitoba, Canada, personal communication, August 1992.

**Table A-2—Sensitivity Analysis[a]**

| Variable | Range of variable | Variation In total costs |
|---|---|---|
| Cost of a bus-based lift | $7,000-17,000 | Up to 70 percent |
| Frequency of a package encountering a full baggage compartment | 0.5-2.0 percent | Up to 50 percent |
| Cost of a passenger ticket (no advance purchase) | $0.06-0.11 | 15-50 percent |
| Incremental cost for outfitting bus with non lift accessibility features | $5,000-7,000 | 10-40 percent |
| Time per week to cycle lift | 5-15 minutes | 14-35 percent |
| Cost of a station-based lift | $4,500-7,000 | Up to 30 percent |
| Maintenance cost for a station-based lift in the first year of its operation | $50-120 | Up to 23 percent |
| Cost of package shipping | $0.05-0.10 per-mile per 100 pounds | Up to 20 percent |
| Frequency of a tie-down being occupied and potential passengers being turned away | 0.1-0.2 percent | 2-11 percent |
| Rate of maintenance cost for a bus-based lift in the first year of its operation | $100-150 | Up to 5 percent |

a See text for a description of the sensitivity analysis.

**SOURCE:** Office of Technology Assessment, 1993.

## Costs of Implementing Accessibility Technologies for a Fixed= Route OTRB Fleet

The results presented above for one accessible bus can be used to infer the implementation costs of a completely accessible OTRB fleet. OTRB operators will purchase accessible OTRBs when the need arises and funds are available. Thus, buses will be phased in over time as other buses are retired. Before the fleet is fully accessible, the additional cost per bus-mile for the entire fleet of buses will be less than that for one accessible bus. As more of the fleet becomes accessible, the additional cost per bus-mile for the entire fleet will approach the figures cited above.

However, under the proposed accessibility requirements presented in chapter 1, OTRB operators can choose to purchase traveler-ready or traveler-complete OTRBs (or some combination). Their choice will depend on the nature of their OTRB system. For example, operators in urbanized areas with many express buses (such as in the Northeast Corridor) will benefit more from station-based technologies than will operators in rural areas with many small stops. To model the effect of this choice, OTA performed case studies of two States and one U.S. region: 1) the rural State of Montana; 2) the both urban and rural State of Alabama; and 3) the largely urban region of Connecticut, Massachusetts, and Rhode Island. OTA examined the implementation of accessibility at a statewide level, because data on individual companies are scarce. However, analysis using statewide data illustrates the important factors that individual bus company owners must consider when complying with future OTRB regulations.

As a result of the freedom of OTRB operators to design their own implementation schemes, countless scenarios could develop. However, OTRB owners will attempt to minimize their overall costs. As a result, station-based lifts will most likely be placed in stations with frequent stops by many OTRBs, and vehicle-based lifts will be carried on OTRBs that make many stops at places with limited service. In order to keep the size of the model manageable, OTA selected three potential schemes for analysis:

1. Use of station-based lifts at all stations and no vehicle-based lifts. OTA recognizes that this scheme is unrealistic because not every stop can be outfitted with a station-based lift. However, it was included as a reference point for judging other schemes.
2. Use of vehicle-based lifts on all OTRBs and no station-based lifts.
3. Use of station-based lifts in stations with 10 or more OTRB stops daily (large stations), and vehicle-based lifts on OTRBs that make at least

one stop at a smaller station. Clearly, the fulcrum of the choice, here 10 stops daily, is a decision that will be made by providers based on prices and individual preferences.

When the specific results of the model are discussed, these three schemes are referred to as "all traveler-ready OTRBs, ' ' all traveler-complete OTRBs," and ''mixed.

Three additional factors must be added to the calculations to model the phase-in of accessible service for the case study areas. First, although OTA recognizes that industry replacement patterns vary, for the purposes of these calculations OTA assumes that OTRBs are purchased on a regular schedule, i.e., the same number of buses per year. For example, if the case study area uses 100 OTRBs, 5 will be purchased each year for 20 years (and thereafter).

Second, as with any product involving research and development (R&D) in its production, OTRB lifts will presumably fall in price as production increases (and R&D costs are recouped) and the technology becomes more efficient. Some technology development has already occurred, especially in response to public sector demand. From an analysis of historical lift prices (adjusted for inflation) during transit lift development, OTA assumes a conservative 1.5 percent rate of technological improvement.

Finally, these calculations assume that operators purchase accessibility technologies without borrowing funds and that profit in any given year is either reinvested in the firm (through capital expenditure), paid out as dividends to stockholders, or used to reduce financial liabilities. In other words, profits are not invested in interest-bearing holdings. Below, this assumption is revisited. Furthermore, since the cost model spans more than 20 years, and several schemes are investigated, it is necessary to include discount costs in order to form a basis of comparison. At this point, however, the discount rate is ignored, and only cash outlays are investigated.

## Results of the Case Studies

Within the State of Montana, in late 1991, an estimated 39 OTRBs traveled daily among 109 stations. Only three of these stations had over 10 stops daily-at Billings, Butte, and Missoula. No OTRBs traveled among these stations exclusively.

The results of two runs of the cost model are presented here for the Montana case study. The first presents a lower bound on costs for implementing accessible service, and it includes Ricon Mirage lifts as the vehicle-based lift option with $4,500 station-based lifts. (No emergency ramps were assumed and all figures are not discounted.) The costs for this run are $760,000 over the first 20 years for the all traveler-ready OTRB scheme, $540,000 for the mixed scheme, and $520,000 for the all traveler-complete OTRB scheme.

The second run presents an upper bound on costs, and it includes the expensive vehicle-based lift option (which displaces baggage capacity), with $7,000 station-based lifts and with emergency ramps required. The all traveler-ready OTRB scheme totals $1.2 million over the first 20 years, the mixed scheme amounts to $990,000, and the traveler-complete OTRB scheme totals $970,000.

Within the State of Alabama, in late 1991, approximately 105 OTRBs traveled daily among 124 stations. Twenty-four of these stations had at least 10 stops daily; they included stops at the cities of Birmingham, Montgomery, and Mobile, but also stops in smaller towns with high fixed-route ridership or that served as transfer locations. Thirty-one OTRBs traveled only among the large stations, and 74 of the OTRBs made at least one stop daily at a smaller station.

As with the Montana case study, two runs are presented. The first lower bound scenario results in costs for the all traveler-ready OTRB scheme for the entire State of Alabama over 20 years of $1.0 million. The mixed scheme amounts to $1.4 million, and the entirely traveler-complete OTRB scheme totals $1.6 million over 20 years.

The second run presents an upper bound on costs. The all traveler-ready OTRB scheme totals $1.8 million over 20 years, the mixed scheme amounts to slightly less than $2.5 million, and the traveler-complete OTRB scheme totals $2.7 million.

Within the tri-State area of Connecticut, Rhode Island, and Massachusetts, in late 1991, approximately 419 OTRBs traveled daily among 170 stations. Of these stations, 117 had at least 10 stops daily; 331 OTRBs traveled only among these stations, and 88 of the OTRBs made at least one stop daily at a smaller station.

As with the two previous case studies, two scenarios were developed using the cost model. The first, less expensive scenario results in costs of the all traveler-ready OTRB scheme for the entire tri-State area over

20 years of $2.1 million, the mixed scenario amounts to $2.9 million, and the entirely traveler-complete OTRB scenario totals **$6.3 million over 20 years.**

**The** second run presents an upper bound on costs, and it includes the expensive vehicle-based lift option (which displaces baggage capacity), with $7,000 station-based lifts and with emergency ramps required. The all traveler-ready OTRB scheme totals $4.3 million for the entire tri-State area over 20 years, the mixed scheme amounts to $5.7 million, and the traveler-complete scheme totals $12 million.

Thus, OTA **finds that operator choice in where to place traveler-ready and traveler-complete vehicles is an important factor in minimizing costs.** By analyzing their route structure to determine which scenario is most cost-effective, operators can lessen their total costs.

Although the all traveler-ready OTRB scheme was least costly in some of the above calculations, there are significant disadvantages to the all traveler-ready OTRB scheme relative to the other two. Most notably, some stations (e.g., Moose's Sport Shop in Camden, Alabama) may lack the facilities to house station-based lifts; where lift housing is possible, OTRB providers may have to pay ''rent' to the station property owner. In addition, some station-based lifts are costly to remove from a station in the event that an OTRB stop is to be dropped from the system or to be converted into a stop that is served by OTRBs with vehicle-based lifts. Conversely, a vehicle-based lift is a variable cost since it can be transported from station to station. These costs of flexibility are difficult to quantify and therefore are not included in the model. However, OTA feels that these costs are significant and should be considered when interpreting the results. Indeed, OTA **finds it will often be impossible to outfit all stations with station-based accessibility technologies, due to space and other considerations. Thus, in some cases, although outfitting all stations with station-based lifts or ramps may be the least costly on paper, it may not be feasible or preferable.**

### Restrooms

If an OTRB is not equipped with an accessible restroom that can be used by all persons aboard the bus without any aid that is not normally used in their daily lives, then the OTRB may make frequent stops (e.g., every 1 1/2 to 2 hours) to allow persons with disabilities aboard the bus to use accessible restroom facilities. Although it is impossible to compare the costs of providing an accessible restroom to adding stops along a route, some data from the case studies may be useful to explore the issue of restroom accessibility.

In Alabama, among all the routes that are run in a given day, an estimated 59 intervals between stops are longer than 1 1/2 hours, 49 are longer than 2 hours, only 3 are longer than 3 hours, and none are longer than 4 hours. In all cases, additional stops could be made at stations that are already used by the bus company. As of September 1991, slightly under 800 stops were made daily in Alabama. For comparison, at most 50 buses must be equipped with accessible restrooms to ensure that all routes with intervals longer than 1 1/2 hours between stops provide accessible restroom service en route, and at most 40 buses must be equipped to ensure that all routes with stops longer than 2 hours apart provide accessible restroom service en route.

Similarly for the other two case study areas:

- Daily in the State of Montana, at most 8 buses (out of 39) travel more than 1 1/2 hours between stops; 8 additional stops at existing stations would be necessary to fill the gaps. At most five buses travel longer than 2 hours between stops; five additional stops at existing stations would be needed to fill the gaps.
- In the tri-State region, at most 159 buses (out of 419) travel daily between two stops longer than 1 1/2 hours apart; 201 additional stops at existing stations would be needed to fill the gaps. (On Sundays, two more buses travel between stops that are longer than 1 1/2 hours apart; two additional stops would be required to shorten the length between the stops.) For an interval of 2 hours, at most 96 buses travel between stations and would require a total of 96 additional stops (at existing stations) to fill the gap.

## Including the Cost of Money and Discount Rates

The term "the cost of money" is used to refer to the monetary value placed on resources expended or forgone when borrowing/lending money. Specifically, this discussion will investigate factors affecting the real cost (including opportunity costs) to OTRB

operators in creating an accessible OTRB system as directed by DOT regulations stemming from the ADA.

It is necessary to make several explicit assumptions before beginning theoretical and practical analysis of the cost of money. Although some of these assumptions are clearly not founded in reality, they will be employed for the time being and then relaxed later in the discussion,

- Transaction costs, particularly of borrowing, are negligible.
- Capital markets are perfect, i.e., borrowing and lending occur at the same rate. For the time being, a (risk-free) rate of 10 percent is assumed. Therefore, discounting will occur at a rate of 10 percent,
- The tax burden is the same regardless of the financial method(s) used to purchase the accessibility technologies.
- There exists no return to capital (for the OTRB operator) on the purchased accessibility technologies.
- All methods of raising funds---g.,., bonds, bank borrowing, equity-result in the same ends for the OTRB operator (the borrower). For ease of discussion, it is assumed that coupon bonds are the method used.

### Borrowing v. Funds On Hand

In previous cost estimates, it was assumed that OTRB operators have the financial ability to purchase accessibility devices as they are needed-that no borrowing is necessary. Now the scenario is investigated where OTRB operators have only enough funds to pay for operating expenses on the new accessibility devices. All funds needed for capital expenses (accessibility technology purchase and overhaul) must be obtained with 10-year debt in the form of coupon bonds.

Regardless of the method used to finance the purchase of a good (in this case, a capital good), the true cost to the firm is the same. The word "true" is highlighted in order to emphasize the inclusion of opportunity costs in this analysis. In any economic analysis, it is necessary to include all implicit costs of forgone earnings-referred to as opportunity costs. In addition, the term "firm" is emphasized since this analysis looks only at costs to the firm, therefore ignoring social costs and implications beyond the immediate impacts on the firm. For example, the discussion disregards the facts that: 1) borrowing by the firm (the OTRB operator) may crowd out other firms from the borrowing market (a cost incurred outside of the firm); and 2) borrowing may increase the return demanded by the market for additional borrowing by the firm.

Under the above assumptions, the true cost of a good is the same regardless of the method used to purchase it. For example, suppose that DOT has mandated an OTRB operator to purchase a level-change device, a capital good. This hypothetical level-change device costs $100, earns no return to capital, and depreciates fully in 1 year. The OTRB operator can borrow funds for 1 year at a rate of 10 percent. Through the concept of opportunity cost, the true cost to the OTRB operator of purchasing this accessibility technology is the potential value of the funds used for the purchase-i. e., what the funds could have been worth if invested in the most profitable option available.[16]

Assume first that, as in the earlier analysis, the OTRB operator has sufficient funds on hand for purchasing accessibility technologies. If the firm invested the $100, in 1 year the funds would be worth $110 in nominal terms, or $100 when discounted. If the accessibility technologies were purchased, the OTRB operator would have zero funds and assets at the end of the year, since the accessibility technology depreciates fully in value in 1 year. The difference between these two figures is the opportunity cost of the accessibility technology-$1 10 in nominal terms (actual expenditures), or $100 when discounted. Now, assume the OTRB operator out of financial necessity borrows funds to purchase the accessibility technology. It will spend $110 ($100 on principal plus $10 in interest) at the end of the year to pay off its lender. On the other hand, if the firm borrowed nothing and purchased nothing, it would have zero dollars at the

16 In this discussion, the terms "invest' or "investment' refer to internal (intra-company) investment, such as buses or buildings, not external investment, such as stocks or bonds.

end of the year. 17 The difference between these two figures is the opportunity cost-$110 in nominal terms, or $100 when discounted. This cost is the same as the earlier case in which the firm had sufficient funds on hand. Therefore, OTA concludes that the true cost of purchasing an accessibility technology is the same regardless of the financing method **used.**

Moreover, it is apparent that the real value of the **money spent when borrowing is simply equal to the nominal value of the outlays in** purchasing the accessibility technology (both are $100). As a result, the cost figures calculated previously represent the true (opportunity cost included) cost of purchasing an accessibility technology.

### Imperfect Capital Markets

Earlier, it was assumed that capital markets are perfect-that borrowing and lending occur at the same (risk adjusted) rate. However, in some real markets, there is an interest rate spread between borrowing and lending rates.

If there exists an interest rate differential in which borrowing rates are greater than (comparable-risk) lending rates, the discount rate will be less than the rate of interest on borrowing. Therefore the above theories will not hold that: 1) a good will cost more when purchased with borrowed funds; and 2) the real value of money spent will be greater than the nominal value of outlays. The amount that these costs are greater will be proportional to the interest rate spread. However, determining g the size of this spread can be difficult.

Due to the vague interpretation of the concept of risk adjustment, one can justify the use of several "risk-adjusted' rates of borrowing. In December 1992, the only traded bond of an OTRB operator carried a Standard and Poors' B rating and a current nominal yield of 10.5 percent. Yields on U.S. Treasury notes (T-notes) are generally regarded as a conservative estimate of the market risk-adjusted lending rate. In late 1992, T-notes with comparable maturity to the OTRB operator's bond carried a nominal yield of approximately 7.0 percent. Therefore, if the 10.5 percent yield on the OTRB corporate bond is regarded by the borrower (the OTRB operator) as being a risk-adjusted rate,[18] the borrower will see a 3.5 percent difference in borrowing and lending rates.

However, if the OTRB operator views default on the bond as possible, the risk-adjusted borrowing rate (in the eyes of the OTRB operator) will fall proportional to the probability of default. Therefore, if default is likely, the risk-adjusted rate on borrowing will be close to the risk-adjusted rate on lending and the rate differential will be small.

Similarly, several positions can be taken in determining an empirical estimate of the risk-adjusted lending rate. It is safe to assume that the rate on Treasury notes and bonds represents the market value on risk-free lending. Therefore, we can assume this rate to be the risk-adjusted rate that OTRB operators could receive on investments. This methodology corresponds to that outlined by the Office of Management and Budget (OMB).[19] In late 1992, the 10-year nominal yield was approximately 7.0 percent.

In economic analysis, the discount rate (proxied by a lending rate, in this case) theoretically represents the return that an investor could earn on alternative investments. Therefore, for OTA's purposes, the discount rate should represent the risk-adjusted rate of return that OTRB operators can earn on internal investments. This rate of return should be equal to (if not greater than) the rate at which OTRB operators borrow money.[20] Referring to the numbers quoted above, since OTRB operators are willing to borrow at 10,5 percent, one can infer that internal investments earn, at a minimum, 10.5 percent return.[21] Following

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17 It may appear, at first, that the OTRB operator does not really have the option of investing the $100 (as in the first case) Or opting to borrow nothing and spend nothing (as in the second case) since the purchase of the accessibility technology is mandated. However, the operator does have, for example, the option of selling assets in order to raise the necessary funds.

18 This Position can be justified by ass uming that the OTRB operator views the bond as a contractual obligation that takes priority over all other debt, equity, or investments.

19 Office of Management and Budget (OMB), Circular No. A-94, revised Oct. 29, 1992.

20 Again, this assumes that the operator sees little chance Of default on the bond/loan.

21 It would be irrational to borrow at a higher rate than one expects to receive (risk-adjusted) on the capital purchased with the borrowed funds.

**Table A-3-Comparison of Borrowing and Funds On-Hand, Including Discounting**

| | Low-cost traveler-complete OTRB | Medium-cost traveler-complete OTRB | Traveler-complete OTRB with externally mounted lift | High-cost traveler-complete OTRB | Traveler-ready OTRB and lift[b] | Low-cost accessible restroom with lift | High-cost accessible restroom with lift |
|---|---|---|---|---|---|---|---|
| Funds on-hand | $20,000 | $23,000 | $15,000 | $35,000 | $11,000 | $34,000 | $74,000 |
| cents per mile | 1.3 | 1.5 | 1.0 | 2.3 | 0.73 | 2.3 | 4.9 |
| Funds on-hand discounted | 18,000 | 21,000 | 15,000 | 31,000 | 11,000 | 29,000 | 66,000 |
| cents per mile | 1.2 | 1.4 | 1.0 | 2.1 | 0.73 | 1.9 | 4.4 |
| Borrowed capital funds | 30,000 | 33,000 | 27,030 | 56,000 | 19,000 | 49,000 | 110,000 |
| cents per mile | 2.0 | 2.2 | 1.8 | 3.7 | 1.3 | 3.3 | 7.3 |
| Borrowed capital funds discounted | 22,000 | 25,000 | 20,000 | 39,000 | 15,000 | 34,000 | 81,000 |
| cents per mile | 1.5 | 1.6 | 1.3 | 2.6 | 1.0 | 2.3 | 5.4 |

NOTE: This table does not include the cost of an emergency ramp unless noted otherwise.

[a] See text.
b This figure represents 1.2 of the price of a station-based lift (see text) and the cost of an emergency ramp and chair.

SOURCE: Office of Technology Assessment, 1993.

this argument, borrowing and lending rates should be equal, and thus the rate differential will be zero.[22]

In all, it is uncertain whether or not there exists a significant interest rate spread. For the sake of finding an upper bound on costs, the results discussed below and presented in table A-3 follow the assumption that risk-adjusted rates are 10.5 percent for borrowing and 7.0 percent for lending, thus, allowing for the greatest interest rate differential.

### Other Factors

Throughout the discussion, it has been assumed that there is no return to capital for mandated accessibility devices. However, it is fairly clear that the existence of accessibility devices will attract some number of new OTRB passengers who were either unable or unwilling to use OTRBs before, The additional revenues from these new passengers will decrease the net costs of accessibility devices, regardless of the financing method(s) used. These revenues are captured explicitly (i.e., through revenue estimates rather than through rate of return) in all outlay and cost estimates. In addition, the access of more persons to OTRB transportation represents a return for society as a whole. However, since this discussion is intended to focus only on OTRB operators, this social return is ignored.

It has also been assumed that the OTRB operator will raise funds through the sale of coupon bonds. Although this need not be the case, any other method of raising funds will have the same results. Other possible schemes for raising funds are: bank loans, term bonds (similar to a bank loan in that principal is paid off progressively rather than at the bond's maturity), and equity. The theory of arbitrage provides a solid justification as to why all methods are comparable, provided that capital markets operate freely and efficiently. If there exists a financial advantage in one debt system over another, there will

[22] In the case that the expected return is greater than the borrowing rate, the differential will be negative, and thus borrowing will be *less* expensive than paying with funds on-hand.

exist arbitrage, which will be quickly eliminated by an efficiently operating market mechanism.

Transaction costs of borrowing have been assumed to be negligible throughout this discussion, and there is no reason to believe them to be otherwise. Relative to the incremental costs of outfitting an OTRB with accessibility devices (upward of $40,000), the fees charged by brokers and the costs to the operator of issuing bonds and accounting for payments are nominal.[23]

### Discussion of Methodology and Results

Cost estimates for accessibility devices, presented earlier in this appendix, all assume that OTRB operators have sufficient funds on-hand to pay capital and operating costs of accessibility technologies when the costs arise. In addition, although the figures are adjusted to represent 1992 dollars, they are not discounted for time preference or opportunity cost, Therefore, the earlier cost estimates should be regarded as estimates of real dollar *outlays*, not real costs. The following discussion outlines: 1) the methodology used to convert these outlays to approximate cost **figures;** and **2)** assumptions and methodology for estimating outlays and costs under the premise that the OTRB operator has sufficient funds on-hand for operating expenses only, and not for capital expenses (i.e., the OTRB operator must borrow in order to purchase and overhaul accessibility devices).

The theoretical purpose of discounting real figures, as discussed above, is to place a monetary value on opportunity cost. A driving force behind the concept of opportunity cost is the preference of investors and businesses to acquire goods and capital sooner rather than later. As applied to costs (rather than revenues and acquisitions), the process of discounting attempts to place a monetary value on the fact that businesses prefer to postpone costs so that money can be either invested or kept liquid in case a more important cost arises. As a result, the process of discounting expenditures makes an expenditure incurred in the future cost less (in discounted terms) than an expenditure incurred today.

As discussed above, the yield on 10-year Treasury notes is to be used as the lending rate, and therefore the discount rate. However, since the previous cost estimates are quoted in real 1992 dollars, a real discount rate is needed to convert these figures to present discounted value. The 7.0 percent yield cited above is a nominal yield (i.e., including inflation). To convert this to a real yield, inflation must be subtracted. Following the methodology outlined in OMB Circular A-94, the real yield on 10-year Treasury notes is 3.6 percent.[24] As a result, this 3.6 percent rate was used to discount the "real outlays" figures to find a present discounted value estimate for "real costs" as presented in table A-3.

In order to estimate real outlays and costs if the OTRB operator were to borrow all capital (presumably due to financial necessity), OTA explicitly calculated the yearly principal and interest payments that would be incurred by an OTRB operator. As in the discussion above, it was assumed that the borrowing would be in the form of a 10-year coupon bond with a 10.5-percent coupon rate. Using the same methodology as for the discount rate, a real coupon rate of 7.07 percent was calculated. This figure was then used to estimate real (1992 dollar) incremental outlays to be borne by an OTRB operator when purchasing one bus under the assumption of borrowing, as presented in table A-3.

In the manner discussed above used to convert real outlays to real costs in the case that the OTRB operator has sufficient funds on-hand, OTA estimated the real costs to the OTRB operator if all capital expenses were financed with borrowed funds. As before, a real discount rate of 3.6 percent was used, yielding the estimates presented in table A-3.

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23 S. far, it has been assumed that tax policy treats all methods of financing capital investment equally. However, if OTRB operators were to be *given tax* credits or allowed to take deductions for interest payments on loans/bonds used to finance capital, the cost of capital using borrowed funds will become less expensive relative to the cost of using out-of-pocket funds. Whether this occurrence would make it absolutely less expensive for OTRB operators to borrow funds instead of using funds on-hand is unclear, since it depends on other assumptions about interest rates and the like. Nonetheless, a tax credit or deduction for interest payments will surely make borrowing less expensive relative to the case in which no tax deduction is permitted.

24 Office of Management and Budget, op. cit., footnote 19, states that inflation forecasts should be derived from the Gross Domestic Product price deflator estimates as cited in the fiscal year 1993 Federal budget. The long-term (greater than 5-year) estimate of inflation is 3.2 percent. OTA recognizes that there is considerable debate about discount rate values and that OMB's estimates are only one attempt to determine appropriate rates.

## The Effect of Potential Price Increases on Overall Ridership

As discussed above, OTRB companies may choose to pass the costs of accessibility technologies on to passengers in the form of price increases. The number of passengers choosing not to travel on OTRBs due to these price increases can be estimated. However, the estimates rely on data that are sketchy at best, so the effect of increased prices was not included in the model. A hypothetical calculation of the effect of price increases can nevertheless help to illustrate the issue.

Useful data that are available include: 1) there were roughly 31 million passengers who used fixed-route OTRB service in 1990; and 2) the operating costs per mile for fixed-route OTRBs total approximately $2.00. Above, it is also estimated that providing accessible OTRBs may cost about 2-cents per mile, or an increase of 1 percent over previous operating costs.

Data that are not well-known include the way that a change in the price of a ticket will affect demand. In general, however, since the population of OTRB passengers is disproportionately poor compared with the rest of the population, it is safe to hypothesize that a price increase could result in a decrease in overall ridership. For example, if we assume that a l-percent increase in the price of a ticket will reduce demand by 1 percent, then a l-percent change in the price of a ticket due to the cost of providing accessible service will decrease ridership by roughly 310,000 trips (or 1 percent of 31 million trips).

Thus, if OTRB companies pass the costs of accessibility onto passengers in the form of fare increases, then significant numbers of passengers may choose not to ride OTRBs in fixed-route intercity service. Since most OTRB passengers have low incomes, increases in OTRB fixed-route fares due to the implementation costs of accessibility could disproportionately affect those Americans who are poor.

# Appendix B: Federal and State Oversight of Over-the-Road Bus Service

## Federal Oversight

The private over-the-road bus (OTRB) industry is supervised by a complicated array of Federal and State agencies, no one of which devotes specific attention to OTRBs (see figure B-l). For some purposes of Federal oversight, OTRBs are treated as trucks, with regulatory control divided among the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), and the Interstate Commerce Commission (ICC).[1] For other purposes, because OTRBs carry passengers, they are subject to other regulations that do not affect the trucking industry. In addition, private OTRB operators must deal with various State economic and safety regulations.

Federal oversight functions fall into three categories: 1) manufacturing and operational standards; 2) economic and environmental regulation; and 3) coordination and compliance. Few agencies deal specifically with issues of accessibility in transportation. The Federal Transit Administration (FTA) has regulations governing publicly assisted vehicles, and the Architectural and Transportation Barriers Compliance Board (ATBCB) has developed guidelines for accessibility technologies. Under the Americans with Disabilities Act (ADA), the U.S. Department of Justice (DOJ) participates in issues of discrimination, including any that might involve the OTRB industry.

### Manufacturing and Operational Standards

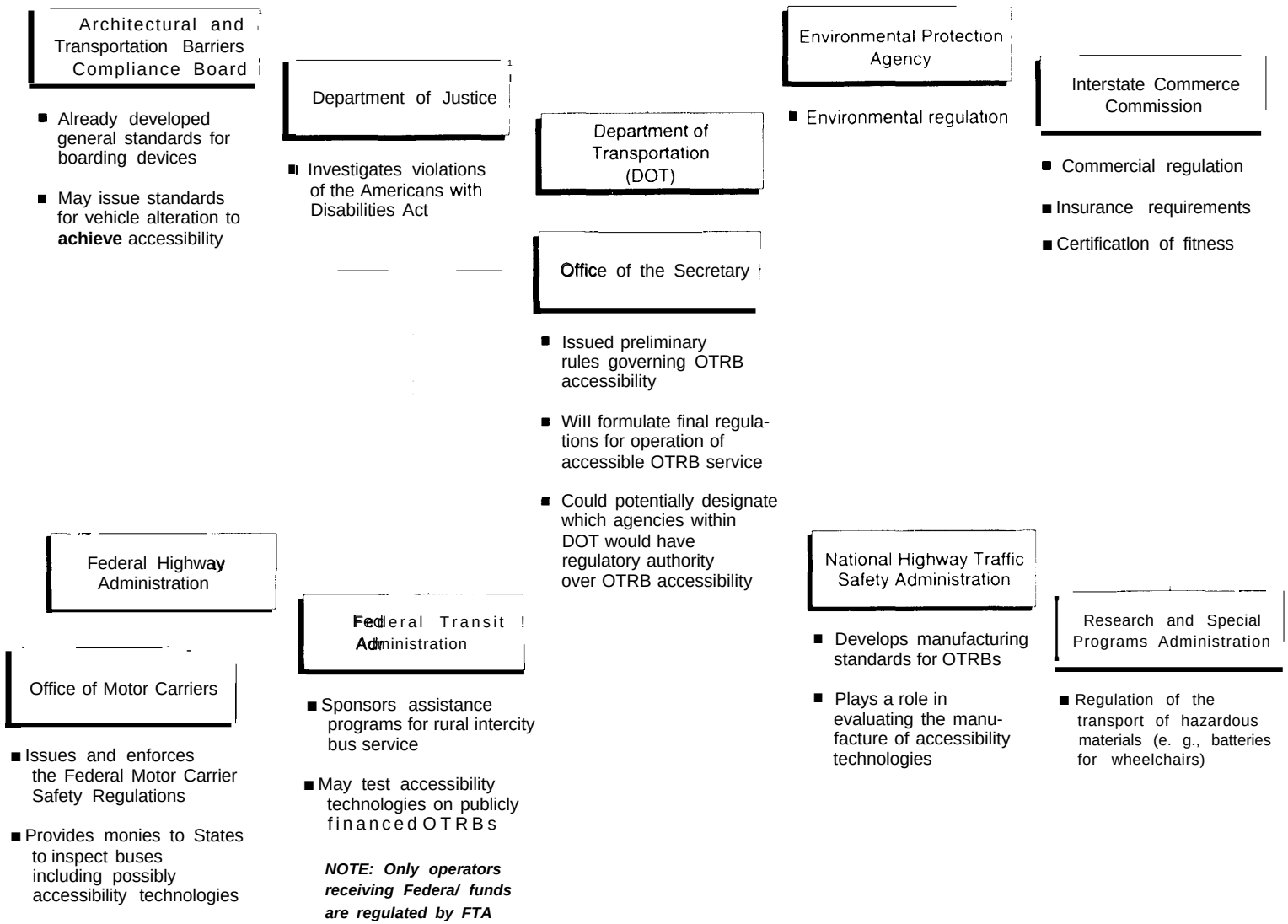
**National Highway Traffic Safety Administration**—NHTSA is charged with developing manufacturing standards for OTRBs; buses are subject to the same requirements as all other vehicles with a gross vehicle weight over 10,000 pounds. NHTSA has established more than 50 standards for such vehicles, most of which apply to OTRBSs These standards are organized into three series: crash avoidance, crashworthiness, and fire protection.[2]

Although its role has yet to be clearly defined, NHTSA may evaluate accessibility technologies, This could involve developing manufacturing standards for boarding designs and vehicle modifications aimed at facilitating accessibility.

Office of Motor Carriers—FHWA's Office of Motor Carriers (OMC) is responsible for the safe operation of motor carriers, defined as those vehicles weighing over 10,000 pounds that are designed to carry more than 15 passengers or transport placardable hazardous materials. OMC issues and enforces the Federal Motor Carrier Safety Regulations-the laws governing the safe operation and maintenance of trucks and buses. The four main components of the

[1] In addition, the Food and Drug Administration issues regulations governing OTRB galley service, restroom sanitation, and waste disposal.
[2] 49 CFR Part 571.100131, 200-222.

**Figure B-l—Federal Government Framework for Over-the-Road Buses (OTRBs)**




SOURCE: Office of Technology Assessment, 1993.

safety regulations are: driver qualifications, driver hours of service, vehicle maintenance, and accident reporting. OMC will play a small role in developing standards for the safe operation and maintenance of accessibility technology on OTRBs. Regulations might cover proper use of wheeled mobility aid tie-downs, and the routine maintenance and safe operation of accessibility technologies.

OMC safety investigators in each State review the performance of interstate motor carriers to ensure compliance with safety regulations; OMC's Motor Carrier Safety Assistance Program provides funds to States to inspect buses and trucks at roadside inspection stations and to conduct facility audits. OMC could include examinations of the operation of accessibility devices in standard roadside inspections.[3]

**Federal Transit Agency—FTA** has been enforcing accessibility requirements for public transit operators for a number of years. Private operators receiving Federal funds are subject to government regulations applying to public transit agencies, and to those provisions of the ADA dealing with public operators. Consequently, ADA provisions and subsequent regulations applying to the OTRB industry, particularly those involving Federal financial assistance, may require 1711A oversight.

FTA is the only Federal agency that sponsors assistance programs for intercity bus service. Under Section 18 of the Surface Transportation Act of 1978, some States have funded promotion of privately operated fixed-route service in rural areas. (See ch. 2 for a discussion of Section 18 and other sources of Federal assistance.)

Existing FTA regulations permit, but do not require, public transit agencies to lease their equipment to private operators for charter service if the private operator is unable to provide equipment accessible to individuals with disabilities.[4] Because most transit agencies with accessible OTRBs use them for commuter service, these vehicles are seldom available for private use except during nonrush-hour periods and on weekends.

FTA plays a limited role in Federal safety oversight. Created in 1989 and funded by FTA, the Altoona Bus Testing Center (Altoona, PA) tests all new model buses purchased with Federal assistance. FTA determines specific design changes or retrofits to be tested, and usually requires the manufacturer to arrange testing with the center, which subsequently prepares a report on the results. The Altoona Bus Testing Center will probably play a similar role for bus-based accessibility technologies.[5] FTA pays 80 percent of the cost of testing the vehicle to the Pennsylvania Transportation Institute, the operator of the facility; the vehicle manufacturer pays the remainder.[6]

**Research and Special Programs Administration, Office of Hazardous** Materials—Transportation of wet storage batteries of the type used to power wheeled mobility aids are subject to hazardous materials regulations administered by the Research and Special Programs Administration (RSPA). The general rule requires that this type of battery either be securely fastened in an upright position and protected against short circuits and leakage, or be removed and packaged separately. However, transportation of wheeled mobility aids equipped with wet storage batteries on passenger vehicles such as OTRBs are not subject to these requirements,[7] RSPA also regulates the transport of other hazardous materials carried on commercial passenger vehicles, such as explosive, poisonous, and radioactive materials.[8]

**The Architectural and Transportation Barriers Compliance Board—ATBCB** was established under the Rehabilitation Act of 1973 as an independent agency of the Federal Government. The Board's responsibilities involve creating an accessible environment, and include investigating andexamining alternative approaches to the architectural and transportation-related barriers confronting individuals with disabilities. ATBCB investigates citizen complaints about

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[3] Susan Petty, chief, State Programs Division, Office of Motor Carriers, personat communication Dec. 13, 1991.

[4] Charter service is defined as ". . . transportation using buses or vans or facilities . . . for a group of persons who pursuant to a common purpose have acquired exclusive use of a vehicle or service to travel together. . . " (49 CFR Part 604.5e).

[5] Bob Reifsteck, facility manager, Altoona Bus Testing Center, personal communication Sept. 14, 1992.

[6] 57 *Federal Register* 8954 (Mar. 13, 1992). This financial assistance does not cover the costs of the vehicle or personnel.

[7] 49 CFR Part 173.222 (Dec. 31, 1991), p, 497. Transportation of wheeled mobility aids equipped with such batteries on passenger aircraft, however, are subject to specific requirements. Transportation of dry cell batteries is not regulated,

[8] 49 CFR Part 177.870 (Dec. 31, 1991), pp. 743-44.

these barriers and helps government agencies formulate general accessibility standards.

ATBCB has developed standards for boarding devices. These include manufacturing specifications and accommodations for persons with differing mobility impairments. ATBCB may release standards regarding the design, manufacture, and alteration of vehicles to achieve accessibility, but does not get involved in vehicle or boarding device operation.

### Economic and Environmental Regulation

The Interstate Commerce Commission—ICC was one of the first Federal agencies to deal with transportation regulation, including the economic regulation of the intercity bus industry. However, the Bus Regulatory Reform Act of 1982 (BRRA) almost completely deregulated the industry, so ICC's role with respect to OTRBs is now very limited. ICC will probably play no role in overseeing OTRB accessibility.

ICC examines applications from carriers for "fitness' to operate fixed-route or charter service.[9] Additionally, freed-route carriers must demonstrate to ICC that their service is in the public interest. If a State regulatory authority rules that a carrier cannot abandon a route, the operator may appeal directly to ICC. The burden then falls on those favoring continuation of the route to prove that discontinuance is *not in the* public interest and that continuation would *not* harm interstate commerce. [10]

ICC can preempt any State regulation of interstate bus service and can overrule State decisions regarding fare increases and exit of carriers. Some States, such as Massachusetts, have protested ICC's role by automatically refusing any request to raise fares, forcing operators to appeal to ICC each time they want a fare increase. ICC almost invariably grants the request.[11]

ICC now requires only Class I carriers, whose operating revenues total more than $5 million, to file annual and quarterly reports. Other bus companies, formerly designated Class II and Class III carriers, are no longer subject to reporting requirements (see ch. 2). Furthermore, Class I carrier reports are not as detailed as those required before deregulation. Consequently, far less information about the OTRB industry is available now than before enactment of the BRRA.[12]

Environmental Protection Agency—The Environmental Protection Agency (EPA) handles most environmental issues affecting OTRBs. Most important for the industry are EPA regulations on air emissions standards.[13] The Clean Air Act of 1990 significantly tightened Federal emissions standards for all motor vehicles, including OTRBs, but allowed States to establish standards higher than those promulgated by EPA. As a result, OTRBs that do not conform to the highest standards will not be able to operate in all States. Other EPA regulations of significance to OTRBs deal with noise pollution, bus storage facilities, and waste disposal.

### ADA Coordination and Compliance

office **of the Secretary of Transportation (OST)—** OST issued preliminary rules in September 1991 governing the accessibility of OTRBs and will formulate the final regulations based on the findings of this OTA study. Those regulations will address the types of boarding assistance required, as well as such operational issues as advance notice requirements. OST also may designate which agencies within the U.S. Department of Transportation will have regulatory authority over OTRB accessibility.

**Department of Justice—DOJ will** investigate violations of the ADA by all entities providing public transportation services. DOJ could order violators to alter their services in order to make them accessible. While an individual challenging the accessibility of a facility or service in court cannot be awarded punitive

9 Fitness consists of safety certification from the U.S. Department of Transportation and insurance coverage for vehicles and their operation.

10 John Duc et al., *Transportation Service to Small Communities: Effects of* **Deregulation** (Ames, IA: Iowa State University Press, 1990), p. 82.

11 Jeremy Kahn, "Stopping by the Bus Terminal on a Dark and Stormy Night: The U.S. Bus Industry Seven Years After Deregulation" *Transportation Law Journal*, vol. 18, No. 2, 1990, p. 259.

12 Econometrics, Inc., ' 'Background Paper on Accessibility for the Disabled and the Intercity Bus Industry," OTA contractor report, Mar. 31, 1991, p. 60.

13 An example of an operational requirement in EPA regulations pursuant to the Clean Air Act with direct implications for accessibility devices is that many lift technologies require the bus to run 10 to 15 minutes during a boarding cycle, while EPA regulations forbid bus idling for more than 3 minutes.

damages, a court can fine up to $50,000 for the first violation found by DOJ and up to $100,000 for each subsequent violation.[14]

## State Oversight

States play a prominent role in both the economic and safety regulation of OTRBs, but most States have not yet determined their roles in overseeing the bus industry's compliance with accessibility regulations. As with the Federal Government, State oversight of private operators of OTRBs is spread among a number of agencies.

California is the only State that, by fall of 1992, had a regulatory program aimed at accessibility technologies. The California Highway Patrol is the main regulatory body in California for wheelchair lifts. California Code of Regulations Title 13 contains specifications regarding lift operating features, design, and testing requirements. These regulations were the model for Federal standards governing accessibility technologies. The California Department of Transportation and Department of Motor Vehicles have smaller roles in regulating the use of wheelchair lifts.

### Safety

As is the case at the Federal level, regulation of bus safety has a relatively low profile in State governments. Only a few States have programs aimed at regulating the safety of OTRBs. OTRB inspections are now eligible for funding under the Motor Carrier Safety Assistance Program, and some States take advantage of this provision. These inspections could include examination of accessibility technologies.

Michigan's program is one of the most complete. The State conducts two types of inspections: an annual examination on the property of the bus company, and random inspections, usually carried out at major attractions such as sports stadiums or tourist facilities. Based on these inspections, companies receive permits for operation within the State. Because the State Department of Transportation contends that its bus inspection practices are more rigorous than those in other parts of the country, Michigan has limited reciprocity. Only buses with stickers from Michigan, Pennsylvania, New York and the Province of Ontario are considered acceptable to operate on Michigan roadways without further State inspection.[15]

Other States concentrate on random roadside inspections of buses. California aims these inspections at the "fly-by-night" companies that often operate tour buses to and from gambling facilities in Nevada. These companies' buses frequently have safety violations, often involving drivers' hours of service.[16]

In an attempt to standardize inspection practices, the Commercial Vehicle Safety Alliance (CVSA), an organization made up of almost all States and Canadian Provinces, has proposed uniform bus inspections guidelines. These proposed standards are due to be released early in 1993.[17] CVSA has worked closely with FHWA in the past, developing safety and inspection guidelines for other motor carriers.[18]

### Economic

State economic regulatory authority has greatly diminished since passage of the BRRA. Most States play a limited role in economic oversight of routes that operate completely within State borders. While carriers can appeal State decisions to ICC, where they are frequently overturned, many States continue such regulation to delay rural service abandonments while alternatives are sought.

Bus operators often face multi-State registration and fuel tax problems. Presently, buses can be required to register and pay a fuel tax in each State in which they operate. However, Title IV of the Intermodal Surface Transportation Efficiency Act (ISTEA) sought to eliminate this requirement. By September 1996, States must join the International Registration Plan and the Intenational Fuel Tax Agreement, which require operators to register and pay fuel tax only in their State of origin, ISTEA also requires that a system be

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14 Paul Stephen Dempsey, "The Civil Rights of the Handicapped in Transportation: The Americans with Disabilities Act and Related Legislation," *Transportation Law Journal, vol. 19, No. 2, 1991,* p. 329.

15 Jerry Rudnick, Michigan Department of Transportation@ personal communication, Dec. 5, 1991.

16 U.S. Congress, Office of Technology Assessment *Gearing Up for Safety: Motor Carrier Safety in a Competitive Environment, OTA-SET-382* (Washington, DC: U.S. Government Printing Office, September 1988), p. 72.

17 Larry Stern, Commercial Vehicle Safety Alliance, personal communication, Jan. 12, 1992.

18 Office of Technology Assessment, op. cit., footnote 16, p. 72.

implemented to allow motor carrier operators to register their ICC operating authority and proof of liability insurance with one State. This State will then distribute the registration fees to other States in which the bus operator provides service.[19] Some States, including Connecticut, Florida, Kentucky, and New York, have adopted tax laws that require all companies operating within their boundaries to pay a ''corporate tax,'' even if they are based outside the State.[20]

A number of States go beyond economic regulation and offer operating and capital assistance to intercity operators (see ch. 2). Michigan, Massachusetts, Pennsylvania, and California have the most extensive programs and have additional regulations governing bus operations, as well, Both Michigan and Massachusetts, which support capital purchasing programs, restrict the operation of publicly funded coaches. In Massachusetts, 80 percent of the routes covered by OTRBs purchased with State assistance must be within the State. Because these buses are intended for fixed-route operation, no more than 15 percent of the bus-miles can be used in charter service, nor can these buses provide charter service during commuter peak hours.[21] Michigan requires that OTRBs purchased with State funds be used for fixed-route service only and return to the State within 24 hours of leaving. The State has further restrictions on purchasing OTRBs manufactured outside the United States.

19 U.S. Department of Transportation Federal Highway Administration, Office of Policy Development, *A Summary: Intermodal Surface Transportation Efficiency Act of 1991*, FHWA-PL-92-008 (Washington DC: U.S. Government Printing Office, 1992), p. 27.

20 Elaine Wade, Government Affairs, American Bus Association personal communication, Apr. 29, 1992.

21 Ecosometrics, Inc., "Overviewof Experience of Operators of Accessible Over-the-Road Coaches,' OTA contractor report, Jan. 28, 1992, pp. 70-72.

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# Appendix D: List of Acronyms

| | |
|---|---|
| AARP | American Association of Retired Persons |
| ABA | American Bus Association |
| ACAA | Air Carrier Access Act |
| ADA | Americans with Disabilities Act |
| ALD | assistive listening device |
| ATBCB | Architectural and Transportation Barriers Compliance Board |
| BRRA | Bus Regulatory Reform Act |
| CCTV | closed circuit television |
| CTAA | Community Transportation Association of America |
| CVSA | Commercial Vehicle Safety Alliance |
| DOJ | U.S. Department of Justice |
| DOT | U.S. Department of Transportation |
| DPU | Department of Public Utilities |
| EOTC | Equal Opportunity Transportation Commission |
| EPA | Environmental Protection Agency |
| FHWA | Federal Highway Administration |
| FTA | Federal Transit Act |
| FTA | Federal Transit Administration |
| GAO | U.S. General Accounting Office |
| GLIH | GLI Holding Co. |
| IBCAP | Intercity Bus Capital Assistance Program |
| ICC | Interstate Commerce Commission |
| ISTEA | Inter-modal Surface Transportation Efficiency Act |
| IQ | Intelligence Quotient |
| MCCD | Massachusetts Coalition of Citizens with Disabilities |
| MSA | Metropolitan Statistical Area |
| NBTA | National Bus Traffic Association |
| NHIS | National Health Information Survey |
| NTBS | National Trailways Bus System |
| NHTSA | National Highway Traffic Safety Administration |
| OMB | Office of Management and Budget |
| OMC | Office of Motor Carriers |
| OST | Office of the Secretary of Transportation |
| OTRB | over-the-road bus |
| PUC | Public Utility Commission |
| R&D | research and development |
| RCP | Rural Connector Program |
| RSPA | Research and Special Programs Administration |
| RTD | Regional Transit District |
| SDW | Survey of Disability and Work |
| SIPP | Survey of Income and Program Participation |
| STA | Surface Transportation Act |
| TDD | telecommunications device for the deaf |
| TIDE | Travel Industry and Disabled Exchange |
| UMTA | Urban Mass Transportation Administration |
| UPS | United Parcel Service |

# Appendix E: Contractor Reports Prepared for This Assessment

Copies of the following contractor reports done for this study are available through the National Technical Information Service (NTIS), either by mail (U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161) or by calling NTIS directly at (703) 487-4650.

Econometrics, Inc., "Background Paper on Accessibility for the Disabled and the Intercity Bus Industry," PB 93-163855.

Econometrics, Inc., ''Evaluation of Methods to Provide Accessibility to Over-the-Road Buses and Services," PB 93-163830.

Econometrics, Inc., "Potential Demand for Over-the-Road Bus Services by Individuals with Disabilities," PB 93-163848.

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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the reviewers and contributors. The reviewers and contributors do not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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**GFO :** 1993 0 - 330–069 QL:3

**ISBN 0-16 -041734-1**

