Preliminary Regulatory Analysis

ACAA SNPRM
Accessible Kiosks and Web Sites

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Table of Contents

List of Tables

Executive Summary

The U.S. Department of Transportation (DOT) is issuing a Supplemental Notice of Proposed Rulemaking (SNPRM) to ensure that automated airport kiosks and air travel Web sites are accessible to air travelers with disabilities. The Department is proposing to require carriers (and airports, in the case of shared-use kiosks) to ensure that all new orders for automated airport kiosks are for models that comply with the technical standard set forth in the proposed rule.[1] U.S. and foreign carriers would be required to meet the Level A and AA success criteria and performance requirements included in the Web Content Accessibility Guidelines (WCAG) 2.0 standards for Web site accessibility. Carriers would also be required to ensure that the Web sites of large travel agents and tour operators (hereinafter referred to collectively as "ticket agents") selling air transportation on their behalf meet the same accessibility standard and that large and small ticket agents provide Web-based discounts and other Web-based amenities to the passengers who contact them offline upon request when their Web sites cannot be used by passengers with a disability because of their disability.

Econometrica has been tasked with developing a regulatory evaluation for these proposed regulatory requirements. In this preliminary analysis, we provide an overview of current industry practices, describe the alternatives that were evaluated, identify the parties affected by these alternatives, develop preliminary estimates of benefits and costs that can be quantified, and indicate the nature of additional benefits and costs for which no quantitative estimates could be developed.

All quantified benefits and costs estimated for individual requirements were translated into current values for each year in the 10-year period beginning with calendar year 2013 (hereinafter referred to as "Year 1").[2] In accordance with Office of Management and Budget (OMB) guidelines, a discount rate of 7 percent is used in the primary analysis and is supplemented with overall estimates using a 3-percent discount rate as well.

[1] As discussed below, this standard is based primarily on Section 707 of the Department of Justice's 2010 ADA Standards but also incorporate elements of the current Section 508 requirements for self-contained, closed machines.

[2] Some affected entities may need to begin incurring expenditures to comply with the proposed regulations relating to accessible Web sites as early as 6 months before the 10-year analysis period. These "Year 0" compliance costs have been included in the 10-year estimates of benefits and costs presented in this evaluation.

Table ES1 - Present Value of Net Benefits for Proposed Requirements, Years 1-10 (millions)

		Kiosks	Web Sites
Monetized Benefits	10 Years, 7% discounting	$86.2	$122.1
	10 Years, 3% discounting	$104.8	$147.3
Monetized Costs	10 Years, 7% discounting	$15.8	$66.8
	10 Years, 3% discounting	$18.6	$72.6
Monetized Net Benefits	10 Years, 7% discounting	$70.4	$55.3
	10 Years, 3% discounting	$86.2	$74.7

The expected present value (PV) of the benefits from the proposed requirements to ensure the accessibility of automated kiosks is estimated at $86.2 million over Years 1 through 10 using a 7-percent discount rate. The expected present value of costs incurred by carriers and airports to comply with these proposed requirements is $15.8 million over 10 years, discounted at 7 percent. The PV of net benefits for the 10-year analysis period at a 7 percent discount rate is thus $70.4 million. Using a 3 percent discount rate, the PV of net benefits for Years 1 through 10 is estimated at $86.2 million.

The expected present value (PV) of the benefits from the proposed requirements to ensure air travel Web site accessibility is estimated at $122.1 million over Years 1 through 10 using a 7 percent discount rate. The expected present value of costs incurred by carriers and airports to comply with these proposed requirements is $66.8 million over 10 years, discounted at 7 percent. The PV of net benefits for the 10-year analysis period at a 7 percent discount rate is thus $55.3 million. Using a 3 percent discount rate, the PV of net benefits for Years 1 through 10 is estimated at $74.7 million.

There are additional benefits and costs associated with the proposed requirements for which quantitative estimates could not be developed. These are discussed in Sections 5.4 and 5.5 for kiosks and in Sections 6.4 and 6.5 for Web sites.

This regulatory analysis indicates that adoption of the proposed requirements for both automated airport kiosks and air travel Web sites will result in projected benefits to the public that outweigh the estimated costs.

Introduction

The U.S. Department of Transportation (DOT) is developing proposed regulatory requirements that would help to ensure nondiscrimination on the basis of disability in air travel. These requirements would extend beyond those included in the May 13, 2008, Final Rule amending the Air Carrier Access Act (ACAA). In the Final Rule, the Department noted that it planned a Supplemental Notice of Proposed Rulemaking (SNPRM) to discuss potential additional regulatory requirements in the five following areas:

Area #	Description
1	Carrier-supplied in-flight medical oxygen
2	In-flight entertainment (IFE) systems
3	Automated airport kiosk accessibility
4	Carrier Web site accessibility
5	Exclusion of service animals on foreign carriers

In the accompanying SNPRM, the Department is proposing requirements addressing areas 3 and 4 to ensure that automated airport kiosks and air travel Web sites are accessible to travelers with various types of disabilities. Econometrica has been tasked with developing a regulatory evaluation for these proposed regulatory requirements. In this preliminary analysis, we provide an overview of current industry practices, describe the alternatives that were evaluated, identify the parties affected by these alternatives, develop preliminary estimates of benefits and costs that can be quantified, and indicate the nature of additional benefits and costs for which no quantitative estimates could be developed. All of these preliminary estimates are based on data available thus far and are likely to be revised as additional information is obtained.

The regulatory requirements under consideration would serve to reduce or eliminate barriers to air travel for passengers with disabilities who require assistance or accommodation in one or more of the following areas:

- Hearing
- Visual
- Mobility
- Fine motor dexterity
- Cognitive

Economic evaluation of possible requirements in these areas is complicated by the fact that the technologies available to address many of these disabilities are continuously evolving. Regulatory requirements must therefore take into account not only the technologies that may be available to carriers for achieving compliance but also technologies that may provide better or more cost-effective future support options for travelers with disabilities, whether or not any requirements are put into effect. Consequently, an important element of this regulatory analysis is an assessment of the feasibility, characteristics, costs, and projected availability and efficacy of these new technologies.

1. Guarantees of Equal Access for Persons with Disabilities

There are currently no Federal statutes or regulations establishing accessibility standards for U.S. and foreign air carrier Web sites and for automated airport kiosks. This section provides a brief overview of the current statutory and regulatory guarantees of equal access for persons with disabilities that are relevant for the evaluation of the proposed requirements to establish such standards in this SNPRM.

1.1. Air Carrier Access Act (ACAA)

The Department issued a final rule in 1990 implementing the 1986 Air Carrier Access Act (ACAA), which prohibits discrimination in the provision of airline service on the basis of disability. The regulations implementing the statute have been revised and extended on numerous occasions, most recently in a rule published on May 13, 2008. The 2008 rule extended the ACAA to apply to foreign carriers and added new provisions relating to passengers who need to use medical oxygen and passengers who are deaf or hard of hearing.

The ACAA rules are designed to minimize the special problems that travelers with disabilities may face as they seek to utilize the air travel system. The Department attempts to achieve this objective:

- By recognizing that the physical barriers encountered by passengers with disabilities can frequently be overcome by employing simple changes in layout and technology.

- By adopting the principle that many difficulties confronting passengers with hearing or vision impairments will be relieved if they are provided access to the same information that is available to all other passengers.

- Through training of all air travel personnel who come in day-to-day contact with persons with disabilities, to understand their needs and how they can be accommodated quickly, safely, and with dignity.[3]

In the accompanying SNPRM, the proposed accessibility requirements for automated airport kiosks will help to mitigate the physical barriers faced by users with mobility, hearing, cognitive, or fine motor skill disabilities, as well as make them usable by those with vision disabilities. The proposed requirements for ensuring Web site accessibility primarily address the need to provide those with vision disabilities access to online information and services related to air travel.

[3] DOT Office of Aviation Consumer Protection and Enforcement, "New Horizons: Information for the Air Traveler with a Disability," available at http://airconsumer.ost.dot.gov/publications/horizons.htm.

1.2. Section 707 of the ADA Accessibility Guidelines

While the ACAA governs service provision by U.S. and foreign carriers, airport-based operations are also subject to various other Federal laws and rules, as the text of the May 2008 Final Rule makes clear:

> U.S. airports are governed, for disability nondiscrimination, by several Federal laws and rules, all of which coexist on the same airport real estate. The ACAA and DOT's ACAA rules apply to terminal facilities owned, leased, or controlled by a carrier, specifically facilities that provide access to air transportation (e.g., ticket counters, baggage claim areas, gates). Title II of the ADA, and the Title II rules of the Department of Justice (DOJ) apply to terminal facilities owned by public entities like state and local airport authorities. DOT's rules under section 504 of the Rehabilitation Act of 1973 apply to those same facilities owned by public entities, if they receive DOT financial assistance (i.e., under the FAA's airport improvement program). In some cases, DOT's 504 rules could apply to airport facilities of airlines (e.g., those air carriers who receive essential air service program funds from DOT). … DOT's Title III ADA rules apply to private transportation serving the airport (e.g., private taxi, demand-responsive shuttle, or bus service). DOJ's Title III ADA rules also apply to places of public accommodation on airport grounds that serve the general public (e.g., hotels, restaurants, news, and gift stores).[4]

Revised regulations for Titles II and III of the ADA were published on September 15, 2010. Standards for automatic teller machines and fare machines in Section 707 of the 2004 ADA Accessibility Guidelines (ADAAG), which are incorporated into both Title II and Title III of the 2010 Standards, will become enforceable requirements on March 15, 2012. While interactive transaction machines (ITMs), other than automatic teller machines (ATMs), are not covered by Section 707, the technical standards that the Department is proposing for automated kiosks are based in large part on the Section 707 requirements.

1.3. Section 508

The U.S. Access Board is an independent Federal agency devoted to accessibility for people with disabilities. The Board develops and maintains design criteria for the built environment, transit vehicles, telecommunications equipment, and electronic and information technology. The Board's accessibility standards for electronic and information technology developed, procured, maintained, or used by Federal agencies are compiled in Section 508 of the Rehabilitation Act of 1973.[5] The requirements in Part 1194.25 of Section 508 pertain to "self contained, closed products," which include automated self-service machines such as kiosks. Elements of these standards have been incorporated into the automated airport kiosk requirements proposed in the accompanying SNPRM.

[4] DOT, 73 FR 27614, May 13, 2008, as modified by Correction Notices 74 FR 11469, March 18, 2009 and 75 FR 44885, July 30, 2010.

[5] Section 508 accessibility standards, information on best practices, and links to training and technical support forums are available at www.Section508.gov.

Part 1194.22 of Section 508 covers Federal agencies' Web-based Intranet and Internet information and applications. These requirements include 16 specific standards, which are designed to ensure that Federal agencies' Web sites can be processed and interpreted by assistive technology such as screen readers. In July 2010, the Access Board issued an Advanced Notice of Proposed Rulemaking (ANPRM) to solicit comment on revising or "refreshing" the current Section 508 standards. However, the timeframe for final publication of the refreshed Section 508 standard is uncertain at present.

In the interim, the Department has based its proposed requirements for Web site accessibility on Web Content Accessibility Guidelines (WCAG) Version 2.0, discussed below. The Access Board stated in the ANPRM that it was considering harmonizing the Section 508 standards with WCAG 2.0, and it requested public comment on a specific technical approach to doing so.

1.4. Website Accessibility Initiative (WAI)

The World Wide Web Consortium (W3C) is an international community of Web programmers and users that develops technical specifications and guidelines for Web site technology. W3C, through its Website Accessibility Initiative (WAI), has twice developed and issued sets of consensus accessibility guidelines. Version 1.0 of the Web Content Accessibility Guidelines (WCAG) provided the foundation for the current Section 508 standards for Web site accessibility. After a long development and review process, Version 2.0 was published on December 11, 2008. WCAG 2.0 encompasses 12 guidelines that seek to ensure that Web sites are "Perceivable, Operable, Understandable, and Robust" for people with various types of disabilities. In contrast to many of the elements of Version 1.0, the performance criteria specified in each section of the WCAG 2.0 guidelines are widely regarded to be operationally achievable, measurable, and potentially enforceable.[6]

Both WCAG 1.0 and 2.0 have been incorporated into government-enacted Web site accessibility requirements by reference. For example, all official Web sites of the European Union institutions are currently expected to follow the WCAG 1.0 guidelines for accessible Web content. In the accompanying SNPRM, the Department is proposing to ensure the accessibility of air travel Web sites through requirements that reference the WCAG 2.0 standards.

2. Disabled Passengers Requiring Accommodation in Air Travel

This section provides an overview of the data sources and estimates that can be used to estimate the population of disabled passengers who may reasonably be expected to benefit from the proposed requirements in the accompanying SNPRM. As the discussion below indicates, adequate public survey data are available to estimate the prevalence of specific disabilities (such as hearing, mobility, and vision-related disabilities) for both the U.S. population generally and among selected age groups. There are also estimates available for the overall rates of Internet

[6] WCAG 2.0 and other guidance, examples, best practices, and resources are available at http://www.w3.org/standards/webdesign/accessibility.

access among people without and with disabilities, although data on the extent to which the frequency and nature of online activity varies among people with specific types of disabilities are limited. Finally, estimates of the extent of air travel by people with disabilities are available from two surveys. Collectively, these data sources provide a foundation for deriving estimates of the numbers of potentially affected air travelers requiring accommodation from measures of the U.S. population with specific disabilities.

2.1. Extent and Severity of Disabilities in the U.S. Population

Information on the extent and severity of disabilities in the U.S. population is available from a variety of government data sources. The most useful of these are the American Community Survey (ACS) and the Survey of Income and Program Participation (SIPP), both of which provide estimates of the proportion of the U.S. population in selected age groups who have hearing or vision disabilities or who have disabilities related to mobility.

The American Community Survey (ACS)
The Census Bureau conducts the ACS on an annual basis to be able to present a more detailed profile of the U.S. population than is available from the decennial Census of Population. The 2008 and 2009 ACS results provide recent estimates of the proportion of the population aged 18 to 64 years, as well as 65 and older, respectively, who have serious difficulty seeing, serious difficulty hearing, or ambulatory difficulty.[7]

One limitation of the ACS data is that the survey does not collect information on the use of assistive technologies, so it is not possible to determine the proportion of people in each of these age ranges who used wheelchairs, for example. In addition, the criteria used to identify hearing and vision difficulties may be less stringent than those that could be used to define the population of individuals who may require accommodation under the ACAA or other Federal accessibility statutes and regulations.

The Survey of Income and Program Participation (SIPP)
The Census Bureau also periodically conducts the SIPP, which asks more detailed questions about a variety of household characteristics and finances. The 2005 SIPP included a supplement on disability status, which was used to develop estimates of the U.S. population with specific disabilities reported to be "severe" or "not severe." The 2005 SIPP also specifically asked about the use of wheelchairs.[8] In contrast to the ACS, the SIPP results are reported for the U.S. population aged 15 years and older (rather than 18 and older), as well as for those 65 and older.

While there are differences between the two sources in the overall methodology, data collection instruments, and dates of administration, it is useful to compare selected results from the 2009 ACS and 2005 SIPP.

[7] The portion of the ACS questionnaire that collects information about disabilities was revised substantially beginning with the 2008 survey, so estimates from the 2008 and 2009 ACS cannot directly be compared with the results from previous years. See Matthew Brault, "Review of Changes to the Measurement of Disability in the 2008 American Community Survey," Census Bureau, September 22, 2009.
[8] The 2008 SIPP also included a supplement that asked disability-related questions, but the results from this section of the survey had not yet been released at the time this evaluation was prepared.

Table 1 - U.S. Population by Disability Status, 2005 and 2009

	SIPP, 2005		ACS, 2009	
	Number (1,000s)	Percent of Group	Number (1,000s)	Percent of Group
All ages	291,099		301,472	
With a disability	54,430	18.7%		
Severe disability*	34,953	12.0%	36,151	12.0%
Aged 15 and older **	230,391		227,114	
With a disability	49,073	21.3%		
Severe disability*	32,776	14.2%	33,244	14.6%
Difficulty seeing	7,794	3.4%	5,966	2.6%
Severe difficulty seeing* **	**1,783**	**0.8%**		
Difficulty hearing	7,809	3.4%	9,761	4.3%
Severe difficulty hearing * **	**992**	**0.4%**		
Ambulatory difficulty	27,360	11.9%	19,014	8.4%
Used a wheelchair* **	**3,311**	**1.4%**		
Aged 15 to 64**	195,363		189,181	
With a disability	30,940	13.4%		
Severe disability*	19,833	8.6%	19,055	10.1%
Difficulty seeing	4,260	1.8%	3,270	1.7%
Severe difficulty seeing* **	**819**	**0.4%**		
Difficulty hearing	3,894	1.7%	3,914	2.1%
Severe difficulty hearing * **	**465**	**0.2%**		
Ambulatory difficulty	14,014	6.1%	9,800	5.2%
Used a wheelchair* **	1,488	**0.6%**		
Aged 65 and older	35,028		37,932	
With a disability	18,133	51.8%		
Severe disability*	12,943	37.0%	14,189	37.4%
Difficulty seeing	3,534	10.1%	2,696	19.0%
Severe difficulty seeing* **	**964**	**2.8%**		
Difficulty hearing	3,915	11.2%	5,847	15.4%
Severe difficulty hearing * **	**527**	**1.5%**		
Ambulatory difficulty	13,346	38.1%	9,213	24.3%
Used a wheelchair* **	**1,823**	**5.2%**		

*Asked as "serious disability" on ACS data collection instrument.

**ACS estimates are for age 18 and older.

***Not included on ACS data collection instrument.

Source: Census Bureau, "Americans With Disabilities: 2005," Current Population Reports, P70-117, December 2008 and 2009 American Community Survey.

In presenting these comparisons, we have aligned the overall percentages of the population in each age range reporting any type of disability in the 2009 ACS with the percentage of the same age group reporting a severe disability in the 2005 SIPP. With this adjustment, the results from the two surveys appear to be very comparable, increasing the level of confidence that they can be used to estimate the number of people who might potentially benefit from improved accessibility of automated airport kiosks and Web sites relating to air travel.

The 2005 SIPP estimates can be interpreted as indicating that, while a significant portion of the U.S. population (and a majority of the population aged 65 and older) has some type of disability, relatively small percentages of the population have each of the specific types of severe impairments that are being addressed specifically by the proposed regulatory requirements. However, many air travelers with less severe vision, hearing, mobility, or fine motor skill impairments may also benefit from more accessible automated kiosks and/or carrier/ticket agent Web sites. For example, more accessible Web sites may make navigation easier for people with motor skill limitations that make using a mouse difficult.

2.2. Use of Electronic Technologies by People with Disabilities

As Internet use became more widespread in the 1990s, a series of Department of Commerce studies focused on the existence of a "digital divide," a term that was used to refer to disparities in the rates of Internet access and the extent of online activities among members of various socioeconomic groups. The last of these studies (which was conducted in 2004) presented estimated Internet use rates for people who reported being blind or having severe vision impairments. More recent, but less extensive, information on online access and participation rates is available from research sponsored by the Federal Communications Commission (FCC) and the Pew Internet and American Life Project.

A Nation Online: Entering the Broadband Age (NTIA 2004)

A 2004 study by the National Telecommunications and Information Administration (NTIA) presented information on differences in online access rates among groups with various disabilities. For this analysis, the access rates of interest are those for people who are blind or who have severe vision impairments:

Table 2 - Internet Use Rates among Various Populations

	2001	2003
Blind/severe vision impairment		
Aged 25-60, in labor force	56.2%	63.7%
Aged 25-60, not in labor force	40.3%	40.0%
Over 60	9.6%	23.0%
No disability reported		
Aged 25-60, in labor force	67.0%	71.0%
Aged 25-60, not in labor force	47.0%	52.5%
Over 60	26.4%	34.2%
U.S. Population	**55.1%**	**58.7%**

Source: NTIA, "A Nation Online: Entering the Broadband Age," Sept. 2004.

The NTIA estimates suggest that Internet access rates for blind people and those with severe visual impairments were lower than for people without disabilities but that the gap between the two groups was closing by 2003. It is possible that the Internet access rate for visually disabled people has grown even closer to that for the general population since then. However, more recent data on Internet access rates for people with specific disabilities could not be located.

Broadband Use and Adoption in America (FCC 2010)

Attention has been focused more recently on the impact of disability status on broadband access rates. In a recent FCC working paper, John Horrigan finds a significant gap between Internet use rates for disabled and non-disabled users:[9]

> Collectively, 24 percent of respondents had an affirmative response to one of those questions and, for purposes of this report, are classified as people with disabilities. Within this group, 42 percent have broadband at home—much lower than the 65 percent average. Some 56 percent of those with disabilities are Internet users, below the 78 percent average. Nearly half (47 percent) of non-Internet users report having some sort of disability.

However, it is difficult to isolate the impact of disability from that of other socioeconomic characteristics that are also associated with lower rates of Internet use, as Horrigan notes:

> …people with disabilities and non-adopters overlap quite a bit and in fact share many characteristics with non-adopters: They are generally older and have lower incomes. For that reason, it is not a surprise that non-adopters include a disproportionately high share of people with disabilities. Some of the difference in adoption rates is due to individuals' disabilities and some is due to lower incomes, advanced age or other factors associated with low adoption.

[9] John Horrigan, "Broadband Use and Adoption in America," Federal Communications Commission, OBI Working Paper No. 1, February 2010.

Americans Living with Disability and their Technology Profile (Pew 2011)

A January 2011 Pew Internet and American Life Project report presented survey-based estimates on the extent of disabilities in the U.S. population and the impact of disability on the use of technology.[10] The Pew report estimates on the impact of disability on the use of electronic technologies corroborate the FCC report finding of a large gap in the Internet use rates between the disabled and non-disabled segments of the population. However, a very small percentage of disabled Internet users indicated that their disability caused problems with using the Internet.

Table 3 - Internet Use among Disabled and Non-Disabled Population

	Disabled	Non-Disabled
High School education or less	61%	40%
HH Income < $30,000/year	46%	26%
Use the Internet	54%	81%
% with use problems	2%	
Do not use the Internet	46%	19%
Have broadband at home	41%	69%

Source: Pew Internet and American Life Project, "Americans living with disability and their technology profile," January 21, 2011.

Based on these results, it seems reasonable to infer that on an income- and age-adjusted basis, Internet access and use rates for the disabled population are becoming increasingly similar to those for the non-disabled population.

2.3. Travel Behavior of People with Disabilities

Relatively few data sources are available to characterize the travel patterns of people with disabilities. The most useful of these are a 2003 report by the Bureau of Transportation Statistics (BTS) and two surveys sponsored by the Open Doors Organization (ODO).

Freedom to Travel (BTS 2003)

In 2002, the BTS conducted a study on the travel behavior of people with disabilities.[11] The results presented in the "Freedom to Travel" report indicated that disabled people had a lower average propensity to travel by air than did non-disabled people—the average disabled person in the BTS study sample was only 78 percent as likely to have traveled on a commercial airline in the past year.

[10] Susanna Fox, "Americans Living with Disability and Their Technology Profile," Pew Internet and American Life Project, January 21, 2011.
[11] DOT Bureau of Transportation Statistics, "Freedom to Travel," BTS03-08, 2003.

Table 4 - Selected Data for 2002 from BTS Freedom to Travel

	Disabled	Non-Disabled
Average Age	50.7	31.9
% Using in Last Year:		
commercial airline	31.5%	40.1%
private/charter airplane	1.4%	1.3%

Source: BTS Freedom to Travel, 2003.

One result worth noting is that the average age of disabled people in the BTS study was nearly two decades higher than that of the non-disabled respondents. It is therefore difficult to assess the extent to which traveler age may influence the propensity to travel by air, irrespective of the person's disability status. The report also does not present travel frequencies for people with varying specific types of disabilities.

The Open Doors Organization/Harris Surveys

A 2002 survey sponsored by the Open Doors Organization showed that about 30 percent of adults with disabilities traveled by air at least once during the previous 2 years. Disabled travelers reported taking an average of two trips by air during the previous 2 years, which is consistent with an estimated 9.4 million trips taken annually by disabled travelers.[12] One-third of disabled travelers who flew during the past 2 years made at least three trips by air.

The ODO survey was updated in 2005. The percentages of those who traveled by air in the past 2 years was comparable in both surveys (as well as the percentage found in the 2002 BTS study), and the percentage of travelers who reported booking online increased substantially between 2002 and 2005.

Table 5 - Selected Data from Open Doors Organization/Harris Interactive

	2002	2005
% who traveled by air in the past 2 years:	30%	31%
Average number of air trips per year	1	1
% who book online	33%	51%
% who consult Internet for accessibility info	46%	43%

Source: Open Doors Organization/Harris Interactive Surveys, 2002 and 2005.

3. An Overview of the Air Transportation Sector and Current Regulatory Structure

This section provides a description and statistical profile of the passenger air travel sector: flights and passengers, U.S. and foreign carriers, airports, travel agencies and tour operators ("ticket agents"), and regulatory authorities.

[12] The ODO survey collected data on trips. Each round trip would be equivalent to approximately 3.2 flight segments, which would imply that travelers with disabilities account for approximately 30 million flight segments annually.

3.1. Flights and Passengers

Airline passengers travel to both domestic and international destinations using both scheduled and nonscheduled (charter) service provided by U.S. and foreign carriers. Carrier-specific data on the annual numbers of domestic and international departures and passengers boarded for each type of flight are available from the BTS T-100 segment database.

Most passenger travel is on scheduled service flights, and seven out of every eight scheduled flights are to destinations within the United States. Virtually all domestic flights are on U.S. carriers. Foreign carriers may transport passengers between two U.S. airports only on segments of flights that originate from or continue on to international destinations. U.S. carriers also account for a significant majority of international departures, although the share of passengers on international flights is divided more evenly between U.S. and foreign carriers because the average number of passengers per departure is larger on flights operated by foreign carriers.

Table 6 - Scheduled Passenger Service: Departures and Passengers, 2009

	Domestic	International	Combined
Departures			
U.S. Carriers	8,751,178	775,885	9,527,063
Foreign Carriers	2,389	483,944	486,333
Total	**8,753,567**	**1,259,829**	**10,013,396**
Passengers			
U.S. Carriers	631,955,369	83,152,598	715,107,967
Foreign Carriers	503,133	66,349,930	66,853,063
Total	**632,458,502**	**149,502,528**	**781,961,030**
Passengers/Departure			
U.S. Carriers	72.2	107.2	75.1
Foreign Carriers	210.6	137.1	137.5
Total	**72.3**	**118.7**	**78.1**

Source: BTS T-100 Segment database, 2009.

The number of passengers flown typically rises each year, but enplanements fell in 2008 and again in 2009. The Federal Aviation Administration (FAA) Aerospace Forecast for 2010 through 2030 projected increases of 0.4 percent and 0.9 percent, respectively, from 2009 to 2010 in the numbers of passengers flying on domestic and international flights. For 2011 and future years, the Forecast projects that annual passenger enplanements will increase by an average of 2.8 percent annually on domestic routes and 4.2 percent on international routes.[13]

3.2. U.S. and Foreign Air Carriers

About 230 U.S. and foreign air carriers provide some combination of scheduled and nonscheduled passenger air service to U.S. and international destinations from at least one U.S. airport. U.S. air carriers operating any aircraft of 60 seats or more must have a certificate under

[13] Federal Aviation Administration, *FAA Aerospace Forecast: Fiscal Years 2010-2030.*

49 USC § 41102 (or an exemption issued by DOT from that section) to provide scheduled passenger service. Some carriers that operate fleets consisting only of smaller aircraft may also be "certificated carriers." A relatively limited number of carriers operating small aircraft are authorized as "commuter air carriers" under the definition provided in 14 CFR 298.3(b). Foreign air carriers must hold permits issued under 49 U.S.C. § 41302 (or an exemption issued by DOT from that section) to operate flights that arrive or depart at U.S. airports.

The applicability of some current Part 382 requirements varies not only between U.S. and foreign carriers but also among different categories of carriers, based on the seating capacity of the aircraft the carrier operates. The requirements proposed in this SNPRM would apply to all U.S. and foreign carriers operating flights to and from the United States that provide flight-related services to customers on automated kiosks at U.S. airports, as well as to all U.S. and foreign carriers that market air transportation to the general public in the U.S. on a Web site.

Reporting carriers

In 2012, the roster of reporting carriers, those U.S. carriers that account for at least 1 percent of domestic scheduled passenger service revenues, is expected to include six mainline carriers (Alaska, American, Delta, Hawaiian, United, and US Airways), three low-cost model major airlines (Frontier, JetBlue, and Southwest), and five regional carriers (American Eagle, Atlantic Southeast, ExpressJet, Mesa, and SkyWest).[14]

Table 7 - Scheduled Passenger Service on U.S. Carriers, 2009

	Number of Carriers	Departures	Passengers	Passengers/ Departure
Reporting Carriers	18	7,008,602	628,155,438	90
Other U.S Carriers	79	2,517,894	86,952,529	35
Total	**97**	**9,526,496**	**715,107,967**	**75**
Reporting % of Total	18.6%	73.6%	87.9%	--

Source: BTS T-100 Segment database, 2009.

Aircraft size-based distinctions among carriers

Carriers that provide passenger service exclusively using aircraft originally designed with 60 seats or less are considered small entities for purposes of assessing impact under the relevant requirements of the Regulatory Flexibility Act. The regulatory requirements for these carriers are somewhat less extensive than for larger carriers.

[14] There were 18 reporting carriers at the end of 2009. Since then, Air Tran has been purchased by Southwest, Continental and United have merged, Comair no longer must report, and Pinnacle has elected to discontinue reporting on a voluntary basis. It is also possible that ExpressJet will discontinue reporting voluntarily if SkyWest (which acquired the carrier in 2010) elects to consolidate reporting by the beginning of 2012.

Table 8 - U.S. Carriers by Size Class, 2009

Group	Seat Criterion	Total in 2009 T-100*	Charter-only**	Scheduled Service	Contract Carriers	Other
Large	> 60	49	16	33	15	18
Small	30 - 60	12	0	12	6	6
Very Small	< 30	38	10	28	1	27
Total		**99**	**26**	**73**	**22**	**51**

Note: 17 large carriers and 1 small carrier are reporting carriers.

*Excludes carriers that were no longer operating independently by the end of 2010.

**Six charters offered some scheduled service in 2009; all are very small Alaska or sightseeing tour carriers.

The U.S. domestic airline industry continues to undergo significant consolidation. Of the 117 U.S. carriers operating at the beginning of 2009, 20 were no longer providing service 2 years later. Fourteen of the remaining carriers are wholly-owned subsidiaries that do not independently market air transportation services but are treated as separate entities for some reporting and regulatory compliance purposes.

Mainline and regional airlines

Several U.S. carriers, including 5 of the 14 carriers expected to be reporting carriers by the beginning of 2012, operate flights primarily or exclusively on a contract basis, providing service primarily for the largest mainline network carriers. Most of these carriers do not sell scheduled air transportation services directly to the general public; the flights they operate are listed on the contracting carriers' schedules under code-share agreements. A few small regional carriers (e.g., Cape Air and Great Lakes) operate both contract and independently-marketed flights.

Regional carriers—both contract carriers and those that market flights independently—provide service to a much larger network of communities than do the mainline and low-cost national carriers. The Regional Airlines Association (RAA) estimates that its 68 member carriers provide the only scheduled service available at 263 of the 428 U.S. airports in the 48 contiguous States and at 185 of the 207 airports in Alaska, Hawaii, and Puerto Rico.[15] Regional carriers are typically subject to the same reporting and regulatory requirements as other airlines in the same size classes.

Foreign carriers

Foreign carriers operating flights to and from the United States are generally subject to the same regulatory requirements as U.S. carriers with respect to covered flights. There are 130 foreign carriers that operate scheduled or charter service to the United States.[16] Of these, 89 market scheduled service flights to U.S. passengers.

[15] Regional Airline Association, *2010 Annual Report.*

[16] Four foreign carriers operate passenger service to and from the United States exclusively with aircraft having fewer than 30 seats. These carriers do not have to comply with the requirements that apply only to U.S. and foreign carriers which provide passenger service on at least one aircraft that has 30 or more seats.

Table 9 - Number of Foreign Carriers

Group	Total in 2009 T-100*	Charter-only*	Scheduled Service	Contract Carriers	Other
EU	47	21	26	2	24
Canada	10	2	8	2	6
Total	**130**	**29**	**101**	**12**	**89**

*No charter service carrier operated more than three scheduled service flights in 2009.

3.3. Airports

The FAA classifies airports into a set of size-based categories based on the annual number of passengers boarded ("enplanements"). The proposed requirements in this SNPRM concerning automated airport kiosk accessibility will apply only at U.S. airports having 10,000 or more annual enplanements. There were 385 U.S. airports with at least 10,000 passenger enplanements in 2009. More than two-thirds of domestic and international passengers departed from 29 major metropolitan hubs, and another one-fifth departed from 37 medium hub airports.

Table 10 - Passenger Enplanements by Size of Airport, 2009

Category	Minimum %/# of Passengers	# of Airports	Passengers (millions)	% of Total	Passengers per Airport
Large Hub	>1% of total	29	491.7	69.3%	17.0 million
Medium Hub	>0.25% of total	37	138.0	19.4%	3.7 million
Small Hub	>0.05% of total	69	56.7	8.0%	821,000
Non-Hub	>10,000/year	250	22.9	3.2%	91,000
Other Commercial	>2,500/year	180	0.9	0.1%	5,000
Total		**565**	**710.1**	**100.0%**	**1.3 million**

Source: BTS T-100 Segment database, 2009.

3.4. Travel Agencies and Tour Operators

Travel agencies and tour operators are the two largest industry sectors (in addition to carriers) that sell air travel. These sales sometimes are made on a standalone basis and sometimes as part of a package that may include accommodations, activities, and ground transportation. Carrier, travel agent, and tour operator Web sites also offer packages that do not include any air transportation.

According to a recent study, about 17 percent of travel agencies have online ticketing capability. The four largest online travel agencies (OTA)—Expedia, Orbitz, Priceline, and Travelocity—reportedly account for 96 percent of all online sales by travel intermediaries in the leisure travel market segment.[17]

[17] PhoCusWright, *The Role and Value of the Global Distribution Systems in Travel Distribution*, November 2009.

Table 11 - Travel Agencies and Tour Operators, 2007

	Total Firms	Largest OTAs	Others with Online Sales	Offline Sales Only	Large Businesses (SBA Definition)	Small Businesses (SBA Definition
Travel Agencies	11,953	4	2,028	9,921	328	11,625
Tour Operators	2,814	0	478	2,336	94	2,720

Sources: Bureau of the Census, Economic Census, 2007; PhoCusWright, *The Role and Value of the Global Distribution Systems in Travel Distribution*, 2009.

However, most travel agencies and tour operators are small businesses with fewer than 20 employees. The applicable SBA size standards designate travel agencies with no more than $3.5 million in annual revenues and tour operators with no more than $7.0 million as small businesses.

Three large Global Distribution System (GDS) companies—Amadeus, Sabre, and Travelport—provide the infrastructure to process both online and offline transactions for most travel agencies and tour operators. Sabre (Travelocity) and Travelport (Orbitz) also own large OTAs as well. GDS companies reportedly processed more than 376 million air transactions in the United States in 2008, accounting for 64 percent of all airline passenger revenue.[18]

For purposes of this regulatory analysis, none of SNPRM requirements would apply to ticket agents directly, but carriers would be required to ensure that large ticket agents marketing air transportation to the general public in the U.S. make their Web sites accessible and that all ticket agents provide certain Web-based amenities to passengers with disabilities who cannot access their Web sites due to a disability.

3.5. Regulatory Authorities

DOT enforces the Air Carrier Access Act and other civil rights statutes and regulations that apply to carriers, conducts economic licensing of U.S. carriers and foreign carriers operating in the United States, establishes regulatory requirements relating to advertising and provision of scheduled and nonscheduled passenger service, issues guidelines and letters to codify and clarify Department enforcement policy, and enters into consent orders to enforce regulations and impose penalties for noncompliance. From 2008 through 2010, DOT entered into 77 enforcement orders with U.S. and foreign carriers, travel agencies, and tour operators. Two of these orders involved noncompliance with established rules and policies relating to ensuring accessibility of air travel to persons with disabilities, and seven others related to failures to comply with the disability complaint reporting requirements.

Regulatory authority for matters relating to the air traffic system and airport operations is vested in the FAA. The FAA Office of the Associate Administrator for Airports has responsibility for all programs related to airport safety and inspections and standards for airport design,

[18] Ibid.

construction, and operation, including accessibility of facilities and transportation controlled by the airport operator.

4. General Framework for Analysis of Benefits and Costs

The SNPRM being evaluated includes proposed requirements relating to automated airport kiosks and to carrier Web sites. Both quantifiable and unquantifiable benefits would accrue from adoption of these requirements, which would also entail costs to carriers and airports. Benefits and costs would also accrue from the proposed requirements for carriers to ensure that the Web sites of their ticket agents are accessible and that agents provide Web-based fare discounts and other Web-based amenities upon request to passengers who cannot use their Web sites due to their disabilities.

While the methodology used to quantify elements of these benefits and costs has provision-specific components, the estimates were developed using a common general framework for analysis. In this section, we provide a discussion of the nature of benefits that are anticipated, the types of costs that would be incurred, and the general assumptions used in developing monetized estimates of the benefits and costs associated with the requirements proposed in the SNPRM.

4.1. Nature of Benefits Anticipated

The types of benefits that air travelers with disabilities would potentially derive from the proposed requirements include the following:

- Time saved in obtaining information, purchasing tickets, and completing various aspects of the check-in process.
- Reduction in the amount of effort and discomfort associated with use of technologies related to air travel.
- Decreased expenditures from improved access to discounted or promotional airfares.
- Improved ability to travel without needing to rely on the assistance of others.

The value of the time savings associated with improved kiosk and Web site accessibility has been estimated and monetized in this regulatory evaluation, which also suggests the range of values that could reasonably be used to quantify the benefits associated with reductions in the amount of effort and discomfort associated with the use of technologies related to air travel.

The Department does not have sufficient information to quantify the potential savings on airfares, if any, that travelers with disabilities may receive as a result of improved access to discounted or promotional airfares on accessible Web sites. In any event, these savings will be exactly offset by an equal reduction in carrier revenues from providing passenger service, with the result that the *net* economic benefits of any such savings to travelers and carriers combined must necessarily be zero.[19]

[19] It is possible that the reduction in the effort required to research and book flights and to check in may encourage additional people with disabilities to travel by air or those who already travel to do so more often, which would represent a net economic benefit. However, the magnitude of this impact is not likely to be large enough to quantify.

In contrast, the increased independence that would be experienced by travelers with disabilities as a result of the proposed requirements represents an important benefit but one for which no monetary value can be assigned.

Carriers would also realize benefits from the proposed requirements. The cost-savings associated with traveler use of kiosks, rather than other onsite forms of check-in, are well documented.[20] There is also evidence that carrier Web sites could be more readily maintained and updated if the programming practices required to ensure Web site accessibility are consistently implemented and followed, although the associated benefits are more difficult to quantify. For example, the W3C Website Accessibility Initiative (WAI) site notes that, "Incorporating accessibility usually increases site development time initially. However, in the long term Web accessibility can reduce the time an organization spends on site development and maintenance, as follows:

- Reduced time and effort needed to change presentation across a site by defining presentation through a style sheet and using proper markup (for example, in XHTML) for structure.
- More efficient debugging with automated validation tools by conforming to standards and identifying a DOCTYPE.
- Reduced redesign and translation time and skills."

The WAI also anticipates costs savings from reduced bandwidth use and server load, easier enabling of content on different configurations (e.g., mobile sites), and easier transition to the use of advanced Web technologies.[21] Comments received in response to the DOJ ANPRM also indicated that implementing programming practices to ensure accessibility would make Web sites easier to maintain. Similar benefits would be realized by ticket agents that make their Web sites accessible at the request of carriers required to ensure accessibility of their agents' Web sites.

Additional benefits may accrue to carriers and to any ticket agents that would be prompted by the proposed accessibility requirements to voluntarily develop or expand the mobile versions of their Web sites, because this investment may improve their ability to attract more business from the important and expanding segment of the air travel market consisting of passengers who prefer to research and book flights through Smartphones and other mobile devices.

4.2. Types of Compliance Costs Incurred

Carriers would incur additional capital, implementation, and continuing operations and maintenance costs to comply with the proposed requirements. Similar costs would be incurred by ticket agents making their Web sites accessible at the request of carriers required to ensure accessibility of their agents' Web sites. Where appropriate, the estimation of these costs incorporates a life-cycle analysis that takes into account the schedule on which compliance is

[20] See, for example, Airport Business, "Analysis: Kiosk Uptime, Revenue," July 8, 2008.
[21] W3C Website Accessibility Initiative, "Developing a Web Accessibility Business Case for Your Organization," available at http://www.w3.org/WAI/bcase/Overview.html.

projected to occur. For example, the costs for installation of new and replacement accessible kiosks are expected to be incurred over a 5-year timeframe.[22]

4.3. General Assumptions Used to Estimate Benefits and Costs

The following general assumptions were employed to develop monetized estimates of the benefits and costs associated with the proposed requirements:

- Quantitative benefits and costs in the preliminary RIA were estimated assuming that the effective date was 6 months before the beginning of the first year of the analysis period. The 2-year period to achieve compliance with the Web site requirements therefore spans from 6 months before Year 1 begins to the midpoint of Year 2. The 10-year period chosen for the analysis was used to evaluate the benefits and costs of the rule because no kiosk or Web site benefits and no kiosk costs would accrue until 6 months after the effective date of the rule. In accordance with OMB guidelines, a real discount rate of 7 percent is used in this primary analysis to compute the present value of net benefits for each year in the 10-year analysis period.[23]

- This analysis includes costs incurred by foreign carriers.

- The numbers of flights and passengers are assumed to increase annually at the rates projected in the FAA Aerospace Forecast for 2010 through 2030 (see Section 3.1 above).

- The value of travel time (and the cost of air travel delay) is estimated at $28.60 per hour for all airline travelers.[24]

- Per-hour costs for applicable categories of carrier, airport, travel agent, and tour operator employees were estimated using Bureau of Labor Statistics (BLS) wage rates, increased by 43 percent to account for the non-wage components (e.g., fringe benefits, employer taxes) of direct labor costs.[25] A mark-up of 100 percent was applied to these direct labor cost estimates to account for supervisory and management planning, communication, training, and oversight time.

A more detailed description and discussion of the baseline data and assumptions used in developing the specific benefit and cost estimates is provided in the relevant parts of Section 5.

[22] It is our understanding from discussions with kiosk manufacturers that while in some cases, the external structure of a kiosk may remain in service for as long as 7-10 years, extending the service life of the machine requires significant "refreshing" of components, including the motherboards, printers (where applicable), and displays. Thus, we would expect airlines and/or airports to incur the full replacement cost of a kiosk every 5 years.

[23] The present value of Web site revision costs incurred in the 6 months before the beginning of Year 1 were also calculated using this discount rate.

[24] Economic Values for FAA Investment and Regulatory Decisions, A Guide, Contract No. DFTA 1-02-C00200, GRA Inc., Oct. 3, 2007.

[25] U.S. Bureau of Labor Statistics, "Employer Costs for Employee Compensation," June 2009.

4.4. Components of the Requirement-Specific Evaluations

Sections 5.1 and 5.2 of the regulatory evaluation provide assessments of the projected benefits and costs for the specific requirements proposed to ensure accessibility of automated airport kiosks and carrier as well as affected ticket agent Web sites, respectively. For each set of proposed requirements, we present the following information:

- ***Current Industry Practices and Need for Additional Regulation.*** This section presents a summary of current industry practices and describes the needs addressed by the Rule. It also includes a brief discussion of the technologies currently available to address the identified needs of disabled travelers, as well as information on additional or improved technologies that can reasonably be expected to become available within the timeframe used in this analysis.

- ***Proposed New Requirements.*** This section outlines the regulatory requirements being proposed by the Department in the accompanying SNPRM and provides information on the entities that will be affected.

- ***Compliance Scenarios Evaluated.*** This section defines the expected impact on affected entities and specifies the most likely ways in which they can be expected to comply with the proposed requirements.

- ***Estimated Benefits of Proposed Requirements.*** This section presents the methodology used to evaluate benefits, estimates for the components that could be evaluated quantitatively, and descriptions of the benefits for which no quantitative estimates could be developed.

- ***Estimated Costs of Proposed Requirements.*** This section presents the methodology used to evaluate costs, estimates for the components that could be evaluated quantitatively, and descriptions of the costs for which no quantitative estimates could be developed.

- ***Estimated Net Benefits and Discussion of Results.*** This section summarizes the benefit and cost estimates for the proposed requirements and relevant alternatives considered.

5. Evaluation of Proposed Requirements for Accessible Kiosks

5.1. Current Industry Practices and the Need for Regulatory Requirements

An automated airport kiosk is a self-service transaction machine that a carrier owns, leases, or controls and makes available at a U.S. airport to enable customers to independently obtain its flight-related services. Use of automated airport kiosks typically reduces check-in waits and, in some cases, reduces the fees paid by passengers for checked baggage. However, currently

deployed kiosks pose significant obstacles to use by travelers with various types of disabilities.[26] Machine heights and installation configurations often make access by passengers in wheelchairs difficult or impossible. Traditional automated kiosks also pose some specific challenges to air passengers with visual impairments, cognitive disabilities, or problems with motor skills, including:

- Touch screens that are difficult, if not impossible, to use by travelers who have limited or no visual acuity.

- Buttons, card readers, passport readers, and other hardware controls that are not discernible by touch.

- An alternative access method, such as audio, may not be available to travelers who have limited or no vision.

Two types of automated kiosks are used at airports: proprietary and shared-use, or Common Use Self Service (CUSS), kiosks. Proprietary automated kiosks have been in use since the early 1990s. They are specifically designed for, and operated by, a single carrier. Shared-use automated kiosks are provided by an airport, a carrier, or an independent service provider with which any carrier having a compliant data set can collaborate to enable its customers to independently access its flight-related services. Early implementation of airline self-service technology was driven by individual airlines placing kiosks near their check-in facilities. In contrast, shared-use kiosks are typically distributed throughout the terminal, with some located at non-airport locations, such as parking garages and nearby hotels. Shared-use kiosks were developed as a result of a collaborative effort between individual carriers and the International Air Transport Association (IATA) to enable carriers to provide a range of passenger services at a shared kiosk. Shared-use kiosks began to be deployed across airports worldwide in significant numbers in 2005.

There are several major suppliers of automated kiosk hardware and software, including NCR, IBM, and SITA. NCR reportedly had an installed base of approximately 8,400 kiosks in 300 airports worldwide by the end of 2009; a separate source estimates that the company has about 80 percent of the U.S. airport market.[27] Statistics on the total number of automated air travel kiosks installed in the United States could not be located.

IBM, SITA, and other vendors develop, install, and support shared-use kiosks, "middleware," and carrier applications, either as a complete package or on a standalone basis. It is our understanding that shared-use terminals are typically purchased and maintained under contracts with airport authorities. The middleware installed on these machines provides an interface between the machine components and controls (such as the touchpad) and proprietary software developed by, or on behalf, of individual carriers. The software demands in a shared-use

[26] The National Council on Disability reported that, as of 2005, no airline kiosk vendor serving the U.S. market had included accessibility among its product features (www.ncd.gov/newsroom/publications/2006/kiosk.htm).
[27] Hugo Martin, "Airport kiosks do nearly everything but check luggage," LATimes.com, December 5, 2009, and Mary Jane Credeur, "NCR CEO Forecasts Growth in Self-Service Machines as Customers Cut Costs," Bloomberg.com, January 24, 2011.

environment are more challenging, because multiple carrier applications have to run on the same platform and each must be able to protect against unauthorized access to proprietary data from other carrier applications.

IBM is currently marketing a demonstration version of an automated airport kiosk that has a variety of accessibility features, including: [28]

- A headset jack with volume control.
- IBM Embedded Via Voice® text-to-speech output.
- Layered audio user assistance and system event sound effects.
- An EZ Access® keypad with tactilely discernable keys.
- An on-screen visual focus indicator that highlights the selected content or control.
- Textual equivalents for all graphics.

As noted above in Sections 1.2 and 1.3, accessibility standards for ATMs and fare vending machines (section 707 of the 2010 Standards for Accessible Design), which were adopted as part of the Department of Justice's Title II and III regulations (28 CFR Parts 35 and 36) in September 2010, do not cover automated airport kiosks. The Section 508 standard for self-contained, closed products (36 CFR 1194.25) adopted by the Access Board requires electronic information products used in or provided to the public by the Federal sector to be accessible, but it does not cover airport kiosks.[29] Currently, there are no ACAA-based accessibility standards that apply to airport kiosks owned, leased, or controlled by carriers.

5.2. Proposed Requirements to Address Identified Needs

The SNPRM includes a detailed set of proposed requirements to ensure that a sufficient quantity of airport automated kiosks ordered after the effective date of the proposed rule would be accessible to air travelers with various types of disabilities.[30] The proposed technical standards would specifically address the following aspects of kiosk design, installation, and operation:

1. ***Use of assistive technology.*** Kiosks would have to be accessible to those with visual impairments without attaching assistive technologies other than a personal headset or audio loop. A telephone handset or an industry standard connector would be provided so that users with visual impairments can attach personal headsets or use a handset to listen to the speech output during a transaction while maintaining their privacy.

[28] Andi Snow-Weaver, "Innovation that Matters: Accessible IBM Airline Self-Service Kiosks," presentation at the Open Doors Organization Universal Access in Airports Conference, October 20, 2010. Additional information is available at http://www-03.ibm.com/able/news/selfservkiosk.html.

[29] In 2000, the Access Board published a report with the Trace Center that focused on making information and transaction machines accessible by providing guidelines which addressed issues for those with sensory, physical, and cognitive disabilities. The Access Board used these guidelines in the development of its Revised Accessibility Standards for Technology, which were discussed in its March 22, 2010 ANPRM.

[30] The proposed requirements are drawn primarily from Section 707 of the ADA Accessibility Guidelines (ADAAG) (the legally applicable standards under Titles II and III of the Americans with Disabilities Act), as well as selected elements from part 1194.25 of the Section 508 Standards. These proposed requirements are expected to be compatible with the anticipated Access Board standards for other types of accessible kiosks.

2. ***Operable parts***. Operable parts on new kiosks would have to be tactilely discernable by users to avoid unintentional activation. Complying kiosks would also be required to alert the user by sound or touch and give the user an opportunity to indicate that more time is needed where a timed response is required.

3. ***Outputs***. Speech outputs would be required to be coordinated with the information on the visual display so that users with low vision or cognitive disabilities may benefit from using the display along with the speech.

4. ***Volume control.*** Where speech output is delivered through a mechanism for private listening, the kiosk would need to provide means for controlling the volume. Where sound is delivered through speakers on the machine, incremental volume control would need to be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level shall be user selectable.

5. ***Captioning.*** Multimedia content that contains speech or other audio information necessary for the comprehension of the content would have to be open- or closed-captioned.

6. ***Input controls.*** At least one tactilely discernible input control would need to be provided for each function. Where provided, key surfaces not on active areas of display screens would need to be raised above surrounding surfaces. Where touch or membrane keys are the only method of input, each would need to be tactilely discernable from surrounding surfaces and adjacent keys.

7. ***Clear floor or ground space***. Kiosks would have to be installed that would provide a clear floor or ground space that meets the 2010 DOJ ADA Standards.

All new kiosk orders initiated 60 days or more after the effective date of the rule would have to comply with the proposed requirements. All U.S. carriers and all foreign carriers operating flights to and from the United States would need to comply with the proposed standards for kiosk accessibility. These requirements would apply only to kiosks installed at U.S. airports with 10,000 or more enplanements per year.[31]

The Department is considering an alternative approach that would require all kiosk orders initiated 60 days or more after the effective date to comply with the proposed standards until at least 25 percent of the kiosks installed at each location in a given airport met these standards. This minimum percentage would need to be maintained thereafter as additional new or replacement kiosks are ordered and installed at each airport location. The benefits and costs of this alternative are compared with those of the baseline proposal in Sections 5.4 and 5.5 below.

[31] Our review of carrier Web site information on kiosk locations indicates that all or nearly all automated airport kiosks are located in large, medium, and small hub airports. We were not able to identify any small or very small U.S. carriers which market scheduled passenger service that currently offer the option to check in at either proprietary or shared-use kiosks. The benefits and costs associated with these proposed requirements would therefore be limited to passengers and flights operated by large carriers from large, medium, and small hub airports.

5.3. Compliance Scenarios Evaluated

The proposed requirements specify that all kiosk orders initiated 60 days or more after the effective date of the rule would need to comply with the accessibility standards presented in the SNPRM text. From our understanding of the procurement process, it appears to be feasible for carriers and airports to meet this deadline. Based on our research and discussions with kiosk hardware and software vendors, it typically takes 4 to 6 months to execute a contract for new kiosk hardware to be produced and installed at specific airport locations after the technical details are specified (and these details can only be known after publication of the final rule). This is especially true for shared-use kiosks, which are ordered by airport authorities rather than carriers.[32]

For purposes of this evaluation, we have assumed that airport authorities would not have to "pull back" and revise kiosk procurements which had been initiated before the effective date of the rule. We therefore assume that all kiosk hardware ordered more than 6 months after the effective date of the rule date would comply with the proposed requirements. Installation of these accessible kiosks is assumed to begin 1 year to 18 months after the effective date of the rule.

However, it is more difficult to project the interval of time that will be required for compliant software applications to be developed, deployed, tested, and made operational on kiosks equipped with the accessible hardware features specified in the SNPRM. Our understanding is that this development process will not begin concurrently with the development of hardware specifications. Instead, hardware and middleware specifications will need to be finalized before development of accessible proprietary and shared-use applications can proceed in a productive fashion. In addition, an extended standards development process will be required to achieve consensus on a single set of shared-use technical standards that meet the proposed accessibility requirements. Based on the timetable for other IATA shared-use standards development activities, it would be reasonable to anticipate that the standards setting and applications development processes will take at least 1 additional year after the finalization of the hardware specifications before carriers can install and run fully developed and tested versions of compliant applications on accessible kiosk systems.[33]

For the baseline scenario we have assumed that all of the kiosks placed in service 1 year or later after the effective date of the rule would be able to able to accommodate compliant carrier applications. However, applications that are fully compliant with the proposed requirements are

[32] This time interval can be divided into two approximately equal sub-intervals. During the first of these, the purchasing entity must develop specifications to supply its existing vendor (in the best case) or incorporate into the requirements specified in a solicitation (which typically involves a more extended procurement process). The remaining lead time is required for the kiosk vendors to determine how best to incorporate these hardware requirements into existing kiosk platforms (again, the best case) or alternatively, to design and implement modifications to existing kiosk models that would accommodate the required accessibility features.

[33] During the time interval between the installation of new or modified kiosks with accessible hardware components and the deployment of carrier applications that support these components, travelers with disabilities will encounter "accessible kiosks" that do not work because they do not have the necessary applications installed. This may result in increased frustration among travelers with disabilities unless the reasons for this apparent failure to "turn on the accessibility features" are adequately publicized.

not assumed to be deployed for an additional 12 months. At this point, as many as 20 percent of the kiosks in service (i.e. an average kiosk service life of 5 years) would be accessible.

As noted, the Department considered an alternative requirement that carriers and airports order accessible kiosks only until 25 percent of the units in any given location met the proposed standards. The discussion above suggests that this probably would not lead to a substantially different end result: the hardware design and production modifications would already be in place, and neither software developers nor their clients would have any incentive to remove or disable accessibility features from carrier applications.

5.4. Estimated Benefits of Proposed Requirements

The proposed requirements would make it possible for air travelers with certain disabilities, including those who use wheelchairs and those with severe vision impairments, to check in more quickly and easily when using an accessible automated kiosk, affording them the convenience and time savings currently experienced by persons without disabilities who choose to use an automated kiosk. The number of travelers who can be expected to benefit depends on the number of trips taken annually by passengers with disabilities that would be addressed by the proposed requirements, the proportion of these passengers who would be able and willing to use accessible kiosks to check in, and the speed with which accessible kiosks would become widely available after the effective date of the rule.

The estimated number of air travelers who would potentially benefit annually from the availability of accessible automated kiosks is calculated from the following components:

- The estimated number of check-ins annually by all passengers departing from U.S. airports, which is equal to the total number of departures ("segments") divided by the average number of segments per one-way trip (1.37) and the average travel party size (1.4) to account for connecting flights and combined check-ins by travelers flying as a group, respectively.[34]

- The proportion of the adult population with disabilities that would make it difficult or impossible to use a non-accessible kiosk, which was assumed to be measured by the percentages of adults who use a wheelchair or other powered mobility assistance device and those who are blind or have severe trouble seeing (1.4 percent and 0.8 percent, respectively).[35]

[34] The parameters used in these calculations are identical to those used in the April 2011 regulatory evaluation that accompanied the recently-published final rule on Enhancing Airline Passenger Protections ("EAPP2"). The number of trips can also be estimated using the BTS Origin and Destination (O&D) data on ticket purchases instead of the T-100 flight segments data. Both approaches yield similar results.

[35] See the results presented in Section 2.1 above.

- An adjustment factor (0.7853) derived from the BTS Freedom to Travel Study that takes into account that people with disabilities are somewhat less likely to travel by air in a given year than are people who do not have any disabilities.[36]

- The estimated share of travelers (approximately 20 percent) who are expected to use automated airport kiosks to check in during Year 1, based on data from the 2010 SITA Airline IT Survey results, which is assumed to remain stable until Year 5 and then decline by one percentage point annually thereafter.[37]

The calculations used to estimate the numbers of passengers who would benefit from the availability of accessible kiosks are summarized in the following table.

Table 12 - Number of Passengers Benefitting from Accessible Kiosks

	Year 2	Years 1-10
Total check-ins by persons with disabilities		
Total passenger flight segments	878,506,084	9,707,020,912
Average segments per one-way trip	1.37	
One-way trips taken	641,245,316	7,085,416,724
Average travel party size	1.4	
Estimated check-ins by air travelers	**458,032,369**	**5,061,011,946**
Percent of population benefitting from accessible kiosks*	2.2%	
Ratio of disabled to general population air travel rates	0.7853	
Total check-ins by travelers with disabilities	**7,913,242**	**87,437,079**
Number of total check-ins performed at accessible kiosks		
Share of check-ins at airport kiosks	20%	19%
Percent of locations with accessible kiosks (Sec. 5.5)	35%	77%
Total check-ins using accessible kiosks	**547,840**	**12,410,250**

*Percent of adult population who use wheelchairs or have severe vision problems.

Sources: BTS T-100, 2009; ATA, 2008 in DOT, EAPP2 RIA, 2011; Census SIPP, 2005; BTS Freedom to Travel, 2002; SITA, Airline IT Trends Survey 2010.

Under the baseline proposal in the accompanying SNPRM, an average of 1.2 million travelers with disabilities would be able to use accessible kiosks in each of the first 10 years after the effective date of the rule. There will, however, be a phase-in period during the first 5 years as accessible kiosks installations ramp up.

[36] As noted in the discussion in Section 2.3 above, this may be partially or entirely attributable to the fact that people with disabilities are older and have lower incomes on average than do people without disabilities, rather than to any specific impediment to travel posed by their disabilities.

[37] ACI, Airline Business, and SITA, "The Airline IT Trends Survey 2010." It is important to note that this estimated percentage is much lower than the corresponding estimate from the companion survey of airport operators. This is because the latter includes only check-ins at airport locations, while the estimate used in this analysis takes into account the rapid growth of online and mobile check-in options. Use of these offsite check-in options is projected to overtake all types of airport-based check-ins combined by 2013 (Year 1 of the analysis period).

Air travelers who could use accessible kiosks would benefit from reduced check-in waiting times. Quantitative estimates of these benefits were developed for this evaluation. In addition, the availability of accessible kiosks will also remove the potential embarrassment some passengers with disabilities may feel when needing the assistance of an attendant at the kiosk. There also may be complementary benefits in the form of reduced waiting times for non-disabled passengers who are required or who choose to use the airline service counters for ticket purchase or check-in. Monetized estimates of these benefits were not developed for this evaluation.

For this analysis, we assumed that the time saved by the average passenger with a disability using an accessible kiosk would be similar to the time savings (13 minutes on average, relative to waiting in line for an agent) enjoyed when an inaccessible ATM or ticketing machine is replaced by an accessible machine.[38] The value of time saved per traveler from using an accessible kiosk is calculated by multiplying this average amount of time saved by the standard value of time ($28.60) for air travel passengers specified in the applicable FAA guidance.[39]

While carriers will incur costs to purchase, install, and maintain accessible kiosks, they can also be expected to experience a reduction in per-person check-in costs, as more persons with disabilities use accessible kiosks instead of requiring the assistance of gate agents to check in. These benefits are calculated using the average carrier savings per passenger when using a kiosk to check in instead of going to the counter (estimated at $3.70 per transaction in a recent trade publication), multiplied by the number of passengers with disabilities who are projected to use accessible kiosks.[40]

Based on these estimates and assumptions, the combined benefits to air travelers with disabilities and to carriers from adoption of the proposed kiosk accessibility requirements are expected to be $5.4 million in Year 2 and $122.8 million for the entire 10-year analysis period.

[38] Estimated by a panel of experts for the Initial Regulatory Impact Analysis on the Revised Guidelines for the ADA, docket DOJ-CRT-2008-0016.
[39] Economic Values for FAA Investment and Regulatory Decisions, A Guide, Contract No. DFTA 1-02-C00200, GRA Inc., Oct. 3, 2007.
[40] Airport Business, "Analysis: Kiosk Uptime, Revenue," July 8, 2008.

Table 13 - Value of Passenger Time and Carrier Labor Cost Savings from Accessible Kiosks

	Year 2	Years 1-10
Monetary value of passenger time savings		
Disabled traveler check-ins using accessible kiosks	547,840	12,410,250
Hourly value of time savings, air travel	$28.60	
Average time saved by using kiosk (minutes)	13	
Monetary value of time savings per check-in	**$6.20**	
Monetary value of time savings to disabled passengers	**$3,394,781**	**$76,902,182**
Value of reduced check-In costs		
Per-passenger reduction in carrier costs	$3.70	
Estimated reduction in labor costs	**$2,027,007**	**$45,917,925**
Total benefits (millions)	**$5.42**	**$122.82**
Discounted benefits (millions)		$86.16

*Present values for Year 1-10 benefits calculated using a discount rate of 7 percent.

It would be reasonable to expect that the estimated benefits may be somewhat lower if the Department were to require that only 25 percent of all kiosk orders after the effective date of the rule had to be compliant with the proposed standards. Waiting times for disabled passengers in kiosk queues would be somewhat longer on average than for non-disabled passengers during peak check-in periods under this alternative. However, it is not possible to quantify the difference between the benefits of this alternative and those estimated for the baseline proposal.

It should be noted that these estimates are preliminary in nature. In the accompanying SNPRM, the Department is expressly seeking comments on certain inputs for this analysis, including:

- The estimated amount of time that a traveler with a disability would save by using an accessible kiosk (and whether the current estimate used needs to be scaled up or down due to unique circumstances at airports).
- The percentage of travelers with various types of disabilities who would be able and willing to use, and benefit from using, an accessible kiosk.
- The extent to which alternative methods of electronic check-in (online, mobile) may be more accessible or efficient for persons with disabilities to utilize, as well as the expected trend, if any, over time in the share of disabled travelers who can be expected to use these non-airport based check-in methods.

Information on the extent to which the proposed requirements would reduce carrier costs associated with gate agent handling of check-ins for disabled travelers is also expressly solicited.

Finally, it should be recognized that there are potentially important categories of benefits for which monetary values cannot be estimated from the available data, as well as those that are intrinsically qualitative. Among these are the following:

- ***Increased independence.*** Accessible self-service kiosks would provide travelers with a greater range of check-in options. Travelers with disabilities could choose to use either the self-service option or the check-in counter, depending on the anticipated transaction time or individual's personal preference. Having this choice available clearly has value to the traveler, but the monetary value of this choice cannot be quantified.

- ***Increased sense of inclusion.*** The availability of accessible kiosks will also remove the potential embarrassment some passengers with disabilities may feel when needing the assistance of an attendant at the kiosk.

- ***Decreased overall waiting time.*** There may also be complementary benefits in the form of reduced waiting times for non-disabled passengers who are required or choose to use the airline service counters for ticket purchase or check-in. It was not possible to develop monetized estimates of these benefits for this evaluation.

- ***Less congestion at ticket counter area***. Accessible kiosks would lessen the demands on customer service agents at the check-in counter. Customer service agents would be freed from the routine tasks of check-in and seat assignments and would have more time available to address individual ticketing and baggage issues. The net effect would be an increased level of customer service to the passengers who need special attention.

- ***Benefits to travelers with neither severe vision impairment nor disabilities requiring wheelchair use.*** Other travelers both with and without disabilities may benefit from the ergonomic design of accessible kiosks. For example, travelers who have difficulty reading English may benefit from having the ability to hear the kiosk instructions.

5.5. Estimated Costs of Proposed Requirements

Carriers and airports incur costs to purchase, install, and maintain automated airport kiosks and can be expected to continue to do so even in the absence of the requirements proposed in the accompanying SNPRM. Therefore, the total costs specifically attributable to complying with the proposed requirements are equal to the incremental life-cycle cost per current model kiosk to add the required accessibility features, multiplied by the number of kiosks required to be compliant.

The Department does not currently have an estimate of the number of automated kiosks installed in U.S. airports, as noted in Section 5.1. Based on the NCR-reported estimates of an installed base of 8,400 units worldwide at the end of 2009 and an 80-percent share of the U.S. airport market, it is reasonable to estimate there were approximately 11,000 automated kiosks in operation at the beginning of 2011. While both NCR and IBM have recently announced contracts for new installations, it seems clear that the continuing growth in online and mobile check-in will ultimately serve to limit future growth in the size of the airport kiosk market.

There are varying estimates of the growth rate in recent years, but it appears that no more than 500 new kiosks are being added to the installed base annually. The cost estimates in this analysis assume that the stock of automated kiosks continues to increase at the rate of 500 per year until the total installed base reaches 15,000 machines in Year 7. Based on these assumptions and a 5-year average machine service life (from the 2010 ADA analysis cited above), the growth in the numbers of accessible kiosks is computed as follows:

Table 14 - Number of Accessible Kiosks Required/Installed

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Automated airport kiosks							
In use at start of year	12,000	12,500	13,000	13,500	14,000	14,500	15,000
Added	500	500	500	500	500	500	0
Replaced	2,500	2,500	2,500	2,500	2,500	2,500	3,000
In use at end of year	12,500	13,000	13,500	14,000	14,500	15,000	15,000
Number of accessible kiosks							
Required	12,500	13,000	13,500	14,000	14,500	15,000	15,000
Already installed	0	1,500	4,500	7,500	10,500	13,500	15,000
Installations of accessible kiosks							
New	250	500	500	500	500	500	0
Replacements of inaccessible kiosks	1,250	2,500	2,500	2,500	2,500	1,000	0
Replacements of accessible kiosks	0	0	0	0	0	1,500	3,000
Total installations	**1,500**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**	**3,000**
Total installed base	1,500	4,500	7,500	10,500	13,500	15,000	15,000
Percent accessible	**12%**	**35%**	**56%**	**75%**	**93%**	**100%**	**100%**

Note: Accessible kiosks are assumed to be deployed beginning 12 months after the effective date of the rule.

Carriers and airports will incur incremental compliance costs for accessible kiosks equal to the cost differences between a non-accessible kiosk and an accessible kiosk. Incremental hardware and software costs will be incurred to develop and produce accessible kiosks. The Department does not have any information to determine whether or not these costs would differ between proprietary systems owned or leased and operated by individual airlines and shared-use kiosk installations, which are shared by multiple airlines at an individual airport and are typically owned or leased by local airport authorities.

Based on conversations with kiosk vendors, the bulk of the incremental costs associated with making kiosk hardware, middleware, and software applications accessible are fixed—i.e., they do not vary appreciably with the number of units sold. For this preliminary analysis, we have estimated that these fixed costs would add $750 to the cost of each new or replacement kiosk

installed. The variable costs for kiosk hardware modifications (e.g., keypads, audio output jacks) represent no more than 10 to 20 percent of this amount.[41]

Based on a per-unit cost estimate of $750 and the numbers of accessible kiosks projected to be installed during Years 1-10, total compliance costs are estimated as follows:

Table 15 - Compliance Costs for Accessible Kiosks

	Year 2	Years 1-10
Increase in accessible kiosks	3,000	15,000
Replacements of accessible kiosks	0	13,500
Total accessible kiosks required	3,000	**28,500**
Incremental cost of accessible kiosk	$750	
Total cost of accessible kiosks	**$2,250,000**	**$21,375,000**
Discounted cost of accessible kiosks (millions)		$15.78

*Present values of Years 1-10 costs calculated using a discount rate of 7 percent.

Based on these estimates and assumptions, the costs incurred by carriers and airports to comply with the proposed kiosk accessibility requirements are expected to be $2.3 million in Year 2 and $21.4 million for the entire 10-year analysis period.

Costs would be lower on an undiscounted basis for the 10-year analysis period if the Department were to require only 25 percent of kiosks in any given airport location to be accessible. However, it is likely that the incremental per-unit cost of purchasing accessible kiosks would be higher under this scenario than if all new kiosks were required to be accessible, because the fixed hardware and software development costs incurred would be spread over a much smaller number of units sold.

The Department is expressly seeking comments on inputs into the analysis, including:

- The incremental cost difference between a new standard automated airport kiosk and a new accessible automated airport kiosk.
- How often automated airport kiosks need to be replaced.
- The current number of automated airport kiosks in the United States owned by airlines and the current number owned by airports.
- Whether implementation of a requirement for accessible automated airport kiosks would significantly affect the cost, inventory, or delivery of accessible kiosks for any period of time after the effective date and, if so, for how long.

[41] This estimate is the midpoint of the range ($303-$1,193) of costs in a TRACE analysis of the modifications that would be required to produce an accessible kiosk. However, the modifications assumed in the TRACE analysis do not exactly match those that would be required to comply with the proposed standards in the accompanying SNPRM. This analysis also assumes that accessible kiosks do not have higher operations and maintenance costs or installation costs than standard kiosks and that costs are incurred the year the kiosks are ordered.

5.6. Estimated Net Benefits and Discussion of Preliminary Results

Taking into account the benefits both to air travelers with disabilities and to carriers from adoption of the proposed kiosk accessibility requirements, as well as the incremental costs to carriers and airports to purchase and install the required number of accessible kiosks, the present value of net benefits from the proposed requirements are expected to be $70.4 million for the 10-year analysis period using a discount rate of 7 percent and $86.2 million for the same time period using a discount rate of 3 percent.

Table 16 - Present Value of Accessible Kiosk Benefits and Costs

Discount Rate Used:	**7 Percent**	**3 Percent**
Total benefits (millions)	$86.16	$104.85
Total costs (millions)	$15.78	$18.64
Present value of net benefits (millions)	**$70.38**	**$86.21**

The present value of net benefits for the baseline scenario and the alternative 25-percent minimum requirement considered by the Department are likely to be similar. While incremental hardware costs would be lower if only 25 percent of new or replacement kiosks were required to be accessible, most of the costs associated with developing accessible kiosk hardware and carrier check-in applications would not be reduced. These fixed costs would simply be spread over a smaller number of accessible kiosks being installed.

Finally, it is not clear that kiosk vendors and purchasers would continue to purchase non-accessible kiosks once the accessible models become widely available. For example, if the shared-use standard is amended to incorporate accessibility considerations, it may actually be more costly to support and maintain two sets of carrier automated kiosk applications—one of which includes the accessibility features and the other of which does not—than to develop and support only a single accessible application. If this turns out to be the case for proprietary check-in applications as well, the requirements in either the baseline scenario or the alternative considered by the Department would ensure that all automated airport kiosks will be accessible at some future point in time.

Table 17 - Kiosk Benefits, Costs, and Net Benefits by Year

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Years 1-10
Benefits												
Disabled traveler check-ins using accessible kiosks		184,745	547,840	903,868	1,254,388	1,600,772	1,679,115	1,635,282	1,587,677	1,536,124	1,480,439	12,410,250
Benefits to passengers (millions)		$1.14	$3.39	$5.60	$7.77	$9.92	$10.40	$10.13	$9.84	$9.52	$9.17	$76.90
Benefits to carriers (millions)		$0.68	$2.03	$3.34	$4.64	$5.92	$6.21	$6.05	$5.87	$5.68	$5.48	$45.92
Total Benefits (millions)		$1.83	$5.42	$8.95	$12.41	$15.84	$16.62	$16.18	$15.71	$15.20	$14.65	$122.82
Costs												
Increase in accessible kiosks		1,500	3,000	3,000	3,000	3,000	1,500	0	0	0	0	15,000
Total costs (millions)		$1.13	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$2.25	$21.38
Net Benefits		**$0.70**	**$3.17**	**$6.70**	**$10.16**	**$13.59**	**$14.37**	**$13.93**	**$13.46**	**$12.95**	**$12.40**	**$101.45**

6. Evaluation of Proposed Requirements for Accessible Web Sites

6.1. Current Industry Practices and the Need for Regulatory Requirements

Air travelers increasingly rely on carrier and travel agent Web sites to research flight schedules and airfares, book and change reservations, and, in many cases, check in for flights before arriving at the airport. Air travel sites typically offer Web-only fare specials for flights and complete tour packages. Those with online booking engines (all but the smallest carriers and most of the larger travel agents and tour operators) provide prospective purchasers with the ability to search either directly or iteratively for the most attractive combinations of flight dates and times, connections, and fares. Many passengers with disabilities, including those with mobility impairments or hearing loss, are able to take full advantage of the information and services offered. However, travelers with vision-related disabilities, as well as those with motor skill disabilities that require the use of pointing devices other than a mouse, currently have much more limited ability to obtain information or services on most carrier and ticket agent Web sites. At present, there are no statutory or regulatory requirements to ensure that carrier and ticket agent Web sites are accessible to consumers with these types of disabilities.[42]

As part of this regulatory evaluation, we conducted an extensive review of U.S. and foreign carrier Web sites. A summary of the results from this review is presented in an appendix, which also provides some background on the technical aspects of Web sites that are relevant for assessing the impact of the proposed requirements in this area.

Among the air travel Web sites included in our review, only Delta Airlines appears to have a specific option that converts its default home page into a version adapted for screen readers and other technologies that make it more accessible for users with severe vision impairments. Other carrier and ticket agent Web sites afford different degrees of accessibility for air travelers with disabilities. Most of the home pages of the carrier Web sites we reviewed had violations of eight or more WCAG 2.0 accessibility guidelines and more than 50 separate issues that would need to be addressed to meet the Level AA compliance standards.[43]

Current Department regulations require carriers to offer Web-only fares and other promotions to disabled callers who indicate that they are not able to use an inaccessible Web site. However, carriers sometimes fail to do so, even when this regulatory requirement is specifically cited during the course of the reservation request.[44]

[42] Note that our calculations of monetized benefits based on the requirements for Web sites are based on time savings by persons with severe visual impairments only.

[43] Similar results have been reported in other research. See, for example, Jonathan Lazar et. al., "Up in the Air: Are Airlines Following the New DOT Rules on Equal Pricing for People with Disabilities When Web sites are Inaccessible?" Government Information Quarterly, 27(4), 329-336, 2010, and Léonie Watson and Emily Coward, "Is your Holiday All-Inclusive? Investigation into the accessibility of travel company websites," Nomensa, June 2011, for recent studies of U.S. and U.K. carrier Web sites, respectively.

[44] Lazar et. al., op. cit., 2010.

Mobile Versions of Carrier Web Sites

The Department does not have information on travel-related Web sites that make it possible for travelers with some types of disabilities to obtain information or services which are not accessible on other carrier or ticket agent sites. However, many of the largest U.S. carriers (9 of the 12 reporting carriers that market air travel to the general public) and a larger number of foreign carriers have one or more alternative versions of their Web sites designed to be accessed and read by browsers installed on mobile phones (including Blackberries, iPhones, and Android-based smart phones) and, more recently, on tablets such as the iPad. These parallel sites eliminate or substantially simplify graphic menus and navigation, video, images, and template design features; they also offer access to at least selected parts of the information and functionality available on the primary versions of their Web sites.

Because these sites are optimized for less capable browsers and much smaller visual displays, they can typically be read much more quickly and efficiently by screen readers and other assistive technology. Content on these sites is, at least at present, predominantly text-based, which reduces the processing capability required to translate visual navigation links, images, and electronic forms. Our review of the mobile version of carrier Web sites indicated that a screen reader can typically read the home page of a mobile site in 10 to 20 percent of the time required to completely read the home page of the primary version of the site.

Table 18 - Mobile Site Adoption and Comparative Read Times

	U.S.	Foreign
Carrier sites checked		
Reporting (over 1 mil. PAX for foreign)	12	7
Number with mobile sites	9	5
Percent with mobile sites	75%	71%
Non-reporting (< 1 mil. PAX for foreign)	6	7
Number with mobile sites	0	3
Percent with mobile sites	0%	43%
Screen reader read times (seconds)		
Average full home page read time	189	171
Average mobile home page read time	30	19
Amount of time saved by using mobile page	159	152
Percent of time saved by using mobile page	84%	89%

Source: Econometrica, Inc., testing using aDesigner, May 12, 2011.

It is important to note that the increased reading speed and improved accessibility of mobile Web sites are at least partially attributable to the reduced amount of information and functionality offered in these versions. For example, the home page of a mobile site often includes only a text menu of selection options, but little actual content. A mobile Web site home page provides an attractive alternative for disabled (and nondisabled) site visitors who are seeking specific information (baggage fees, gate assignments) or are attempting to perform a common transaction (booking a flight, requesting flight status alerts). This option is less attractive for those who are

looking at travel Web sites but have less specific objectives for visiting and may be interested in scanning through a larger portion of the site's content in a less directed manner.[45]

Our review of nine reporting carrier mobile Web sites shows that most offer a set of core functions, including the ability to check flight status, check in online, and book or change flights. Fewer sites have been expanded to the point where they offer more extensive access to general travel information, travel purchase terms and conditions, or the ability to purchase other travel services. Of the 12 reporting carriers that market air travel directly to the public, 3 did not appear to have mobile versions of their primary Web sites at the time of our review, nor did any of the 24 other U.S carriers included in our Web site accessibility review.

Table 19 - Mobile Web Site Content for Reporting Carriers

	Number	Percent
Marketing carriers	12	100%
With mobile sites	9	75%
Mobile Web site content		
Flight status	9	100%
Check-in	8	89%
View my itinerary	8	89%
Book/change reservations online	7	78%
Frequent flyer account	7	78%
Flight schedules	6	67%
Contact us/About us	6	67%
Updates & alerts	5	56%
Terms and conditions/Legal/Policies	3	33%
Travel Information (Gates and/or in-flight services, etc)	3	33%
Sales & offers	3	33%
Car rental	1	11%

Source: Econometrica, Inc., review on May 16, 2011.

Carriers that already have mobile sites will expand them to offer a wider range of information and services, while most larger carriers that do not currently have mobile Web sites can be expected to develop them in the next few years. It is reasonable to anticipate the core functions identified in our review will be among the first capabilities available on new carrier mobile sites.

[45] It is also true that many online visitors to travel Web sites do not own current generation Smartphones that are capable of accessing the mobile versions. In the future, there will probably be fewer potential travelers who are able and interested in performing online transactions on primary Web sites who will not have a mobile device that can access an alternative version. See, for example, the recent SITA white paper, "Five Steps of Air Travel that Smartphones will Change by 2020," New Frontiers paper, 2010. In any event, the URLs of most mobile versions of Web sites can be directly accessed on a traditional PC-based browser, such as Internet Explorer, Firefox, or Chrome.

6.2. Proposed Requirements for Addressing Identified Needs

The Department is proposing to require that all U.S. and foreign carriers which market air travel to passengers in the United States ensure that the content on their primary Web sites are completely compliant with the WCAG 2.0 Level A and AA performance criteria within 2 years of the effective date of the rule.

Two interim benchmarks that would have to be met as well are:

- All new or completely redesigned carrier Web sites published online 180 days after the effective date or later would have to meet the WCAG 2.0 Level A and AA standards.

- Access to a set of core functions currently offered on the majority of reporting carrier mobile Web sites would have to be provided either through a link from those functions on the primary Web site to fully accessible corresponding functions on a mobile site or by making those functions accessible on the primary Web site by 1 year after the effective date.[46]

By 2 years after the effective date, carriers would also be required to ensure that their larger authorized ticket agents (travel agencies and tour operators) which market air transportation online to the general public have accessible Web sites. Carriers would not need to ensure that travel agencies and tour operators that meet the SBA size standards established to define small businesses in these two industry sectors (annual revenues of less than $3.5 million and $7.0 million, respectively) have accessible Web sites. However, carriers would still be required to ensure that these ticket agents make available all Web-based special fares or services upon request to customers who indicate that they could not use an agent's inaccessible Web site due to their disability. The Department is also proposing to require carriers to continue to offer these special fares and services upon request to individuals who cannot use Web sites that meet the WCAG 2.0 Level A and AA standards for accessibility due to their disability and to ensure that their ticket agents do the same when customers cannot use the agents' accessible Web sites due to their disability. While this regulatory evaluation includes the costs to ticket agents from the proposed requirement for carriers to ensure that their agents make their Web sites accessible, it does not address any costs incurred by agents in providing Web-based amenities to passengers who cannot access their Web sites due to a disability.

The Department intends to allow carriers to provide "alternative conforming versions" of inaccessible Web pages instead of requiring that all pages be accessible. Pages that qualify under this provision would have to offer the full information and functionality of the inaccessible versions of these pages. For this evaluation, we have assumed that Delta's dynamically-generated Web site pages would meet this requirement, but that very little if any mobile Web site content would qualify under this standard.

[46] Contract carriers and charter carriers that do not market air transportation directly to the general public would also have to comply with the proposed requirements but would not need to provide accessible versions of core functions that they do not otherwise offer. For example, the Web sites for many very small U.S. carriers do not offer online booking or check-in services.

6.3. Compliance Scenarios Evaluated

To assess the benefits and costs associated with these proposed requirements, it is first necessary to define the ways in which carriers and their ticket agents may be reasonably anticipated to achieve compliance with each of the three tiers of standards proposed for air travel Web sites. To facilitate the exposition in the remainder of this evaluation, the 6-month, 12-month, and 2-year sets of proposed requirements are referred to as Tier 1, Tier 2, and Tier 3 standards, respectively.

For this analysis, we have made the following assumptions:

Tier 1 (6 months after effective date)
All carriers that market air transportation directly to the general public already have Web sites, but the proposed Tier 1 requirements would require accessibility for new or "completely revised" sites published 6 months or more after the effective date of the proposed rule. Reporting carriers appear to undertake significant "facelifts" of their sites at intervals between 2 and 4 years, based on review of screenshots of selected carrier home pages viewed using the "Wayback Machine" at www.archive.org. Assuming the same revision interval is also true for large carriers, as many as half could be expected to undertake complete revisions of their Web sites during the 18-month interval between the proposed compliance dates for the Tier 1 and Tier 3 requirements. These carriers would have to ensure that their primary sites are fully accessible before having them "go live."

Smaller U.S. carriers appear to overhaul their Web sites less frequently than do larger carriers – typically once every 4 to 5 years, based on a review of screenshots from www.archive.org. We assume that one out of every three small and very small U.S. carriers would completely revise their Web sites during the interval between the dates on which the Tier 1 and Tier 3 standards would take effect.

The interval of 6 months between the effective date of the rule and the Tier 1 compliance date appears to provide sufficient time for carriers to be able to take the proposed accessibility guidelines into account when they undertake Web site overhauls that begin after rule publication.[47] Carriers with Web site overhauls already under way at the time of rule publication would be expected to complete these projects and publish their new sites on a date before compliance with the Tier 1 standards would be required.

Carriers would not be required to ensure that their ticket agents' Web sites would meet the proposed accessibility standards until 2 years after the effective date of the rule. The largest online travel agents and tour operators are likely to incorporate accessibility into site overhauls or new site launches expected to take place after the Tier 1 requirements go into effect.

Tier 2 (12 months after effective date)
It is reasonable to anticipate that most large U.S. and foreign carriers will already have one or more mobile Web sites by the date of rule publication. Those that do not would have a strong incentive to accelerate development and publication of a mobile site by the time the Tier 2

[47] Web site design timelines available on the Internet are often based on start-to-finish implementation times between 4 and 6 months.

standards would take effect.[48] Relatively modest revisions would be required for the core functions on these mobile sites to be made compliant with the proposed accessibility standards.

Nearly all small and very small U.S. carriers that market scheduled air transportation directly to the public operate flights exclusively in Alaska, Hawaii, or among islands in the Pacific or Caribbean. These carriers typically have not developed and published mobile versions of their primary Web sites, and they may not do so by the rule publication date. However, the majority of these carriers operate relatively simple primary Web sites that do not offer online booking, check-in, or flight status updates. Comparatively fewer revisions would be required to make the more limited set of core functions currently offered on these small and very small carrier sites compliant with the proposed accessibility standards.[49]

Carriers that publish completely revised primary Web sites after compliance with the Tier 1 standards is required will already have satisfied the Tier 2 requirements. In addition, some carriers that are in the process of overhauling their primary Web sites when the Tier 2 requirements take effect may have drafts of new Web pages ("beta" versions) available that would meet the "alternative conforming version" standard for determining whether a particular core function on the primary Web site was accessible.[50]

Tier 3 (2 years after effective date)

Carriers would be required to have their entire primary sites comply with the full set of proposed standards by 2 years after the effective date of the rule. By this time, we have estimated that about one-half of the larger carriers and about one-third of smaller carriers would have already undertaken overhauls of their primary Web sites that would make them compliant with the Tier 3 standards. The remaining carriers would either need to retrofit their existing sites or develop alternative conforming versions that comply with the proposed accessibility standards.

Retrofitting for accessibility is generally more complicated and costly than building it into new designs. Thus, it is possible that those carriers which would not otherwise have redesigned their Web sites may be prompted to do so in conjunction with the evaluation and programming required to achieve compliance with the WCAG 2.0 Level A and AA guidelines. The Department is not able to determine the extent to which carriers with inaccessible Web sites may decide to undertake overhauls they would not otherwise have done as an alternative to retrofitting the current versions of their primary Web sites to comply with the Tier 3 standards.

Alternative Scenarios Evaluated

In addition to the baseline scenario developed to evaluate the proposed requirements, we have also examined the benefits and costs associated with two alternative scenarios:

[48] According to the 2010 SITA Airline IT Trends survey, 70 percent of airlines plan to be able to see tickets on passengers' phones by 2013 (Year 1 of the analysis period), up from 18 percent who currently have this capability.

[49] Charter carriers and contract carriers that operate scheduled service flights for marketing carriers are also not expected to have to undertake significant revisions to comply with the Tier 2 standards because their Web sites typically do not offer most of the core functions included in the proposed requirements.

[50] This would be true for the "beta" versions that provide most or all of the information and functionality of the current published versions of the same pages.

- ***Mobile Site Alternative.*** It is considerably easier to ensure that mobile versions of Web pages comply with applicable accessibility guidelines than it is to achieve the same level of performance for the same pages of the primary Web site. One possible alternative approach would be to exempt a carrier's primary Web site from meeting the proposed accessibility standards, as long as it publishes and maintains a synchronized mobile site that is fully accessible and includes all of the core functions and information specified in the Tier 2 standards. While the core functions itemized in the Tier 2 standards do not include all of the content currently available on some mobile Web sites, it is reasonable to anticipate that carriers would make the remaining pages of their mobile sites accessible as well.[51]

- ***Elimination of Tier 1 and Tier 2 Standards for Small and Very Small Carriers.*** Small and very small carriers typically do not have mobile version of their primary Web sites and undertake complete overhauls of their sites less frequently. Under this alternative, small and very small carriers would not be required to comply with the Tier 1 and Tier 2 standards, although their primary Web sites would have to meet the WCAG 2.0 guidelines by 2 years after the effective date of the rule.

The Department lacks adequate information to evaluate the benefits or costs of some other possible alternatives. Among these would be requiring carriers to meet only the WCAG 2.0 Level A success criteria and ensure that their ticket agents do the same. This alternative was not analyzed because we could not determine the extent to which this reduced level of accessibility would limit the ability of site visitors with relevant disabilities to access information and services of interest. Another alternative of potential interest would be to require all carriers to make the core functions in the Tier 2 standards accessible on their primary Web sites by 12 months after the effective date of the rule. However, we do not have adequate information or technical expertise to be able to determine the extent of retrofitting that would be required to make a primary Web site partially compliant with the WCAG 2.0 guidelines. We are also unable to determine if this option would provide additional benefits from having access to more information and services than are available on the mobile versions of these pages or instead would reduce the projected benefits because of user frustration with navigating sites with a mix of accessible and inaccessible pages.

6.4. Estimated Benefits of Proposed Requirements

The proposed requirements would permit travelers with disabilities to benefit from increased access to the full range of information and services available to online customers:

- Access to the lowest airfares and other Web-only discounts and promotions, as well as expanded capabilities to search for more convenient flight dates, times, and connections.

- More efficient and sometimes less costly ways to conduct routine transactions, such as prepaying baggage fees and checking in online.

[51] Under this alternative, the primary Web site would have to have a link to the accessible mobile site that could be accessed from any Web pages on which any component of the core set of information and services was offered.

- Easier access to personal and general air travel information and policies, including trip itineraries and flight status inquiries, frequent flyer accounts, and relevant air travel policies and restrictions.

Monetizing the value of these benefits directly is difficult, particularly in light of the documented willingness of travelers with vision-related disabilities to persist in accomplishing tasks online even when confronted with obstacles posed by inaccessible Web sites and conflicts between Web site technologies and screen readers.[52] Removing or reducing these barriers to access would reduce the amount of time it would take for travelers with disabilities to realize the reduced expenditures, more efficient transactions, increased availability of information, and other benefits associated with access to air travel Web sites. The estimated benefits to travelers based on time saved associated with being able to use accessible air travel Web sites depend on several factors, including:

- The number of current and future air travelers who use screen readers and other adaptive technologies to access carrier and/or ticket agent Web sites.

- The extent to which these customers would utilize accessible air travel Web sites.

- The amount of time that could potentially be saved annually by the typical traveler who benefits from the availability of accessible Web sites.

- The monetary value of each unit of time saved.

The estimated amount of time saved from the availability of accessible air travel Web sites is based on the following:

- The number of potential beneficiaries is estimated by multiplying the Survey of Income and Program Participation (SIPP**)** estimate of the U.S. population with severe vision difficulties (1.78 million in 2009, with the population growing in each subsequent year by the forecast FAA growth rates for domestic passengers) by the BTS estimate of the percentage of people with disabilities who have traveled by air in the past year (31.5 percent) and the proportion of persons with disabilities who are online (46 percent in 2010, according to the 2011 Pew Internet and American Life study, and increasing by 2 percent in each subsequent year).

- For this analysis, we have assumed that an average of two Web sites are searched prior to booking a trip online and that each trip booked online generates two additional visits to the site on which the air travel was booked for subsequent transactions and to obtain flight-related information. These assumptions are conservative because they do not take into account site visits by future travelers who are just "looking around" or are in the early stages of planning a trip.

[52] Jonathan Lazar et. al., "What Frustrates Screen Reader Users on the Web: A Study of 100 Blind Users," International Journal of Human-Computer Interaction, 22(3), pp. 247-269, 2007.

- For this analysis, we have assumed that, on average, three pages are viewed during each visit to an air travel Web site. According to Web analytics provider OneStat.com, more than half of all site visitors view only one or two pages per visit.[53] For online booking, a minimum of five page views are typically required, even if the initial search yields a suitable option. In addition, a larger number of page views may be required for air travel Web site visitors with vision-related disabilities if the screen reader is not able to translate inaccessible menus, links, and other navigation elements.

- Our review of carrier Web site home pages found that it takes a screen reader, such as JAWS or Window-Eyes, an average of 3 minutes to read through a typical carrier Web site home page. In contrast, site visitors with broadband connections and without vision-related disabilities can take advantage of near instantaneous loading of the same page. Our review of mobile carrier sites indicated that the typically much more compact home pages of these sites usually take 80–85 percent less time (about 20 seconds) for a screen reader to convert to speech output than do the primary Web site home pages for the same carriers.[54]

- The Lazar et al. study cited above concluded that the typical blind Web user loses 30.4 percent of the total time spent online to frustrations associated with inaccessible Web content and Web site technology conflicts with screen readers.

The product of these estimates represents the total amount of time saved by travelers with relevant disabilities due to using fully accessible air travel Web sites. Each hour of time saved is valued at $28.60, which represents the weighted average of the values currently recommended for cost-benefit studies of travel time savings accruing to travelers for business and personal reasons.[55] For this analysis, separate benefits estimates were calculated for the Tier 2 and Tier 3 standards.[56] Benefits are calculated under the assumption that travelers with disabilities continue to visit air travel Web sites that have been made accessible and those that continue to be inaccessible in the same proportions as they would have had they all remained inaccessible.[57]

[53] OneStat.com, "Most people visit 1 or 2 pages during a visit according to OneStat.com," September 18, 2007.

[54] This does not, of course, exactly measure the amount of time a typical user with a vision-related disability would spend on the home page. Some visitors would be able to identify the link or menu item of interest quickly and proceed to the next page or site before the entire home page is translated. Others will need to hear the entire page translated and then review content or information on that page before deciding where to go next. For this preliminary evaluation, we have not attempted to determine which of these two countervailing factors is quantitatively more significant.

[55] Economic Values for FAA Investment and Regulatory Decisions, A Guide, Contract No. DFTA 1-02-C00200, GRA Inc., Oct. 3, 2007.

[56] We did not compute separate benefits estimates for visitors to new or completely revised carrier Web sites that would need to comply with the Tier 1 standards. In any event, incremental benefits would accrue only until the Tier 2 and Tier 3 standards take effect, so this omission does not materially affect the estimated total benefits to persons with disabilities from the availability of accessible Web sites.

[57] This "no-migration" assumption was used to develop preliminary estimates of the amount of time saved. A more reasonable expectation is that there will be substantial shifts in Web site visitation habits among travelers with vision-related disabilities as more new or completely revised accessible air travel Web sites are published. In this case, the ultimate future benefits from achieving complete accessibility of all air travel Web sites will be realized more rapidly than estimated in the "no-migration" scenario. However, because all covered air travel Web sites would be required to meet the proposed accessibility standards within 2 years of the effective date of the rule, the

While carriers will incur costs to develop, publish, and maintain accessible Web sites, they can also be expected to experience a reduction in the number of calls to customer service representatives from persons with disabilities who are unable to conduct transactions or locate information online. These benefits are calculated using the average savings per avoided call (estimated at $5.50 per call in a market research study), multiplied by an assumed share of 50 percent of the passengers with disabilities who are projected to use accessible Web sites.[58]

The estimated benefits for each tier of standards were computed as shown in the following tables:

Table 20 – Annual Time Savings from Proposed Tier 2 and Tier 3 Requirements

	Tier 2*	Tier 3**
Amount of time currently spent on inaccessible Web sites		
Number of sites visited per year	4	4
Number of pages viewed per site	6	6
Average minutes spent per page	3	3
Annual hours spent on travel Web sites	**1.2**	**1.2**
Time saved by accessible and mobile Web site availability		
Percent of time saved by accessibility		30.4%
Percent of time saved by mobile version	85%	
Annual time saved per site visitor (hours)	**1.0**	**0.4**

*Assumes 1/2 of total page views are of pages made accessible in Tier 2 standards.

** Benefits accrue only for pages that have not already been made accessible.

quantitative significance of this simplifying assumption on the discounted present value of estimated benefits is relatively small.

[58] Forrester Research, "Need To Cut Costs? Improve The Web Site Experience," December 1, 2008.

Table 21 - Estimated Benefits from Proposed Tier 2 and Tier 3 Requirements

	Year 2	Years 1-10
Estimated number of beneficiaries		
Blind/severe visual impaired, aged 15+	2,001,197	22,112,151
% traveling by air in past year	31.5%	
% visiting online travel sites	54%	61%
Total site visitors who benefit	**340,404**	**4,280,547**
Time saved per person annually*	1.2	1.3
Value of time saved per hour	$28.60	
Total benefits to site visitors (millions)	**$11.71**	**$159.78**
Estimated benefits from call center savings		
% of site visitors who call due to disability	50%	
Total number of avoided calls	170,202	2,140,273
Cost savings per avoided call	$5.50	
Total cost savings from avoided calls (millions)	$0.94	$11.77
Total benefits (millions)	**$12.64**	**$171.55**
Discounted benefits (millions)**		$122.11

*The 10-year analysis period estimate of 1.3 hours time saved annually is equal to the weighted average of 0.5 hours in Year 1 (one-half of the Tier 2 estimate shown in Table 20), 1.2 hours in Year 2 (all of the Tier 2 estimate, plus one-half of the Tier 3 estimate from Table 20), and 1.4 hours in each of Years 3 through 10 (reflecting the combined savings from full compliance with the Tier 2 and Tier 3 requirements).

**Present values of Year 1-10 benefits calculated using a discount rate of 7 percent.

Based on these estimates and assumptions, total benefits from the proposed Tier 2 and Tier 3 standards are estimated at $171.6 million for Year 1 through Year 10. The present value of benefits realized during the entire 10-year analysis period is estimated at $122.1 million using a discount rate of 7 percent.

The timetable under which the estimated benefits would be realized is somewhat complicated:

- The benefits calculated for the Tier 1 requirements begin to accrue 6 months after the effective date of the rule (i.e. the beginning of Year 1 in this preliminary analysis) as the first overhauled carrier Web sites that meet the proposed accessibility standards are published. These benefits increase in the second year after the effective date of the rule as more sites are made accessible to comply with the Tier 1 requirements. However, the incremental benefits of the Tier 1 standards would be much smaller once compliance with the Tier 2 standards is required (1 year after the effective date of the rule), and no incremental benefits would accrue from this provision once compliance with the Tier 3 standards is require (2 years after the effective date of the rule).[59]

[59] It should be noted that the benefits from the Tier 1 requirements would continue to accrue if the Tier 3 standards were postponed or eliminated. At some point in time all (or nearly all) active carriers and ticket agents would be expected to undertake a Web site overhaul that would trigger the Tier 1 requirements. The annual benefits realized under either the Tier 1 or Tier 3 standards would be equal from that point forward, since all carrier and ticket agent

- The benefits from the Tier 2 requirements begin to accrue 12 months after the effective date of the rule, assumed to be halfway through Year 1 in this preliminary analysis. In addition to the time saved by accessibility, travelers with disabilities will realize additional benefits from compliant mobile Web sites that offer more rapid access to the core functions most commonly used by air travelers.

- Benefits from the Tier 3 requirements begin to accrue 2 years after the effective date of the rule, assumed to be halfway through Year 2 in this preliminary analysis. However, the incremental benefits from the Tier 3 requirements are limited to the time saved while viewing pages that have not already been made accessible as a result of primary Web site overhauls (Tier 1) or provision of core functions on accessible mobile Web sites (Tier 2).

Notwithstanding these timing issues, the annualized benefits estimated in Table 19 for (Tiers 2 and 3 combined) would be fully realized in the third and each successive year of the 10-year period used in this analysis. Benefits in the first year after the effective date of the rule are expected to be minimal, because relatively few carriers that undertake primary Web site overhauls which would be subject to the Tier 1 standards would be able to have these compliant sites available by 12 months after the effective date of the rule. The impact of the timeline considerations discussed above is therefore limited primarily to the benefits estimates for the second year in the 10-year analysis period. Consequently, we did not attempt to estimate the incremental benefits from the Tier 1 standards that would be realized in the first 2 years after the effective date of the rule. Adopting this simplifying assumption does not have a material impact on the overall benefits estimates.

Additional Benefits from Accessible Web Sites

In addition to the monetary value of the time saved from Web site accessibility, there is a separate and distinct value associated with the reduced amount of frustration experienced by users during the time that they continue to spend on air travel Web sites. Although we did not do so for this preliminary evaluation, the value of this benefit could potentially be monetized. Travelers with disabilities will also benefit from an increased sense of independence as a result of being able to conduct a standard transaction or obtain travel information without assistance, although it is not possible to estimate a monetary value for this benefit.

Carriers and ticket agents may also benefit from adding travelers with disabilities to their passenger base and reducing direct customer service assistance costs associated with researching and booking flights, conducting post-purchase transactions, and responding to flight and general travel information requests.

This preliminary analysis estimates the amount of time saved only for people who are blind or have severe difficulty seeing. Additional benefits may be realized by those with less severe vision impairments, as well as those who find navigating and finding information on current Web sites difficult for other reasons (such as those who cannot use a mouse). Notwithstanding

Web sites covered by the proposed accessibility requirements would have been overhauled at least once since the Tier 1 standards took effect. In this analysis we have treated these benefits as accruing under the Tier 3 standards for simplicity.

the conservative nature of these estimates, the monetized benefits of the proposed requirements are substantial—more than $14 million in the first year after air travel Web sites become fully compliant with the WCAG 2.0 accessibility standards.

Impact on Estimated Benefits for Possible Regulatory Alternatives

As noted above, most carriers' mobile Web sites do not provide the full range of information and functionality that is available on the same carriers' primary Web sites. Even on pages that provide core information and services, the primary Web pages may offer additional search and results display options, more extensive sets of navigation menus and links to other pages, and more embedded multimedia content. However, the information and functionality that is provided on mobile sites can be accessed much more rapidly.[60]

It is not possible to quantify the impact on the benefits to travelers with disabilities that would result from permitting carriers and ticket agents to provide accessible links to fully accessible mobile Web sites instead of requiring that they make the primary versions of their Web sites fully accessible. Site visitors with disabilities who value the information or functionality that would not be available on a carrier's accessible mobile site would realize fewer benefits under this alternative set of possible requirements. Those who would be interested in performing particular tasks or locating specific information available on the mobile site may be made better off under this alternative, especially because the scope and capabilities of mobile Web sites and the proportion of travelers using mobile devices as their primary means of Internet access are both expected to expand significantly in the next few years.

Benefits that would be realized if only the Tier 2 requirements were adopted can be estimated. The monetized value of benefits in this scenario is estimated at $120 million for Years 1-10 of the analysis period . The present value of benefits realized during the 10-year analysis period from the Tier 2 requirements alone is estimated at $86 million using a discount rate of 7 percent. These estimates are $40 million and $28 million lower, respectively, than the undiscounted and discounted benefits estimated for the baseline scenario evaluated.

Exempting small and very small carriers from the proposed Tier 1 and Tier 2 requirements can be expected to have a modest, transitory impact on benefits. While these carriers account for only a small percentage of the passengers on all scheduled departures, in many cases, they serve communities that are not serviced by any of the larger carriers (most operate routes exclusively in Alaska, Hawaii, or islands in the Pacific or the Caribbean). Under this alternative, residents of these communities with vision-related disabilities would not be able to use the relevant carrier Web sites until they are made fully accessible under the proposed Tier 3 standards 2 years after the effective date of the rule.

Unquantifiable Benefits

As noted in the discussion above, there are potentially important categories of benefits for which monetary values cannot be estimated from the available data, as well as some that are intrinsically qualitative, including:

[60] In addition, some of the navigation elements, links, and content on primary web pages may be included for reasons (e.g., search engine optimization) that do not provide measurable direct benefits to site visitors.

- ***Improved accessibility for people with other disabilities.*** Making Web pages meet WCAG 2.0 AA standards would help users with disabilities other than severe vision impairment. A Web site with a cleaner layout and less content per page may be more readily usable by travelers with less severe vision disabilities, cognitive disabilities, or epilepsy.
- ***Increased air travel by persons with disabilities.*** Making carrier Web sites accessible may remove a barrier to travel for independent people with severe vision impairments, making it somewhat more likely they will travel and increasing the number of trips purchased.
- ***Reaching more consumers without disabilities.*** A growing segment of the population uses a mobile platform, such as a tablet or Smartphone, as the primary means of Internet access. Implementing or expanding a mobile Web site to ensure accessibility would improve a communication channel that is relevant for existing and potential new customers without disabilities.
- ***Decreased carrier customer service costs.*** When a traveler is away from a computer, a complete, easy-to-navigate mobile Web site is less likely to result in calls to the carrier and in-person requests for information or customer service.
- ***Passenger convenience.*** Air travel requires many passengers to leave home hours before their scheduled flight; typically, their primary means of Internet access en route to and at the airport is a mobile phone. Similarly, on the return leg of their journey, mobile phones are likely to serve as passengers' main form of access to the Internet. By having a fully functional mobile Web site, carriers will increase the ability of their passengers to check flight status, check in, and perform other functions that make air travel easier and more convenient.
- ***Better internal understanding of Web sites.*** A detailed Web site inventory would improve the publisher's ability to understand and clean up existing errors and performance issues. For example, our review of carrier Web sites turned up many instances of broken links, circular references, and, in one case, hidden links to gray market pharmacy Web sites.
- ***Reputation.*** In addition to the more tangible benefits of a well-developed mobile Web site, providing this capability is increasingly regarded as a sign of a modern, successful company. Carriers' corporate images may be improved by rolling out well- designed mobile Web sites to meet the proposed accessibility requirements.

6.5. Estimated Costs of Proposed Requirements

Carriers and ticket agents may benefit from adding travelers with disabilities to their passenger base and reducing direct customer service assistance costs associated with researching and booking flights. However, complying with the likely requirements for Web site accessibility will cause carriers (and their agents) to incur costs associated with making it possible for visually-impaired users to read Web sites using commercially-available software. Carriers and their agents will face direct, indirect, and opportunity costs for increasing Web site accessibility. There are direct costs associated with programming and site redesign for greater accessibility, indirect costs related to program management and training, and potential opportunity costs in applying technical resources toward accessibility rather than other Web-based business strategies (e.g., social networking).

Compliance costs for ensuring Web site conformance with applicable accessibility standards will depend on several factors:

- The number and complexity of pages included on the current Web site
- The type of technology used (e.g., HTML, PHP, asp.net)
- The extensiveness of the revisions required to achieve conformance
- The current Web site development and maintenance staff or contractor's level of expertise and training in accessibility issues.

Based on our review of the W3C Website Accessibility Initiative (WAI) site and other online programming guides, it is clear that the time involved to "retrofit" existing Web pages is much larger than that associated with ensuring new pages comply with accessibility guidelines. In fact, many experts regard many of the requirements to ensure accessibility as merely good programming practices that should be more consistently followed by Web developers in any event.[61]

This preliminary analysis includes compliance cost estimates for one-time revisions of the current carrier and ticket agent Web sites. Work required to revise non-accessible sites would include, but not be limited to, the following tasks:

- Review and assessment of current Web site features that require remediation
- Development of a compliant site design template and style sheet
- Revision or alternative programming of JavaScript-based menus and navigation
- Creation of alternative displays for site graphics, images, and video material
- Development of alternative versions of forms and scripts
- Conformance verification, evaluation, and certification.

The training and expertise in accessibility issues of carrier and ticket agent Web development teams for affected carriers and ticket agents will vary, but no provision for training or outside

[61] See, for example, the technical factors listed by W3C in the Website Accessibility Initiative site section on building a business case for accessibility, available at http://www.w3.org/WAI/bcase/tech.html.

consultants (other than for conformance evaluation and certification) is included in these estimates.

Separate compliance cost estimates were developed for mobile Web sites (to meet the Tier 2 requirements) and primary Web sites (to meet the Tier 3 standards). Actual Tier 3 costs will be somewhat lower than estimated here, to the extent that carriers are able to incorporate accessibility into overhauled sites covered by the interim Tier 1 standards instead of having to retrofit their existing primary sites. However, the quantitative significance of this factor is limited by the relatively short time period between the dates on which compliance with the Tier 1 and Tier 3 standards would be required.

Tier 2 Compliance Costs

Because most mobile Web sites are smaller and less complex than primary Web sites, substantially fewer revisions would be required to make these sites fully compliant with the WCAG 2.0 accessibility standards. For this preliminary analysis, we developed estimates of the costs for making typical mobile sites fully accessible, based on the assumption that carriers would find it easier to make the entire mobile site conformant instead of limiting the revisions to the pages containing information or services included in the proposed list of core functions. Estimated costs would be only slightly lower if the revisions were limited only to pages relating to these core functions.

Compliance costs were calculated using the following assumptions and estimates:

- The typical mobile site for a very large or large carrier is assumed to have one-third as many pages as the primary Web site. Mobile sites for small and very small carriers are assumed to have one-half as many pages as the primary versions of these carriers' Web sites.[62]

- The fixed time costs for conformance evaluation and certification and for overall site layout and revision of the home page are assumed to be 20 percent of the hours required to perform the same functions for primary Web sites of the same size. The incremental cost of reviewing and revising each additional page is assumed to be 50 percent of the time required to revise a page on the primary Web site.

- Per-hour programming costs, including corporate or contractor overhead, are assumed to be $150 per hour for revisions of very large and large carrier mobile sites and $120 per hour for revisions of small and very small carrier sites.

Based on these preliminary assumptions and estimates, the costs to make mobile Web sites fully accessible are calculated as follows:

[62] Reporting carriers are classified as very large carriers; other U.S. carriers are classified according to the number of seats on the largest aircraft used to provide passenger service. Foreign carriers were apportioned into the four size classes based on the annual number of passengers flown to and from the United States.

Table 22 - Estimated Web Site Revision Costs to Comply with Tier 2 Requirements

	Carrier Size Class			
	Very Large	**Large**	**Small**	**Very Small**
Average number of pages	300	100	60	30
Programming/review hours required*				
Conformance evaluation/certification	60	40	30	20
Site layout and home page	60	40	30	20
Each site page	0.5	0.5	0.5	0.5
Total hours required	**270**	**130**	**90**	**55**
Cost per hour (programming/overhead)	$150	$150	$120	$120
Cost per site	**$40,500**	**$19,500**	**$10,800**	**$6,600**
Number of sites requiring revision**				
U.S. carriers	12	6	6	27
Foreign carriers	15	36	36	2
Total number of sites	**27**	**42**	**42**	**29**
Total revision costs				
U.S. carriers	$486,000	$117,000	$64,800	$178,200
Foreign carriers	$607,500	$702,000	$388,800	$13,200
Total Tier 2 revision costs	**$1,093,500**	**$819,000**	**$453,600**	**$191,400**
Total costs (millions)	**$2.56**			
Discounted costs (millions)***	**$2.65**			

*Assumes all covered carriers provide accessible mobile sites in lieu of making full versions accessible to comply with the Tier 2 requirements.

**Excludes contract carriers and charter carriers which do not market air transportation to the general public.

***Assumes 50 percent of compliance costs are incurred in Year 0 and 50 percent in Year 1. The Year 0 costs are rolled forward to Year 1 using a 7 percent inflation rate.

Estimated compliance costs associated with the Tier 2 requirements are relatively small—about $2.6 million divided among 140 U.S. and foreign carriers. This estimate does not include any costs that may be incurred by contract carriers or charter carriers. These carriers typically publish very small Web sites that provide limited information and functionality in the specified core function areas.

It should be noted that this estimate also does not include additional costs for carriers to plan, design, and develop the layout and content of new mobile Web sites that may be launched between the rule publication date and the date on which compliance with the Tier 2 standards would be required. While it is true that carriers could avoid offering the required core functions on an accessible mobile site by ensuring that these capabilities are fully accessible on their primary Web sites, it is unlikely that the latter option would be less costly. In addition, developing and publishing a mobile site is likely to be necessary, as an increasing share of both disabled and non-disabled air travelers use mobile devices as their primary means of accessing the Internet.

Tier 3 Compliance Costs

Costs for carriers to make their primary Web sites compliant with the Tier 3 requirements were calculated using a similar approach. The average number of pages to be revised was extrapolated from the results of our carrier Web site review. The fixed and per-page time requirements for site revisions are preliminary estimates and depend on the extensiveness, programming, and accessibility of the carriers' current sites. We found substantial cross-carrier variation in current Web site technology across these dimensions. Per-hour programming costs for each carrier size class were assumed to be identical to those used in the estimation of mobile site revision costs.[63]

Based on these preliminary assumptions and estimates, the costs to make primary Web sites fully accessible are calculated as follows:

[63] The Air Transport Association said in its comments to the 2004 NPRM that at least some air carriers would require a significantly higher number of hours to comply with the standards in that NPRM. Similarly, the Interactive Travel Services Association (ITSA) argued that compliance for travel agencies would be far more technically complex than DOT had anticipated and estimated the cost of basic Web site compliance with the Section 508 standard to be $200,000-$300,000 per company with millions more in ongoing maintenance costs. However, it is not clear that estimates from 2004 are still relevant for estimating compliance costs in 2012 and beyond. Web sites of that era were only beginning to transfer all of the formatting control to Cascading Style Sheets (CSS), which make maintenance and updating of Web pages much easier and less time-consuming. Use of CSS is now nearly universal. The programming tools available in Web design software were also much less well-developed. Finally, the 2004 NPRM proposed compliance with the current Section 508 standards. In comments submitted in response to the questions raised in the DOJ ANPRM, Concerned Web Developers noted that "The current Section 508 does not acknowledge the evolution of the web beyond static HTML; it does not support application development for the web; it does not acknowledge the rampant use of multimedia on the web… WCAG [2.0] is a more robust and more current set of guidelines, and is better-supported." (Concerned Web Developers. DOJ-CRT-2010-0005-0297.1.pdf, available on www.regulations.gov).

Table 23 - Estimated Web Site Revision Costs to Comply with Tier 3 Standards

	Full Site			
	Largest	**Large**	**Small**	**Smallest**
Average number of pages	900	300	120	60
Programming/review hours required				
Conformance evaluation/certification	300	200	150	100
Site layout and home page	300	200	150	100
Each site page	1	1	1	1
Total hours required	**1,500**	**700**	**420**	**260**
Cost per hour (programming/overhead)	$150	$150	$120	$120
Cost per site	**$225,000**	**$105,000**	**$50,400**	**$31,200**
Number of sites requiring revision				
U.S. carriers*	12	37	12	38
Foreign carriers	15	36	36	2
Travel agencies	8	10	88	222
Tour operators	4	6	12	72
Total number of sites	**39**	**89**	**148**	**334**
Total revision costs				
U.S. carriers*	$2,700,000	$3,885,000	$604,800	$1,185,600
Foreign carriers	$3,375,000	$3,780,000	$1,814,400	$62,400
Travel agencies	$1,800,000	$1,050,000	$4,435,200	$6,926,400
Tour operators	$900,000	$630,000	$604,800	$2,246,400
Total Tier 3 revision costs	**$8,775,000**	**$9,345,000**	**$7,459,200**	**$10,420,800**
Total costs (millions)	**$36.00**			
Discounted costs (millions)**	**$36.04**			

*Includes contract carriers and charter carriers which do not market air transportation to the general public.

**Assumes 25 percent of compliance costs incurred in Year 0, 50 percent in Year 1, and 25 percent in Year 2. The Year 0 costs are rolled forward to Year 1 using a 7 percent inflation rate.

These preliminary estimates show that under reasonable assumptions about the amount of time and resources that would be required the compliance costs for retrofitting the primary versions of carrier and ticket agents Web sites to comply with the proposed Tier 3 requirements would be about $36.0 million. U.S. and foreign carriers would incur an estimated $17.4 million in costs to make their existing primary Web sites fully compliant with the WCAG 2.0 accessibility standards. Travel agencies and tour operators would incur an estimated $18.6 million in costs to meet the Tier 3 requirements.

Carriers and ticket agents are also likely to incur ongoing costs in connection with maintaining and updating their primary Web sites to ensure that accessibility is not degraded as a result of any changes. Our estimates of these costs are as follows:

Table 24 - Ongoing Annual Site Maintenance Costs

	Full Site			
	Largest	**Large**	**Small**	**Smallest**
Percent of pages replaced/added	20%			
Average number of pages/year	180	60	24	12
Percent of retrofit time for new pages	20%			
Programming/review hours required				
Conformance evaluation/certification	60	40	30	20
Site layout and style sheet	60	40	30	20
Each site page	0.2			
Total hours required	**156**	**80**	**60**	**40**
Cost per hour (programming/overhead)	$150	$150	$120	$120
Maintenance cost per site	**$23,400**	**$12,000**	**$7,200**	**$4,800**
Number of sites				
U.S. carriers*	12	37	12	38
Foreign carriers	15	36	36	2
Travel agencies	8	10	88	222
Tour operators	4	6	12	72
Total number of sites	**39**	**89**	**148**	**334**
Annual costs				
U.S. carriers*	$280,800	$444,000	$86,400	$182,400
Foreign carriers	$351,000	$432,000	$259,200	$9,600
Travel agencies	$187,200	$120,000	$633,600	$1,065,600
Tour operators	$93,600	$72,000	$86,400	$345,600
Total ongoing annual costs	**$912,600**	**$1,068,000**	**$1,065,600**	**$1,603,200**
Annual cost (millions)	**$4.65**			
Total costs, Years 1-10 (millions)**	**$39.52**			
Discounted costs (millions)**	**$28.12**			

*Includes contract carriers and charter carriers which do not market air transportation to the general public.

**Ongoing costs begin to be incurred halfway into Year 2.

U.S. and foreign carriers would incur an estimated $2.0 million annually in costs to ensure that their primary Web sites remain fully compliant with the WCAG 2.0 accessibility standards as new pages are added and existing pages are revised. Travel agencies and tour operators would incur an estimated $2.6 million annually in costs to ensure that their primary Web sites remain fully compliant with the WCAG 2.0 accessibility standards as new pages are added and existing pages are revised.

As with the benefits analysis, there are potentially important categories of costs for which monetary values cannot be estimated from the available data, as well as those that are intrinsically qualitative, including:

- ***Use of resources.*** Carriers will need to devote resources to creating or updating Web pages to ensure regulatory compliance. It is possible that these resources could otherwise be used to provide more or better functionality on their Web sites.
- ***Loss of creativity/options.*** Ensuring all elements of an air travel Web site adhere to WCAG standards may reduce the carrier options in creatively presenting Web content and may stifle innovation.
- ***Maintenance costs.*** Each time a Web site is updated, the new content would have to be checked to verify that it complies with the proposed standards. This may make updating the Web site more time consuming. Existing and new personnel may also have to undergo extra training before starting work on a covered air travel Web site.
- ***Point of diminishing returns.*** The cost of removing 80 percent of the accessibility guideline violations may be a small fraction of the cost of fixing the remaining 20 percent.
- ***Enforcement costs.*** The Department would have to invest resources in acquiring and maintaining the ability to monitor and review covered air travel Web sites, conduct testing and verification periodically, and work with site publishers to understand and remedy identified violations of the proposed accessibility standards.

6.6. Estimated Net Benefits and Discussion of Preliminary Results

The present value of net benefits from the proposed Web site accessibility requirements is expected to be $55.3 million for the 10-year analysis period using a discount rate of 7 percent and $74.7 million for the same time period using a discount rate of 3 percent. The estimated net benefits of the proposed requirements would be even larger if the values of improvements in access for people with disabilities other than blindness or severe visual impairments could be estimated and included in the regulatory evaluation.

Table 25 - Present Value of Accessible Web Site Benefits and Costs

Discount Rate Used:	7 Percent	3 Percent
Total benefits (millions)	$122.11	$147.27
Tier 2 compliance costs (millions)*	$2.65	$2.60
Tier 3 compliance costs (millions)	$36.04	$36.01
Ongoing site maintenance costs (millions)	$28.12	$33.94
Total costs (millions)	$66.81	$72.55
Present value of net benefits (millions)	**$55.30**	**$74.72**

*Assumes all covered carriers and ticket agents opt to provide accessible mobile sites in lieu of making full versions accessible to comply with 12-month requirements.

The preliminary benefit and cost estimates developed for the baseline scenario and for the two alternatives included in this evaluation indicate that any of them would generate monetized benefits to travelers with disabilities that would substantially exceed the costs that would be incurred by carriers and ticket agents to develop and publish accessible Web sites. The net benefits of the first regulatory alternative—requiring accessible links to fully accessible mobile sites—are somewhat higher than those for the baseline scenario. However, the benefit and cost estimates for both sets of requirements are sensitive to a large number of component assumptions

and estimates. Using certain reasonable alternative values for some of these component assumptions and estimates, the net benefits calculated for the baseline scenario would exceed those estimated for the alternative set of possible accessibility requirements.

There are potentially significant differences in the unquantifiable benefits that would be realized in the baseline scenario (which would require primary Web sites to be fully accessible) and the alternative approach that would permit carriers and ticket agents to meet the proposed requirements by providing accessible links to fully accessible mobile Web sites. For example, requiring full versions of Web sites to be compliant eliminates the need to determine whether or not the mobile version, or other accessible alternative, provides equivalent coverage and is updated as frequently. This would reduce the extent of future internal and regulatory monitoring that would be required to determine whether a carrier or ticket agent is in compliance. On the other hand, allowing compliance by means of a link to an alternative accessible Web site may prompt carriers and ticket agents to develop mobile sites more quickly, which would provide additional benefits to disabled travelers in the form of larger reductions in the amount of time typically required to navigate and conduct transactions on mobile Web site pages.

Table 26 - Web Site Benefits, Costs, and Net Benefits by Year

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Years 0-10
Benefits												
Number of site visitors who benefit		318,868	340,404	362,896	386,380	410,895	436,480	463,176	491,024	520,069	550,355	4,280,547
Benefits to passengers (millions)		$4.65	$11.71	$14.37	$15.30	$16.27	$17.29	$18.34	$19.45	$20.60	$21.80	$159.78
Benefits to carriers and ticket agents (millions)		$0.88	$0.94	$1.00	$1.06	$1.13	$1.20	$1.27	$1.35	$1.43	$1.51	$11.77
Total Benefits (millions)		$5.53	$12.64	$15.37	$16.37	$17.40	$18.49	$19.62	$20.80	$22.03	$23.31	$171.55
Costs (millions):												
Tier 2 costs	$1.28	$1.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.56
Tier 3 costs	$9.00	$18.00	$9.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$36.00
Ongoing maintenance costs	$0.00	$0.00	$2.32	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$39.52
Total costs	$10.28	$19.28	$11.32	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$4.65	$78.08
Net Benefits	**-$10.28**	**-$13.75**	**$1.32**	**$10.72**	**$11.72**	**$12.75**	**$13.84**	**$14.97**	**$16.15**	**$17.38**	**$18.66**	**$93.47**

Appendix: Carrier Web Site Characteristics and Accessibility

As part of the preliminary RIA, Econometrica conducted an extensive review of the characteristics and accessibility of a large, diverse sample of U.S. and foreign carrier Web sites. In this appendix, we first provide an introduction to some of the technical aspects of Web sites and Web page coding and then present a description and discussion of results from this review.

A.1. Web Site Technology and Accessibility

Web Site Basics

Web sites are a collection of individual, related, linked Web pages. Web pages are electronic documents consisting of media content (such as text, images, and video) and computer code that determines how the content is rendered on a monitor. Web browsers, such as Firefox and Internet Explorer, process the computer code and display the Web page content. Web browsers have a large number of optional add-ons, extensions, and plug-ins that expand browser capabilities to read and run specific computer code and to display a larger range of media content.

Increases in personal computing power and telecommunications speed, along with new Web browsers, sophisticated programmers, dynamic Web site content and design, and new media formats, have overwhelmed efforts to develop and maintain Web site technology standards. Differences in browsers, Web site code, and media content can result in some Web sites being partially inoperable unless opened with a specific browser or unless a specific add-on, extension, or plug-in is installed.

The evolution of Web sites into more visually complex displays with complex navigation options has provided benefits for air travelers generally and especially for consumers who are deaf or hard of hearing. However, these features pose additional challenges for airline passengers with visual or cognitive disabilities, and carrier and ticketing agent Web sites often provide these passengers with a phone number for customer assistance and ticket purchase.

Among the largest network and low-cost U.S. carriers, only Delta appears to have a specific option that converts its default home page into a version adapted for screen readers and other technologies that make it more accessible for individuals who are blind and those with severe vision impairments. The full versions of other carrier Web sites currently afford different degrees of accessibility for consumers with various types of disabilities.

Mobile Web Site Technology and Accessibility

An increasing number of users access Web content through Smartphones, tablets, and other mobile devices, many of which have hardware and software limitations that reduce the use of advanced technology on Web sites accessed through these devices. To address these limitations, an increasing number of organizations that publish Web sites operate abbreviated parallel Web sites (typically with URLs in the form of either mobile.nameofcompany.com or m.nameofcompany.com, instead of www.nameofcompany.com) that eliminate or substantially simplify graphic menus and navigation, video, images, and template design features but offer access to all or selected parts of the information and functionality of the full versions of their Web sites.

Some of these simplified mobile sites are accessible; most could be made accessible with a small fraction of the amount of conformance assessment, design, and programming work that would be required to render a full Web site accessible. Nine of the twelve reporting carriers that market air transportation and the four largest online travel agencies (OTAs) publish versions of their Web sites for mobile phone users. Some, like the mobile.aa.com site, render substantial portions of the full Web site in line-by-line text form with minimal graphics. Others are more skeletal, offering access only to online booking, flight schedules, flight status updates, and a limited amount of travel information (e.g., checked baggage policies and fees). Not all provide direct access to the sections that provide information on accommodation of travelers with special needs.

Web Site Technology and Accessibility Standards

Making Web site content accessible to persons with disabilities is based on the same principles used by Web browsers to display content. A program processes the computer code and media content to render the information on a Web site in an accessible manner. One can consider a Web browser itself a program that makes Web content accessible, albeit not for all disabilities.

The first Web sites were documents written in hypertext markup language (HTML). An HTML document consists of text interspersed with "tags," code that defines the display properties of the text. For example, the tags <B> and </B> surround text that should be bold when displayed. Early Web browsers interpreted the HTML tags and displayed the Web page content. The concept of tagging content remains important to current Web site technology, and it is fundamental to making Web content accessible to persons with disabilities, but advances in technology, computing power, and content have made Web site technology increasingly complex.

Making Web sites accessible requires specific and comprehensive use of tags to determine how to present the Web site information in an accessible form. For example, a table on a Web site should be tagged as a table, with each header, row and each cell also tagged. This allows the table to be presented, row by row and cell by cell, with headers properly indicated. Other examples of accessibility elements are providing alternate text descriptions for images and navigation that allows for keyboard input. Both of these modifications can also be implemented using tags.

Like Web site technology standards as a whole, Web site accessibility standards have struggled to keep pace with advances in technology, telecommunications, and computing power. At the same time, such advances have increased the potential and actual accessibility of Web sites. Often complex, non-accessible content can be creatively reprogrammed or reformatted as accessible content without changing how it is displayed in a standard Web browser.

A.2. Carrier Web Site Characteristics

The costs associated with providing accessibility to the full versions of carrier Web sites depend on their extent and complexity. Over the past several years, corporate Web sites have grown substantially larger—both in terms of the number of pages and of the average page size (i.e.,

amount of content displayed).[64] Using Xenu's Link Sleuth site evaluation tool, we inventoried the total number of HTML pages in a broad spectrum of carrier Web sites, including:[65]

- All 12 reporting carriers that market scheduled passenger service to the general public.
- The other six U.S. carriers that market scheduled passenger service on at least one aircraft with more than 60 seats.
- All six U.S. carriers that market scheduled passenger service on at least one aircraft with between 30 and 60 seats (but none with more than 60 seats).
- Eleven of the twenty-seven U.S. carriers that market scheduled passenger service exclusively on aircraft with less than 30 seats.
- Twelve foreign carriers that had 1 million or more passengers depart from U.S. airports in 2009.
- Twelve foreign carriers that had fewer than 1 million passengers depart from U.S. airports in 2009.

For each of these Web sites, Xenu's Link Sleuth tool was used to tabulate:

- The total number of pages, measured as the number of HTML or related types of files, accessible on the site.
- The total number of images in .jpg and similar formats for which alt text captions might potentially need to be included.
- The number of downloadable documents in PDF format.
- The number of links to external URLs or other elements.

The results of these tabulations are presented in the table below:

[64] See, for example, WebSiteOptimization.com, "Average Web Page Size Quintuples Since 2003," available at http://www.websiteoptimization.com/speed/tweak/average-web-page/.

[65] Xenu's Link Sleuth™ checks a Web site by visiting the home page, compiling a list of links on that page, then visiting each of those pages; it repeats the process until all pages in a Web site are cataloged. Xenu's Link Sleuth™ was designed to find broken links in a Web site, but the process also produces many useful statistics. See http://home.snafu.de/tilman/xenulink.html.

Table A-1 - Carrier Web Site Element Counts

Carrier Category		Web Site Element Counts			
		Pages	Images	PDFs	External Links
Domestic	reporting carriers	914	759	26	1,025
	other large carriers (> 60 seat aircraft)	303	604	16	388
	small carriers (30-60 seat aircraft)	58	93	23	140
	very small carriers (only < 30 seat aircraft)	71	112	4	60
Foreign	carriers with > 1 million U.S. passengers/year	1,414	267	29	1,863
	carriers < 1 million U.S. passengers/year	792	530	44	1,284

Source: Econometrica, Inc., site testing using Xenu's Link Sleuth, April-May 2011.

The most notable results of these tabulations include:

- The average numbers of pages for reporting carrier Web sites is more than 3 times larger than estimated in the May 2010 preliminary options analysis.
- The largest foreign carrier sites are bigger than the sites of most U.S. carriers.
- Most sites have links to relatively few downloadable documents.
- Large U.S. and foreign carrier sites typically have several hundred links to URLs and content hosted on other sites.

A.3. Carrier Web Site Accessibility

Another determinant of the costs that would be incurred in complying with the proposed requirements is the extent and diversity of accessibility issues that would need to be addressed. To characterize the potential scope of the revisions that would potentially be required, we reviewed the home pages of each carrier in the six groups described above using the Qompliance add-in for the Firefox browser. The following tabulations were compiled from the site-specific reports generated by Qompliance:[66]

- The total number of issues identified that represent definite or potential violations of WCAG 2.0 Level A and Level AA standards.

[66] Qompliance is a Firefox Extension that gives Firefox users direct access to Deque's Worldspace, a Web content Accessibility tool. Worldspace is a Web-based enterprise tool that automates testing for Accessibility (Section 508 and WCAG), Privacy, Quality, and Security. See https://addons.mozilla.org/en-US/firefox/addon/qompliance/.

- The number of different WCAG 2.0 guidelines violated.

- The number of issues identified that represent violations only of Level AA-specific standards.

Table A-2 - Accessibility Testing of Carrier Web Site Home Pages

Carrier Category		Average Number of Violations (WCAG 2.0 A/AA Level)		
		Total Issues	Total Guidelines	AA Level Issues
Domestic	reporting carriers	80	11	12
	other large carriers (> 60 seat aircraft)	116	12	31
	small carriers (30-60 seat aircraft)	59	9	6
	very small carriers (only < 30 seat aircraft)	46	8	15
Foreign	carriers with > 1 million U.S. passengers/year	67	9	7
	carriers < 1 million U.S. passengers/year	78	9	20

Source: Econometrica, Inc., site testing using Qompliance add-in on Firefox 3.6 browser, April-May 2011.

These results indicated that the home pages of U.S. carriers in all size classes, as well as foreign carriers, have significant numbers of accessibility issues, most of which involve violations or potential violations of Level A standards. Small U.S. carrier sites have lower average numbers of total accessibility issues that would need to be addressed, but the required revisions would still involve a substantial number of different WCAG 2.0 guidelines.

A.4. Mobile Versions of Carrier Web Sites

Companies increasingly publish multiple versions of their public Web sites to optimize the experiences of users who access the Internet using various types of tools, including traditional Web browsers, mobile browsers, and screen readers. We attempted to locate and access any extant mobile versions of the Web sites published by carriers in each of the six categories included in our review. Of the 12 reporting carriers that market air transportation to the general public, 9 offer alternative versions designed specifically for mobile device access. As the following table shows, the extent and type of content varies significantly across these nine sites:

Table A-3 - Mobile Web Site Content for Reporting Carriers

	Number	Percent
Marketing carriers	12	100%
With mobile sites	9	75%
Mobile Web site content		
Flight status	9	100%
Check-in	8	89%
View my itinerary	8	89%
Book/change reservations online	7	78%
Frequent flyer account	7	78%
Flight schedules	6	67%
Contact us/About us	6	67%
Updates & alerts	5	56%
Terms and conditions/Legal/Policies	3	33%
Travel Information (gates, in-flight services, etc)	3	33%
Sales & offers	3	33%
Car rental	1	11%

Source: Econometrica, Inc., review on May 16, 2011.

All nine sites provide the ability to check flight status; all but one allow travelers to check in or access their itineraries; and all but two allow users to book or change flights and access their frequent flyer accounts.

Very few other U.S. carriers (but the majority of foreign carriers) included in our review have mobile versions of their Web sites at present.

A.5. Screen Reader Parsing of Full and Mobile Versions of Carrier Web Sites

Because mobile versions of Web pages are designed to display content more compactly, they typically contain fewer images and provide simpler navigation. These adaptations also substantially reduce the amount of time that it takes for a screen reader to translate the page into audio output. To quantify the extent of this difference, we utilized the aDesigner application to estimate the amount of time that it would take for a typical screen reader to read all the contents of each carrier home page included in this review.[67]

[67] Home pages of carrier Web sites are typically among the most complicated to render in fully accessible form, since they include the online booking engines and links to the remaining pages on the site.

Table A-4 - Carrier Web Site Screen Reader Times

Carrier Category		Screen Reading Time (seconds) for Home Page		
		Full Version	Mobile Version	% of Full Version
Domestic	reporting carriers	199	30	15%
	other large carriers (> 60 seat aircraft)	231	no site	**
	small carriers (30-60 seat aircraft)	116	no site	**
	very small carriers (only < 30 seat aircraft)	185	no site	**
Foreign	carriers with > 1 million U.S. passengers/year	225	25	11%
	carriers < 1 million U.S. passengers/year	144	18	12%

Source: Econometrica, Inc. site testing using Xenu's Link Sleuth and aDesigner, April-May 2011.

As noted previously, nine of the 12 reporting carriers that market air travel to the general public have mobile Web sites. Eight of the 12 larger foreign carriers and seven of the smaller ones included in our review also maintain mobile versions of their Web sites. The screen reading times for both U.S. and foreign carrier mobile site home pages are substantially lower than for the full Web site home pages. However, it should be noted that the mobile versions of home pages generally serve solely as menus to direct users to the content available, rather than acting as destinations for site visitors.