

APPENDIX A DISABLED AND ELDERLY PERSONS AS A MARKET FOR AIRPORT SERVICES

Ling Suen, Transport Canada, and Brian Guthrie, Hickling Corporation

INTRODUCTION

Deregulation of the U.S. airline industry and the resulting decline in the cost of air travel has made this form of transportation more accessible to a broader range of socioeconomic groups than ever before. However, physical barriers in aircraft and airports continue to impede the use of air travel by disabled persons. Clearly, the identification and removal or easing of such barriers will help extend the usage of air travel services by this group.

The principal focus of most research in this field has been on urban buses and trains, with more recent focus on aircraft. However, the availability of important new data sources now allows investigation of those barriers which are faced by disabled persons in their use of airport terminal services. The types of barriers faced can be identified, together with the number and characteristics of disabled persons who are facing those barriers. Within this latter analysis it is possible to identify the numbers in specific disabled groups who face particular barriers. Further analysis can suggest the extent to which these barriers are limiting the potential size of the market for airport services.

With the demand for air travel services in the United States expected to grow strongly over the next decade, it is important to identify now which groups will be limited in their ability to participate in this trend. This paper seeks to both identify those barriers to air travel which exist in the airport terminal, as well as to determine the extent to which these barriers are limiting usage of air travel services by disabled persons. A secondary aim of the paper is to suggest areas in which further research is required in order to deal adequately with this problem.

DEFINING THE AIRPORT-DISABLED

People who are disabled in their ability to access air travel services are clearly a subgroup of the more generally transportation-disabled public. Certainly, not all disabled and elderly people are disabled with respect to their ability to use transportation services. For some, using both short and long distance transport services will be no more difficult than for those without any particular handicap. For others, the nature of their disability will render them housebound. Table 10 illustrates the range of disability characteristics across the general population.

TABLE 10 RELATIVE SIZES OF DISABLED POPULATIONS

Characteristics	Percentage of general population
All disabled	14.1
Transportation-disabled	8.3
Disabled with respect to long-distance transport	5.0
Trouble using air transport	0.7
Wheelchair users	0.5

Source: Health and Limitation Survey, 1986

Disability with respect to the use of airports, like more generalized transportation disability, needs to be defined functionally, given that the use of these services necessitates the performance of specific tasks, including:

- Travelling to and from the air terminal;
- Moving around the departure/arrival terminal;
- Grasping money, tickets, carrying baggage;
- Seeing timetables, viewing screens, hearing announcements, etc.;
- Understanding the operation of transportation systems (i.e., understanding routes, transfers, fares, etc.);
- Using the facilities at the terminal, including the restroom facilities, restaurants, and so on; and
- Boarding, disembarking, and riding.

An appropriate functional definition of airport-disabled persons would accordingly be those people who cannot travel by air because specific barriers limit their ability to use airports, or whose use of air travel is limited or impeded by such barriers. Within this definition is included both those who face barriers which could be overcome through the provision of special services and equipment; as well as those who could not be helped by even the most sophisticated level of service. Accordingly, when wishing to specify the disabled and elderly market for airport services, one must be careful to include only those who are not specifically airport-disabled, together with those who are or who may be able to access air terminals when special equipment and services are available.

SOURCES OF DATA

The recent availability in Canada of both the Canadian Health and Disability Survey and the more recent Health and Limitation Survey has greatly extended the information available about the size and characteristics of the population of transportation-disabled persons in Canada. In contrast, the most recent nationwide survey in the United States was carried out in 1977, and only examined local transit issues(1). As the Canadian data provides information significantly in excess of that currently available in the United States, it was decided for the purpose of this paper to use the proven technique of incidence rates to estimate U.S. disabled populations from the Canadian data(2). Thus, throughout this paper, the incidence figures quoted are Canadian, while the population figures reflect the Canadian incidence rate applied to corresponding U.S. populations.

This paper draws almost exclusively from the information provided by the Canadian Health and Limitation Survey (HALS), conducted following the 1986 national census. This survey is the most comprehensive of its kind in Canada, and indeed in North America. The survey coverage included Canadians in every province, region, and territory, both those living in institutions and those in households, and so encompassed almost 120,000 disabled respondents. In addition to extending survey coverage from previously achieved levels, HALS also incorporates an extension of previous survey definitions of disability to include individuals who are limited in the kind or amount of activity they can do because of a learning, mental, psychiatric, or emotional disability. HALS also deals more specifically than previous studies with those people who are more likely to under-report themselves as being disabled, such as older people and those with a mild disability.

HALS adopted a functional limitation approach in defining disability in the adult population aged 15 and over. Questions concerning the ability to engage normally in activities of daily living were used to determine functional limitations. This approach is consistent with the World Health Organization's definition of disability, which is "any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being."

Within the HALS survey, the following categories of disability are defined:

- Mobility: limited in ability to walk, move from room to room, carry an object for 10 metres, or stand for long periods;
- Agility: limited in ability to bend, dress or undress oneself, get in and out of bed, cut toenails, use fingers to grasp or handle objects, reach, or cut own food.;
- Seeing: limited in ability to read normal print or to see someone from 4 metres, even when wearing glasses;
- Hearing: limited in ability to hear what is being said in conversation with one other or two more persons, even when wearing a hearing aid;
- Speaking: limited in ability to speak and be understood;
- Other: limited because of a learning disability or emotional or psychiatric disability, or because of developmental delay; and
- Unknown: limited but nature not specified.

HALS is rich in transport-specific information concerning the disabled. It examines the different modes of transportation used (including long distance, short distance, and personal vehicles), as well as the travel patterns of the group as a whole. Within the data is included information about the availability of suitable transportation services, usage of the different modes available, the difficulties that are encountered when using different transport modes, as well as the special needs of disabled travellers.

MARKET ANALYSIS

Quantifying the Potential Market for Airport Services

The potential market of disabled persons for airport services is a subset of both the entire U.S. disabled population and all transportation-disabled persons in the United States.

HALS has identified 14.3 percent of the adult population (15 years and over) as reporting some level of activity limitation in 1986. Applying this incidence rate to the U.S. adult population suggests that approximately 28.1 million disabled persons reside in the United States(3).

Of this total population of disabled persons, the potential market for airport services will only include those who are not precluded from the use of all forms of long-distance transport. Within this group will be included both those who are housebound (defined by HALS to be 7.8 percent of the total disabled population), together with those who are prevented from taking any long-distance trips because their condition or problem makes the use of long-distance transport services unsuitable. In this latter group, HALS indicates

that approximately 60 percent of the population of disabled people who are prevented from using long-distance transport services say that they do not use these services because of their condition. This implies that approximately 10 percent of the disabled population are prevented from using long-distance transport because of their condition, and a further 7.8 percent cannot because they are housebound. However, the remaining 82 percent of the disabled population are able to use long-distance transport, and accordingly are part of the potential market for airport services. This represents a potential market in the United States of 23 million persons.

Quantifying the Airport-Disabled Population

Using the HALS data sources, it is possible to quantify the population of disabled people who experience difficulties when travelling by air. It should be noted that these difficulties will incorporate problems experienced both within the air terminal and on the air carrier.

Table 11 illustrates that most disabled people do not specifically face difficulties in their use of long-distance transportation. In fact, excluding those disabled people who are housebound or otherwise precluded from long-distance travel, only 9 percent of disabled persons experience difficulties when using one or more modes of long-distance transport.

Table 12 shows that of this specific group, almost two-thirds identify difficulties when travelling by air. Thus, approximately 6 percent of people who are disabled, but are not precluded from long-distance travel, have disabilities which affect their use of air travel. Thus, the U.S. air travel-disabled population can be quantified at approximately 1.38 million people.

Table 12 also shows, more specifically, that people with hearing disabilities and seeing disabilities are the most likely groups to experience difficulties when traveling by air.

The relative incidence of difficulty encountered by disabled people when travelling by other modes of long-distance transport is also described in the table. It can be seen that the mode of transport causing the most problems for disabled groups is long-distance bus (approximately 72 percent identified this mode); the mode causing the least amount of difficulty was rail (approximately 55 percent identified this mode).

TABLE 11 DISABLED PEOPLE WHO FACE DIFFICULTIES USING LONG-DISTANCE TRANSPORT

Type	Percentage having difficulty		
	By air	By rail	By LD bus
All	0.64	0.56	0.72
Mobility	0.61	0.55	0.74
Agility	0.60	0.56	0.75
Seeing	0.67	0.62	0.73
Hearing	0.67	0.53	0.68
Speaking	0.63	0.68	0.68
Other	0.70	0.59	0.64
Unknown	0.71	0.47	0.59

TABLE 12 DIFFICULTY OF USING DIFFERENT MODES OF LONG-DISTANCE TRANSPORT

Type	Percentage having difficulty		
	By air	By rail	By LD bus
All	64	56	72
Mobility	61	55	74
Agility	60	56	75
Seeing	67	62	73
Hearing	67	53	68
Speaking	63	68	68
Other	70	59	64
Unknown	71	47	59

Characteristics of the Airport-Disabled Population

Tables 13 through 15 display the disability, gender, and age characteristics of that part of the disabled population who identify barriers to their use of air travel. In Table 13 it can be seen that over a third of the total population is over 65 years old. Further analysis indicates that almost 40 percent of people who have mobility and agility impairments, and approximately 50 percent of those with seeing and hearing disabilities are aged in

excess of 65 years. This fact suggests that at least a significant portion of these disabled groups owe their particular disability to the natural effects of ageing, rather than to any congenital or accident-related cause. Interestingly, of those disabled people who face barriers to air travel, 60 percent are female. One probable explanation for this phenomena may be derived from the heavy weighting of people aged over 65 in the sample, people who, on average, are more likely to be female.

Table 14 shows that the airport-disabled are most likely to be people with mobility or agility disabilities. Those with cognitive disabilities are the group next most likely to face difficulties in the use of air travel. The percentages in Table 14 do not add to 100 percent because many disabled people have multiple disabilities.

TABLE 13 AGE DISTRIBUTION OF PEOPLE WITH DISABILITIES WHO EXPERIENCE DIFFICULTIES IN USING AIRPORTS

Age	Percent of total	Number of people
15-34	19	262,656
35-54	26	359,424
55-65	20	276,400
65 +	36	497,664
Total	100	1,382,400

TABLE 14 PERCENTAGE DISTRIBUTION OF AIRPORT-DISABLED BY DISABILITY

Type	Percentage
Mobility	73
Agility	66
Seeing	24
Hearing	35
Speaking	11
Other	40
Unknown	2

Types of Barriers Encountered at the Airport

Disabled people face a broad range of barriers in accessing airport terminal services. These barriers are often at least partially a function of the nature of the disability. Barriers to airport use exist both in accessing the airport terminal, and in using the facilities within the terminal.

Table 15 shows both the types of terminal specific barriers encountered by disabled people who are users of airport services, together with the ranking of each barrier as a source of trouble.

It is surprising to note that only a small percentage of the disabled population who are not prevented from travelling long-distance cite the existence of specific barriers to their use of airports. For example, the difficulty experienced most frequently—moving around the terminal—was only a problem for 3 percent of the population. Other barriers, including hearing announcements, seeing signs and notices, accessing the washroom facilities and getting to the terminal, affected only 1 percent of the group. In fact, as the accessibility of washroom facilities and the issue of staff supportiveness were measured generally, and not in a terminal-specific way, these barriers are possibly overstated with respect to their importance as terminal-specific barriers.

Barriers to airport use will affect people suffering from different disabilities in different ways. Table 15 also shows how different disability groups are more likely to be affected by certain barriers than are others. For example, people with speaking disabilities as a group are more likely to encounter difficulties when moving around the airport than any other group; 9 percent of people with speaking disabilities cite this as a barrier. People with visual impairments are next most likely to experience this difficulty; 7 percent of this group identify this as a barrier.

Table 15 also illustrates that certain groups of disabled people will, overall, face more difficulties in using airport terminals than will other groups. Thus, it can be seen that of those disabled people who are long-distance transport users:

- 29 percent of people with speaking impairments face terminal-specific barriers;
- 19 percent of people with visual impairments face terminal-specific barriers;
- 11 percent of people with agility impairments face terminal-specific barriers;
- 13 percent of people with cognitive impairments face terminal-specific barriers; and
- 9 percent of people with mobility or hearing impairments face terminal-specific barriers.

This last finding would seem to have important planning implications, but it should also be noted that the two groups most likely to be affected by terminal barriers are also the two smallest groups of disabled persons who are part of the defined airport-disabled population.

TABLE 15 TYPES OF DIFFICULTIES ENCOUNTERED AT THE AIRPORT

	All	Mobility	Agility	Seeing	Hearing	Speaking	Other	Unknown
Getting to terminal	1	1	1	2	1	2	1	0
Moving around terminal	3	4	4	7	3	9	5	0
Hearing announcements	1	1	1	3	3	6	3	0
Seeing signs or notices	1	1	1	5	1	5	2	0
Using washroom facilities	0	0	0	1	0	1	1	0
Unsupportive staff	0	0	0	1	0	1	1	0
Percentage of all disabled travellers who face terminal barriers	7	9	11	19	9	29	13	0
Number of disabled travellers who face barriers in use of airports	1,382,400	843,264	691,200	190,771	425,77	966,355	342,835	99,532

People with speaking disabilities account for under 5 percent of this group, while people with seeing disabilities account for under 14 percent of the group.

Another important implication of this finding is that the groups of disabled people who are most likely to be affected by terminal barriers are not those who would conform to the general notion of a disabled person—that is, a person in a wheelchair. Not only do these results dispel that myth, but it is clear that there are a large number of "invisible" disabled people, such as the speaking-disabled, who proportionately face significant barriers in airport use. Certainly, airport design needs to cater to the needs of these less visible groups. However, the fact that these groups represent only a small proportion of the population who are disabled, but able to use long-distance transport, suggests a difficult trade-off: often those disabled people who experience the greatest difficulties in the use of airport facilities will also represent a very small proportion of the total potential disabled market for airport services.

Obviously the above analysis does not investigate the entire range of barriers faced by all disabled persons in the use of airports—it simply constitutes the set for which data is available. Figure 2 illustrates a broader range of barriers that may be encountered by disabled persons when using an airport terminal.

Barriers to Airport Use and their Impact on Air Travel

Clearly the importance in defining barriers to airport use by the disabled population lies in determining the extent to which these barriers actually limit the use of air

travel. Table 16 shows that those people who have difficulty in using air transport are, on average, likely to take fewer air trips than those who experience no difficulties. It should be noted that this specific analysis includes all barriers to air travel (that is, terminal barriers and aircraft barriers). Thus this analysis cannot say that it is airport-specific barriers which are responsible alone for limiting long distance travel.

TABLE 16 IMPACT THAT DIFFICULTIES HAVE ON THE NUMBER OF AIR TRIPS TAKEN

Trips taken	Percentage who experience difficulty	Percentage who do not experience difficulty
0	88.9	79.3
1	9.0	15.8
2	1.4	4.2
3-5	0.3	0.6
6+	0.4	0.1
Total	100.0	100.0

Income as a Barrier to Airport Use

As a group, disabled people are on average more likely to have lower incomes than the general population. This relates largely to the lower incidence of employment amongst the group, and a greater consequent need to rely on some form of welfare assistance. This

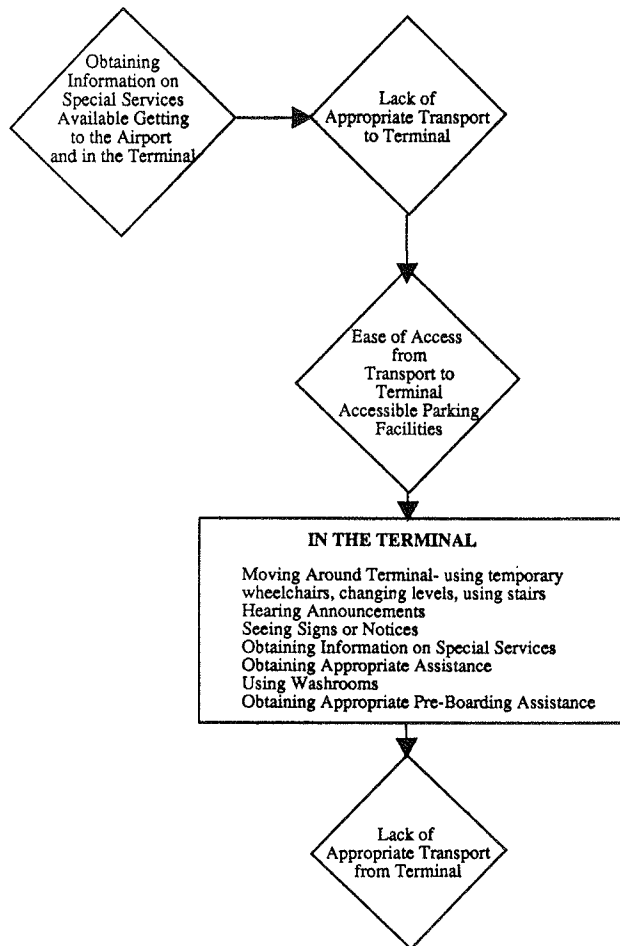


FIGURE 2 Airport barriers defined.

generalization is likely to be equally applicable to the U.S. population of disabled people as it is to the Canadian population, despite the differences in the socioeconomic characteristics of the two societies. However, given that there are significant differences between the economic profiles of the U.S. and Canadian general populations, it was decided that in this section of the paper the use of incidence rates would be inappropriate. Accordingly, the following table and analysis is all specific to Canadian populations, although general inferences about income as an effect on U.S. populations can certainly be drawn. Table 17 illustrates that 55 percent of all people who are disabled had individual annual incomes of less than \$10,000. Approximately 70 percent of all disabled people had incomes of less than \$15,000, (Note that Table 17 is expressed in Canadian dollars.)⁽⁴⁾ This income pattern is also reflected in the level of air travel usage: of those with incomes less than \$15,000 annually, approximately

90 percent did not take any air trips over the 3-month period measured.

In comparison, of those with incomes over \$35,000, less than 80 percent took no trips. Similarly, of those with incomes under \$15,000, no respondents took 3-5 air trips; in comparison, of those with incomes in excess of \$35,000, approximately 4 percent took 3-5 trips in the 3-month period. These findings suggest that perhaps income is the greatest barrier of all to the use of airports by disabled people.

Special Needs of the Airport-Disabled

The special needs of airport disabled people have important planning implications. Data analysis suggests that only 3 percent of these disabled long-distance travellers identify a need for special services and facilities to assist them in their use of all modes of long-distance transport. This relatively low number is possibly an understatement of the true number who would benefit from the provision of special facilities. Certainly, if people are unaware of how certain facilities would aid in their use of transportation services, then they are unlikely to cite a need for the provision of that facility. Table 18 shows the breakdown across disability groups of those requiring special services to assist their use of long-distance transportation services. It is interesting to note here that the group of people most concerned with obtaining special services and facilities to assist their long-distance travel are people with speaking impairments. This finding supports later findings in this paper that in fact this group faces the most barriers in the use of airport services.

The inability to obtain useful information about the availability of special services and facilities for disabled persons can in itself constitute a barrier to travel. Of people who do require special services when travelling long distance, 25 percent could not easily access information about those services. This constitutes an unnecessary barrier to travel.

Disabled people often require attendants when travelling for long distances. Table 19 shows that 17 percent of disabled long-distance travellers require an attendant to assist them. The need for an attendant is greatest amongst people with speaking disabilities; almost half of this group require such assistance. People with seeing and cognitive impairments are the groups next most likely to require an attendant's assistance. It can also be seen from Table 20 that disabled people aged in excess of 65 years are more likely to require the services of an attendant than are any other age group.

TABLE 17 INCOME AS AN INFLUENCE ON AIR TRAVEL

Income	Percent of all disabled travellers	Number of air trips taken (percent)				
		0	1	2	3-5	6+
None	10	93	7	1	0	0
Up to 4,999	16	92	6	2	0	0
5,000-9,999	29	91	7	1	0	0
10,000-14,999	15	90	9	1	0	0
15,000-19,999	8	93	6	1	0	0
20,000-24,999	6	88	11	1	0	0
25,000-29,999	5	82	14	2	2	0
30,000-34,999	4	87	8	4	1	0
35,000+	7	79	11	5	4	1
Total	100					

TABLE 18 PERCENTAGE OF TRAVELLERS WITH DISABILITIES WHO HAVE SPECIAL NEEDS

Type	Percentage who need special services	Percentage who do not need special services
All	3	97
Mobility	5	95
Agility	5	95
Seeing	6	94
Hearing	3	97
Speaking	9	91
Other	4	96
Unknown	1	99

TABLE 19 NEED FOR AN ATTENDANT WHEN TRAVELLING LONG DISTANCE (BY DISABILITY)

Type	Percentage who need attendant
All	17
Mobility	22
Agility	24
Seeing	37
Hearing	18
Speaking	46
Other	29
Unknown	6

TABLE 20 NEED FOR AN ATTENDANT WHEN TRAVELLING LONG DISTANCE (BY AGE)

Age	Percentage who need attendant
15-34	12
35-54	12
55-64	16
65+	25

MODEL OF THE AIRPORT-DISABLED POPULATION

The analysis completed in the paper thus far suggests that it would be useful to be able to model and quantify the airport-disabled population, as well as the impact that the availability of special services and facilities would have in extending the disabled market for airport services. The model developed in Figure 3 is a suggested framework for this further work. The model, which is largely self-explanatory, simply divides the total population who take long-distance trips (defined for the purposes of this study as trips of 80 km or more) into those who do travel by air and those who do not. The model then further subdivides these groups according to a range of functional criteria that establish their need for special equipment and services in the airport terminal. In this study, opportunities to extend the size of the current market for airport services to include more of the disabled and elderly population would derive from meeting the needs of two groups:

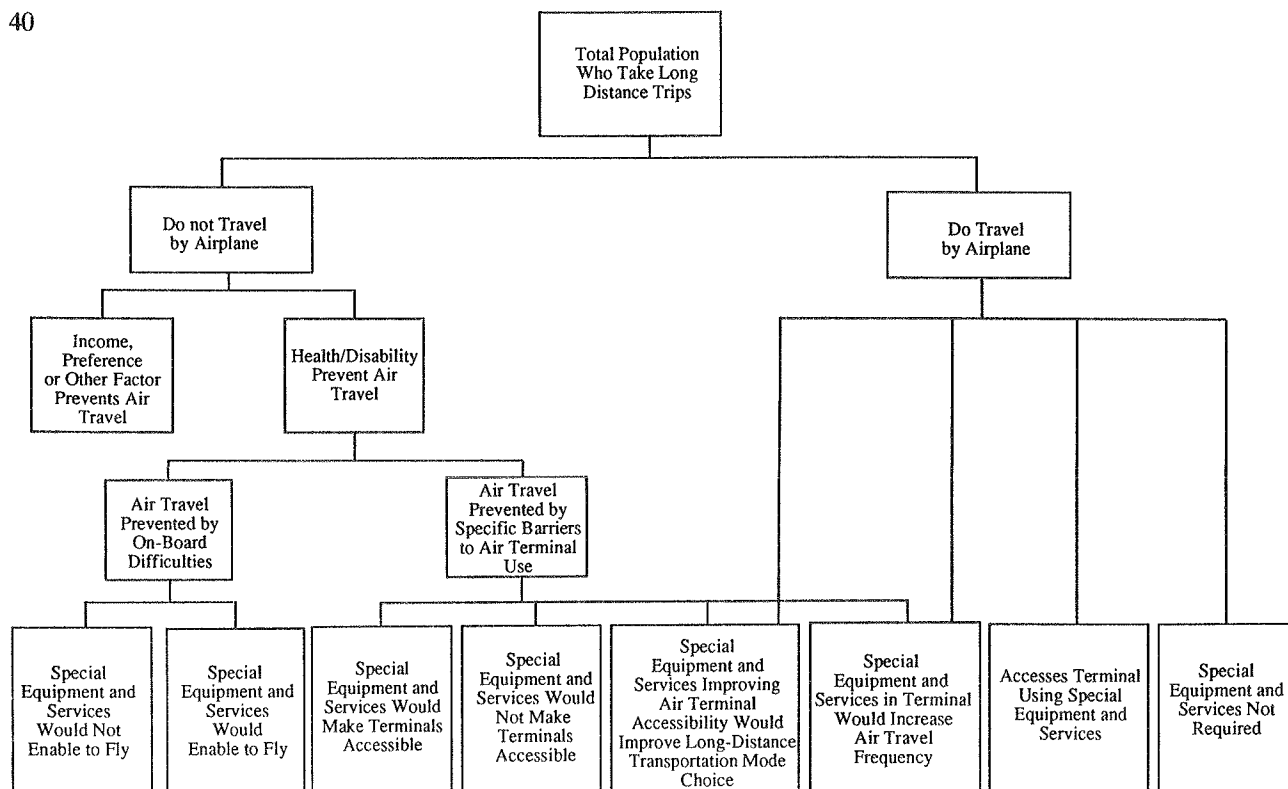


FIGURE 3 Defining the airport-disabled populations.

1. Those who do not currently travel by air due to their disability and related barriers to terminal use, but who could do so with the provision of special equipment and services; and
2. Those who would use air travel more frequently if special services were provided to make air terminals more accessible.

CONCLUSIONS

It is clear that despite the rapid growth evident in the U.S. air travel industry, the growth of the disabled persons' market is being limited by the existence of barriers at airport terminals. While available data resources cannot tell us the numbers of disabled people who would use air services with the removal of these barriers, we do know that a potential market of approximately 23 million people exists in the United States, and that a significant number of those people are limited in their use of air travel because of the existence of those barriers. An objective of further research would be to identify the percentage of that potential market for air travel services that is using air travel as a mode of long-distance transport. Of those who do not use air travel, it would be important to identify the extent to which surmountable barriers (such as those related to

the design of the airport terminal) account for the failure to use air transport, as opposed to the extent to which more insurmountable barriers (such as income-related barriers) are responsible.

This paper suggests that the groups that are most likely to experience difficulties in using airport terminal services are amongst the smaller groups within the overall disabled population. This phenomena poses a challenge for Airport Authorities: whether available resources should be used firstly to deal with the barriers faced by the larger groups of disabled people, or whether they should be expended initially in assisting those groups which face the most severe limitations in airport use.

The paper identifies the major barriers to the use of airport services as being:

- Moving around the terminal;
- Hearing announcements in the terminal;
- Seeing signs and notices in the terminal;
- Getting to the terminal; and
- Accessing the washrooms at the terminal.

While this is clearly not an exhaustive list of terminal barriers faced by disabled people, it does constitute the full list for which data is available. Clearly, further research could extend this listing and further detail the

nature of barriers which the disabled public may face when using airport terminals. A closely related issue is the need to identify airports where facilities do already exist which are designed to ease some of the abovementioned barriers. Research is needed to identify successful models of facilities and services which do adequately meet the special needs of disabled groups in their use of airport facilities. Not only should the monitoring of such facilities provide important feedback, but further research is needed to identify the extent to which such facilities have succeeded in increasing the number of disabled persons who use those airports, or at least in increasing the ease with which disabled persons can use those airports.

Clearly, further research and a subsequent implementation strategy are required throughout the U.S. airport system if the aviation network as a whole is to be opened effectively to the disabled. This will only occur when the needs of a growing and heterogenous population of disabled and elderly people are met more adequately.

NOTES:

1. U.S. Department of Transportation National Survey.
2. D. Lewis and B. Smith, "Special Driving Needs: Definition, Market Size For Canada and The United States and Guidelines For Consumer Choice," proceedings of the Fourth International Conference on Mobility and Transport for Elderly and Disabled Persons, Canada, 1986.
3. U.S. Census statistics identify 88.5 percent of the total U.S. population as being over age 15.
4. As of May 1990, the \$US equivalents of these Canadian incomes were approximately as follows:
 - CAD \$10,000 = US \$8,440
 - CAD \$15,000 = US \$12,660
 - CAD \$35,000 = US \$29,540
5. The data presented in this section measures the special needs of all disabled long-distance travellers, but is thought to provide a useful indication of the special needs of people who are disabled specifically in the use of airports.