Abridgment

Accommodating Deaf and Hard-of-Hearing Persons on Public Transportation Systems in Massachusetts

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The Massachusetts Executive Office of Transportation and Construction commissioned this study because no definitive information exists to form transit policy for the hearing impaired. The study notes the types of problems experienced by the hearing impaired, who frequently lack access to oral communication when using bus, subway, and airplane transportation. The results are missed connections, significant delays, and increased risk in emergencies. Transportation personnel who are not prepared to communicate with the hearing impaired and inaccurate destination information compound the problem. Transportation officials have concentrated on the needs of the mobility and vision impaired. This study suggests, however, that there is rough parity in size among the hearing-, vision-, and mobility-impaired populations. Planners should take account of the needs of the hearing impaired as well as these other populations. Several technologies and methods exist to lessen the problems faced by the hearing impaired. These vary in cost and applicability in transportation settings. In the short term, however, officials can implement low-cost improvements such as installation of amplified telephones and telecommunication devices for the deaf (TDDs), provision of accurate route schedules, and use of note slips on buses. In the long term, we suggest installation of electronic readerboards, visual emergency alarms, and touch screen video monitors and use of sensitivity training sessions.

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The Massachusetts Executive Office of Transportation and Construction commissioned this study because no definitive information exists to form transit policy that takes into account the needs of the hearing impaired. In a longer report we detail cost information and suggest specific design recommendations by travel mode for the Commonwealth of Massachusetts. However, this abridgment contains some overall lessons and suggestions for transportation planners nationwide.

To develop a policy framework, we assess the types of problems experienced by hearing-impaired people and some demographic characteristics of the population. We discuss potential technologies and methods available to lessen the problems faced by the hearing impaired on public transportation. Finally, we suggest some short- and long-term improvements that transportation officials can implement.

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PUBLIC TRANSPORTATION PROBLEMS FOR THE HEARING IMPAIRED

People with hearing impairments confront a series of situations on public transportation that pose difficulty, although not all of the situations will lead to problems on every trip and some problems are also faced by the general population. Let us consider a few key access points for the hearing impaired in different modes of travel:

- Bus:
  - — Accessing schedule and destination information through printed material or, if over the phone, through use of a telecommunication device for the deaf (TDD).
  - — Communicating with the driver through sign language or written notes.
- Subway:
  - — Using signs and system maps to obtain destination information.
  - — Relying on transit personnel who may be unable to communicate effectively with the hearing impaired.
  - — Obtaining information from public address announcements, such as a change in train status from local to express or directions in an emergency.
  - — Obtaining information on the train about upcoming stops.
  - — Relying on amplified phones or TDDs to make outgoing phone calls.
- Airplane:
  - — Accessing emergency voice boxes in parking garages.
  - — Obtaining information regarding flight announcements.
  - — Relying on signs to know destination information.

HEARING-IMPAIRED POPULATION

There are many points along a typical public transportation trip where the hearing impaired face difficulty. In fact, many of the problems are present in all three modes of travel. How many people will benefit from improvements?

In 1985, the National Center for Health Statistics estimated

that 9.1 percent of the population, or 21.2 million, had a hearing impairment (*1*, p. 1). The hearing-impaired population is defined as those persons reporting any type of hearing problem. Approximately 10 percent of the hearing impaired can be considered to be severely or profoundly deaf (*2*, Tables 62 and 78). Most of the hearing-impaired population can understand some auditory messages either unaided or with hearing aids. Consequently, many could benefit from audio, as well as video, accessibility improvements. However, we suggest that transportation planners not overemphasize the distinction between the deaf and hard-of-hearing. In noisy environments, the hard-of-hearing may become functionally deaf.

How does the number of potential hearing-impaired users compare with other special-needs populations? In Massachusetts, we found that there is rough parity in size among the different populations, even when using various definitions. These numbers suggest that there is a significant hearing-impaired population that could be assisted by modifications to transit systems. Planners should ensure that policy actions include this population.

TECHNOLOGY AND TRAINING

Many types of technologies are currently available for the hearing impaired: amplifiers and receivers, induction loops, visual displays, and TDDs. Transit authorities also use sensitivity training to alert staff to needs of the hearing impaired.

Amplifiers and Receivers

Amplifiers and receivers include FM and infrared systems that convert announcements into FM or infrared signals. The signals are then picked up by a receiver and stereo headset. The advantage of such systems is that they offer high-quality sound. Yet, the disadvantages are numerous in a public transportation setting. For example, use requires individual receivers, and few people possess their own units. Furthermore, public use is typically limited to a quiet, stationary setting such as a theater. Finally, such systems are relatively expensive.

Induction Loop

The induction loop functions by creating a magnetic or induction field that can be picked up by the telecoil in a hearing aid. Induction loops are typically used in private homes, classrooms, and meeting rooms. For the loop to function effectively, the entire circumference of the area should be encircled. Individuals set a switch on their hearing aid to the telecoil or T-position.

The advantages of the induction loop are that it connects easily to existing public-address (PA) systems and it assists those most profoundly deaf. However, we do not recommend induction loops for transportation settings. Metal in vehicles, electromagnetic fields, and the use of fluorescent lights in buildings make use of loops impractical. The interference of radio transmissions and the fact that only a small percentage of the hearing impaired wear hearing aids with T-switches are further disadvantages.

Video Monitors

Many companies market video monitor systems that use television screen monitors to televise commuter rail information, as well as news and advertising. Systems intermingle numerous pages of text and rotate different pages on a periodic cycle. The advantages of this technology are that it provides updated information systemwide to the hearing impaired and other riders and that it can be subsidized through advertising revenues. However, because highly visible information is particularly important, we have reservations about the usefulness of monitors to the hearing impaired in subway stations. Monitors are particularly useful when schedule information is detailed and fairly constant such as at airports. However, visibility is a key criterion. The letter size on monitors is small when compared to the standard 7-in. size possible on readerboards. In addition, people may not be attracted to screens with stationary graphics. Thus, on the basis of visibility, we recommend the use of readerboards, rather than video monitors, in subways.

Electronic Readerboards

Electronic readerboards use either digital or liquid electronic display (LED) technology. The latter scrolls messages across a screen like many of the signs seen in New York's Times Square. The oldest readerboards are self-contained and have as many as 16 computer chips, each programmed with specific one-sentence messages. Updating messages is time-consuming. Newer systems are more centrally controlled.

The advantage of readerboards is that a computer can instantly update information and send it systemwide or to selected readerboards. Both hearing-impaired and other passengers can benefit. On the other hand, readerboards with incandescent bulbs are energy intensive and have high maintenance costs. In addition, LED readerboards can be difficult to read from an angle.

Overall, however, electronic readerboards are the best means of providing access to infrequent verbal information such as PA train delay and paging announcements. LED readerboard systems are preferable to incandescent digital readouts because of their lower energy and maintenance costs. When detailed bus, train, or flight schedules must be continually available, video monitors are preferred.

We do not recommend placing readerboards inside subway cars. The technology is available, but emergency warning lights that are well labeled are a better safety solution. In addition, destination information on the train can be less expensively supplied using system maps inside cars in combination with signs on the platforms.

TDDs and Phone Amplifiers

TDDs, which resemble small typewriters with a screen or printer, allow the hearing impaired to make telephone calls. The TDD eliminates the need for an interpreter but it does require that another TDD be used at the other end. TDDs have decreased in cost and increased in use.

Phone amplifiers are used to increase the volume of public

pay phones. They are typically placed in the phone receivers but recent attempts to vandal-proof the phones have resulted in the placement of the amplifiers in the body of the phone.

The advantage of these two technologies is that their cost is relatively low and falling. Furthermore, their use is expanding so people are becoming more familiar with them. On the other hand, precautions have to be taken to avoid vandalism directed at the units.

Schedule and transit information is generally available to the hearing impaired via TDDs. However, TDD numbers need to be widely publicized among the hearing-impaired population. Steps are being taken to install TDD units in subway stations and airport terminals. We support these measures. Because the cost of TDD units has fallen significantly, their use should be expanded. The cost of amplifying devices on public pay phones has also dramatically declined. It should be noted that there are federal regulations relating to placement of amplified phones, which must be complied with.

Sensitivity Training

Most transit authorities provide a general orientation to new employees that includes information on how to deal with the physically handicapped. Some transit authorities also discuss the needs of the hearing impaired and provide personnel with a short manual explaining how to sign important messages. A few authorities even provide annual refresher courses.

Not all information can be provided to passengers by signs, visual displays, and emergency signals; therefore, transit personnel need to be trained on how to communicate with the hearing impaired. Such training should be part of a new employee's orientation and be repeated periodically. Ideally, training should be conducted by people who are hearing impaired themselves. Ticket booth attendants and those at information desks should also have manuals or laminated cards describing the most essential sign phrases.

Accurate Signs and Schedules

Those with hearing impairments are even more dependent than the general public on printed information. Thus, signs and schedules should be available in adequate number. Because obtaining verbal clarification is complicated by hearing impairment, the accuracy of signs and schedules is essential.

CONCLUSION

Transit authorities are just now becoming aware of the needs of the hearing impaired in transportation settings. Clearly, with budget constraints, planners will have to choose from the alternatives given in this paper. These can be broken down into low-cost, short-term and more expensive long-term improvements.

Transit authorities should consider these low-cost and relatively simple improvements in the short term:

- Provision of TDD information numbers.
- Installation of amplified phones and TDDs.
- Provision of accurate and adequate transit schedules.
- Use of note slips for communication with bus drivers.

The following improvements should merit consideration for the long term:

- Installation of electronic readerboards.
- Installation of visual emergency alarms.
- Use of sensitivity training sessions.
- Installation of touch screen video monitors.

Realistically, not all of these recommendations can be implemented immediately. However, it is important to remember the following points:

- Over 9 percent of the population depend on visual information.
- Where the hearing listen, the hearing impaired must read.
- Emergency alarms for the hearing impaired must be visual.
- Personnel are the final alternative if technology fails.

Planners should ensure that policy reflects the needs of the hearing impaired. In fact, actions taken on their behalf often benefit all riders. Transit authorities have a foundation on which to build accessible systems for the hearing impaired.

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