Understanding Airline and Passenger Choice in Multi-Airport Regions

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 98

Understanding Airline and Passenger Choice in Multi-Airport Regions

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Washington, DC

IN ASSOCIATION WITH

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

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Barney Parrella of Inter*VISTAS* Consulting LLC was the principal investigator for the project and primary author of the guidebook. Steven Martin, Christopher Warren, and Richard Sullivan of Inter*VISTAS* were also investigators for the project, and each had major roles in the development and conduct of the research plan and writing of the guidebook. Zach Mensen, Taylor Miller, Mira Aiello, and Debbie Homonai of Inter*VISTAS* assisted with the research, data collection, data analysis, and project management aspects of the project. Dr. Claire Rose, Maisha Hudson, and Jenna Blough of ETI performed the literature review and related tasks in support of the project. Amy Kvistad of Kvistad Design provided graphics services throughout the project and for the guidebook.

The study team would like to sincerely thank the airport and airline representatives who participated in this project for their contribution to the development of the airline industry background section and the regional case studies. These elements of the study were essential for the development of a report that provides useful guidance for practitioners of air service development in the airport community.

FOREWORD

By Joseph D. Navarrete
Staff Officer
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ACRP Report 98: Understanding Airline and Passenger Choice in Multi-Airport Regions provides insight into the business models airlines use to establish service in regions with multiple airports and how passengers select an airport within a multi-airport region. The report features five cases studies, consisting of two classic examples of multi-airport regions (the Los Angeles Basin and the San Francisco Bay Area) and three diverse examples (Western Carolina, the Northern Gulf Coast, and Central Wisconsin). The report's findings will help airports and their stakeholders focus limited resources on strategies that can provide sustainable levels of service within the context of their multi-airport environment.

Commercial service airports place a high priority on developing and maintaining air service for their communities, requiring a thorough understanding of air service, geography, and socioeconomic issues at both the regional and national levels. The factors underlying airline service decisions and passenger choice are made even more complex when a region is served by more than one airport. While there is an extensive amount of literature focused on passenger choice, very limited research has been undertaken concerning how airlines choose to serve multi-airport regions. This lack of knowledge has led to misunderstandings of why airlines often decide not to serve a particular airport in a multi-airport region and why one airport may have significantly more passengers than others in the region. These misunderstandings may also lead to unrealistic expectations regarding the level of passenger and airline activity an individual airport in a multi-airport region may be able to support.

The research, led by InterVISTAS Consulting, began with a review of recent relevant literature which was used to develop an initial list of key factors affecting airline and passenger choice in multi-airport markets. A series of air service regions, each representing different types of multi-airport markets, was then identified, and case studies were conducted to better understand the interplay of various airline and passenger choice factors. The lessons learned from the case studies were combined with the contractor's insight to produce the report's findings.

Chapter 1 provides a background and summary of the research objectives and approach. Chapter 2 highlights key features of multi-airport regions, including market size, catchment area, geography, air service, and other factors. A summary of relevant literature is provided in Chapter 3. Chapter 4 describes the factors passengers consider when selecting an airport in a multi-airport region, while Chapter 5 provides insight into the process airlines use to evaluate the most profitable way of serving a multi-airport region. Five regional case studies are presented in Chapter 6 to provide real-world examples of the interplay of the various factors described in the previous chapters. The findings and conclusion of the research are provided in Chapter 7. A glossary and annotated bibliography are included as appendices.

CONTENTS

Note: Many of the photographs, figures, and tables in this report have been converted from color to grayscale for printing. The electronic version of the report (posted on the Web at www.trb.org) retains the color versions.

SUMMARY

Understanding Airline and Passenger Choice in Multi-Airport Regions

The objective of this research is to assist airports and their stakeholders to better understand the factors that drive airline service decisions and passenger choice in multi-airport regions. To accomplish this objective, the panel and the research team developed a scope of work and search approach that focus on the objective of informing the airport community regarding the interaction of choice factors that drive the decisions of airlines and passengers. These interactions reflect the relationship between supply (airline decisions to provide air service) and demand (air traveler decisions on which airport and airline to fly), but are complicated by the extent and nature of airport and airline options within a region.

Each market, region, and airport is unique. In addition, each airline is unique, with some common business plan features but different capabilities and approaches to the markets they serve. Each individual consumer makes a discreet choice regarding where, when, and how he or she will book, purchase, and travel by air. Accordingly, a research approach has been developed for this study that uses a revealed preference approach, with a focus on the interrelationships of airline and passenger choice factors, and the characteristics of multi-airport regions that affect those choices.

The research team selected five regions, which represent a cross-section of instructive examples, as case studies: Los Angeles Basin, San Francisco Bay, Western Carolina, Northern Gulf Coast, and Central Wisconsin. Each of these regions was analyzed regarding how various choice factors appear to have influenced passenger trends and airline decisions in the region. The combination of quantitative analysis and related research resulted in insightful case studies, with lessons learned and the guidance obtained. The case studies are presented in Chapter 6.

Recent events and trends have impacted each airline's perspective on, and approach to, implementing its business plan and deploying air services, including the following:

- The use of airline aircraft in the terrorism events of September 11, 2001, and the subsequent imposition of extensive passenger security screening and border controls caused an instantaneous drop in the demand for air transport.
- Rising and fluctuating oil prices caused higher fares in some markets and service reductions in price-sensitive markets and on long-haul domestic routes.
- Numerous bankruptcies, acquisitions, mergers, downsizings, and other actions were taken by airline managements as they tried to weather the storm.
- The financial crisis of 2008, and the ensuing Great Recession, further depressed the demand for air travel, resulting in additional consolidation of the industry.
- Airlines focused on balancing capacity with demand on a market-by-market basis to achieve the goals of greater efficiency, high load factors, pricing power, and a return to profitability.

At the time of this writing, airlines continue their cautious approach regarding the addition of capacity on existing routes or start-up of new services. Decisions on capacity expansion are now made with ever greater analytic and strategic consideration.

Regions with multiple airport options pose additional choices to both airline decisionmakers and air travelers. The research undertaken and the case studies performed through this study reveal the nature of these choice factors—some of which have widespread applicability and others that are unique to each situation.

The research and case studies yielded the following key findings (described in greater detail in Chapter 7):

- Airlines prefer to concentrate services at as few airports as possible in a market;
- Vigorous competitive response is likely if an incumbent airline feels threatened;
- Niche services at alternative airports need business model compatibility and good surface access;
- Niche and ultra-low-cost carriers tend to be more opportunistic in airport choice;
- Large carriers have the resources to serve more than one airport in a region if needed;
- Airfare parity can balance out other differences among airports;
- Convenient, nearby hub airport will prompt traffic leakage from areas served by smaller airports;
- Long and difficult drive to a major airport invites the choice of inferior service at nearby smaller airports;
- City-pair service advantages can overcome drive time concerns;
- Balanced services at multiple airports can create a competitive environment;
- Small airports can retain less price-sensitive local travelers through convenience; and
- Airline service reliability concerns prompt travelers to use airports with more flight frequency.

The research, case studies, analyses, and reviews of airline and air travel trends performed in this study lead to a series of interrelated conclusions about passenger and airline choice in multi-airport regions. The most significant conclusions and issues relate to the effects of airline industry maturation, the resulting evolution of specialized airline business models, and the maturation of the U.S. air travel market. Airlines are averse to risk and place a high value on maintaining a careful balance of capacity, demand, and sustainable pricing. Expansion of air services must meet very high suitability tests in relation to an airline's expansion strategy and competitive requirements. The reduction in the number of airline hubs has been a major aspect of airline industry maturation and consolidation. Fewer hubs result in a need for a smaller aircraft fleet and less overall capacity in the network, resulting in fewer hub service options, especially for smaller communities and smaller airports in multi-airport regions. Static or reduced air service levels at smaller airports in a region will also fuel greater traffic leakage to an alternative airport, especially if the levels of service are significantly higher at the alternative airport, and if the drive time and ground access are reasonable. The net effect is fewer air travel options for air travelers. Passenger choice options are increasingly circumscribed by airline decisions regarding where and how to serve markets with multiple airports.

The study also raises fundamental issues for those who seek to improve air service to U.S. communities, especially small communities or at small airports in multi-airport regions. Some conclusions are applicable to most, if not all, multi-airport regions, while others are only relevant to regions with similar characteristics. The study confirms the conclusion that each combination of market, airport, and airline circumstances in a region is unique, but that several key considerations, such as the following, are important for air service development success:

- The importance of recognizing and understanding the business model that is driving each airline's choices, and how a region, a community, and an airport fit (or do not fit) into those choices;

- The performance of detailed analysis and service-specific evaluation to support the air service business case to a particular airline;
- Robust and focused involvement of community interests in the support of air service development, with the airport operator in the lead;
- High priority by smaller airports regarding public information efforts in the local market to ensure that local residents and businesses understand the services that are available at the local airport, and the relative convenience of using the local airport;
- Provision of support for the introduction of new entrant airline services as a means to developing services in underserved markets and improving the competitive environment in a region or at an airport;
- Provision of the most efficient airport operation possible, consistent with the requirements of public interest and services; and
- Institution of educational outreach programs for stakeholders on trends in the domestic air travel market and the impact of these trends on airline and passenger choice.

In their totality, these conclusions and issues present a changed landscape for communities, airports, airlines, and air travelers, and the need for alternative air service strategies by airport operators and their stakeholders.

CHAPTER 1

Background

Air travel markets are comprised of many different demand characteristics that, in the aggregate, result in opportunities for airlines to provide air services at airports that are properly situated to access the markets and equipped to handle airline operation. In the simplest model, air passengers decide where they wish to fly and then choose an acceptable flight that operates from an acceptable airport. Passengers then travel by surface transportation to the airport where the selected flight will depart, transition from the surface transportation portion of the trip to the aviation portion of the trip, and commence the air journey.

More commonly, air travelers located in, or planning to fly to, a region will have multiple airport options and substantial airline competition, making choices much more complex. Multiple airports in a region, each with different levels of air service, quality of terminal/landside facilities and services, and customer service quality compete with each other. As airports compete for air service and traffic, they seek to maximize their share of the regional market, or "catchment area." The interplay of airline choice factors, such as network competition, pricing strategies, levels of service, and customer affinity programs, among others, contribute to this complexity.

Multi-airport market regions are commonplace in the United States, as they are in many countries, especially in competitive air transportation environments. Understanding the types of multi-airport systems, the factors affecting airline choices as to what airport(s) to serve, and the factors driving passenger decisions regarding the use of airline services is essential to understanding how and why airlines and passengers make their choices in multi-airport regions.

Research Objectives

The objective of this research is to assist airports and their stakeholders to better understand the factors that drive airline service decisions and passenger choice in multi-airport regions. To accomplish this objective, the ACRP panel and the research team developed a scope of work and research approach that focuses on the objective of informing the airport community regarding the interaction of choice factors that drive the decisions of airlines and passengers. These interactions reflect the relationship between supply (airline decisions to provide air service) and demand (air traveler decisions on which airport and airline to fly), but are complicated by the extent and nature of airport and airline options within a region.

Detailed analysis of these complex relationships at the micro level of individual airline/passenger discreet choice would be a massive undertaking, and not likely to generate findings and guidance that would be useful to airport management and stakeholders. Indeed, as will be presented in this study, much detailed investigation of passenger choice factors is already available in the existing research literature, while very little is available regarding airline choice factors (especially in the context of regions with multiple airports). The panel and the research team agreed that greater utility will result from the identification and description, at a macro level, of the key choice factors that are involved, and the presentation of an analysis that enhances the understanding of their interrelationships.

Research Approach

Each market, region, and airport is unique. In addition, each airline is unique, with some common business plan features but different capabilities and approaches to the markets served. Each individual consumer makes a discreet choice regarding where, when, and how he or she will book, purchase, and travel by air. Accordingly, a research approach has been developed for this study that uses a revealed preference approach, with a focus on the interrelationships of airline and passenger choice factors that have been demonstrated by events and trends, and the characteristics of multi-airport regions that affect those choices.

Demand, Supply, and Choice

The demand for air travel is generated by individual decisions by individual consumers. In each market, that demand is manifested through the booking of reservations, the purchase of tickets, and the completion of travel. The markets involve multiple city-pair combinations, made more complex by the presence of multiple airports serving individual or proximate markets in the regions of origination and destination. The choices are further complicated by the levels and prices of services offered by multiple carriers in each region and, potentially, at each airport.

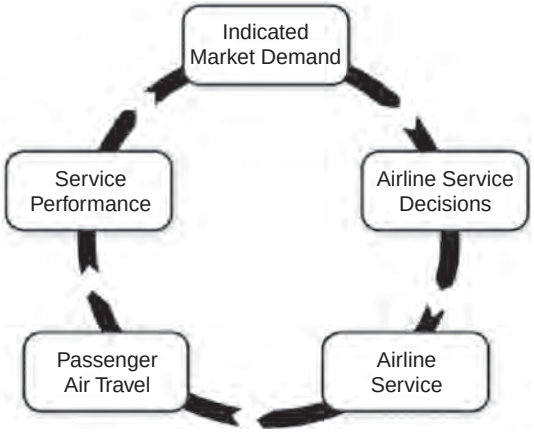
These individual consumer choices, when aggregated for a region or an airport, constitute *market demand* for air service. Underlying this demand are the macro-economic forces of volume (population) and buying power (household or disposable income), as well as the business, tourism, or other business development forces prevalent in the region. Within this aggregation of market demand, segmentation occurs based on the purpose of the travel: business, business combined with leisure, or leisure. The nature of a region's market demand for air service determines how each airline will view that region in the context of its unique business model.

The greater the market demand (size and buying power), the greater the opportunity the market presents to airlines whose business model fits the service opportunity. Airlines serve markets by providing air service to specific airports, consistent with their business plans, at levels that, in the aggregate, are intended to satisfy overall consumer demand in the market. However, the level and quality of service provided by a particular airline at a particular airport will be based on a combination of factors relating to the airline's business plan objectives, priorities, capabilities, and perceptions of the market environment. Thus, demand in each market, as well as the relative level of service to be offered for that demand, will be viewed by each airline, and for each airport, in a different light. See Exhibit 1-1.

The presence of multiple airports and multiple airlines in a region suggests that more choices are available for consumers, and increases the likelihood of more competition and lower fares. However, the competitive environment in a region may not be as vigorous as one would expect from the multiplicity of airlines and airports. Competition occurs on a trip-by-trip and city-pair level. Although there can be aggregated benefits to broad competition among airlines (especially network carrier services), the supply side of the demand/supply relationship in air travel occurs primarily on a city-pair itinerary basis.

Airline industry conditions also impact how airlines view multiple airport regions. Industry consolidation, capacity constraint, high variable costs (i.e., fuel), and other circumstances coming out of the Great Recession have resulted in an unprecedented close relationship between airline seat capacity and passenger air travel demand. At the time of this writing, airlines, through sophisticated revenue, inventory, and pricing management systems, are achieving historically high average load factors. They are also exhibiting great care when adding capacity on existing routes or starting service on new routes. Decisions on capacity expansion, while always made with care, are now made with greater analytic and strategic consideration. This has especially been the case in small markets, and in markets where multiple airport options are available to airline decisionmakers.

Exhibit 1-1. Market demand and airline service relationships.



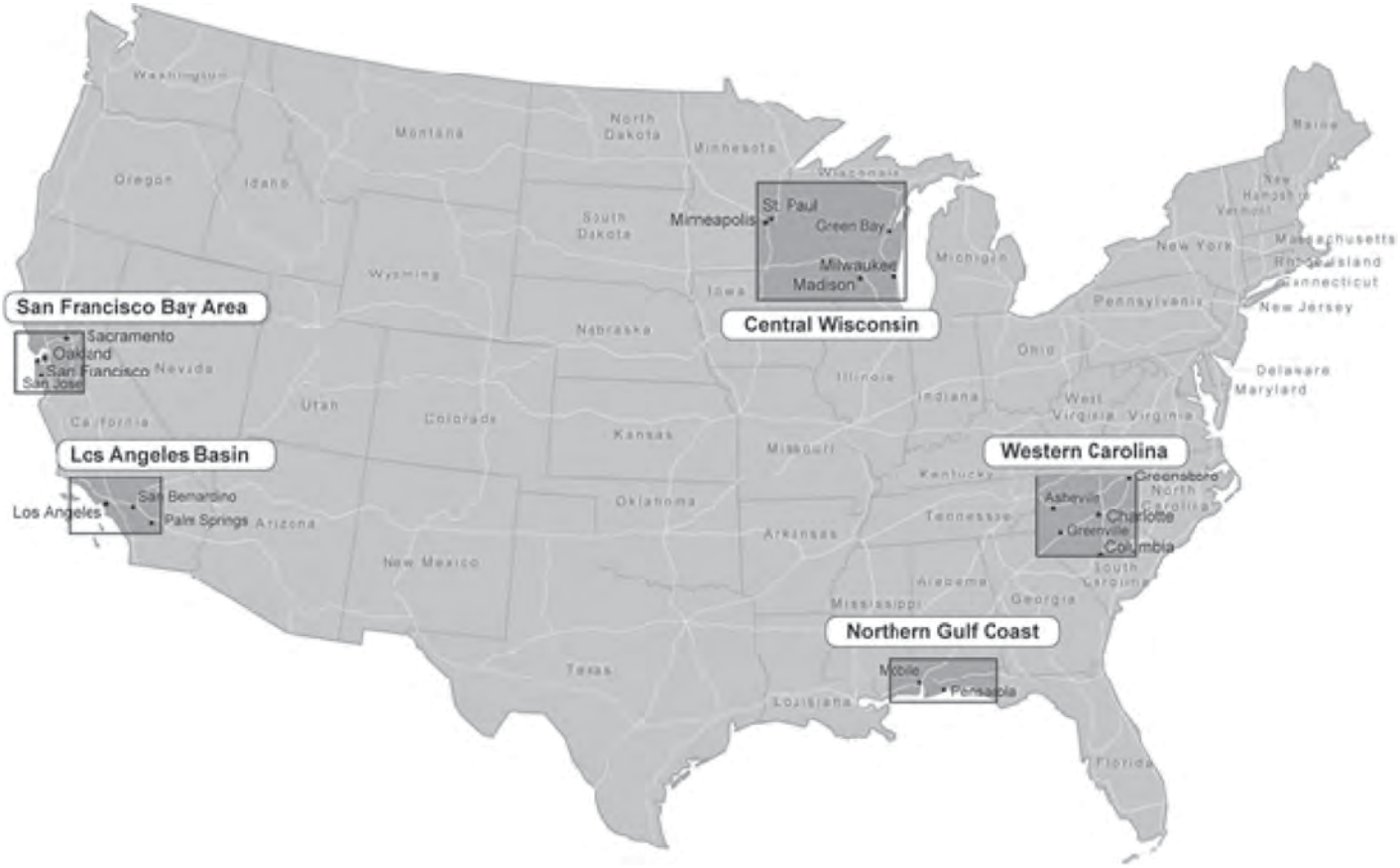
Airline decisions on levels of service and airport choice, in turn, impact the choices that become available to air travelers. Although the demand for service may be present in a region (or part of a region), airline decisions regarding where service should be provided can constrain or expand the options available to air travelers and the service, price, and airport choices involved.

Accordingly, this study approaches the issue of passenger and airline choice by analyzing trends in capacity, traffic, and pricing at each airport in a region, and in the region as a whole, to indicate the choices that airlines have made, and how those choices are impacting passenger choices. This focus on airline choice, and the considerations involved in those choices, enables a better understand of resulting passenger options and choices, and indicates how both airline and passenger relationships among these factors impact the efforts of airports and communities to improve air service.

The research team undertook an extensive analysis (described in detail in Chapter 6) of the following five regions, as shown in Exhibit 1-2, which represent a cross-section of instructive examples:

1. Los Angeles Basin,
2. San Francisco Bay,

Exhibit 1-2. Multi-airport regions selected for case studies.



3. Northern Gulf Coast,
4. Western Carolina, and
5. Central Wisconsin.

Each of these regions was analyzed regarding how various choice factors appear to have influenced passenger trends and airline decisions in the region. Those choice factors were linked to several activity and performance metrics, and analyzed on a time-series basis to identify trends, tendencies, and intervening events. Additional research was conducted to understand how each regional market, and the airports within it, were impacted by trends and changes. Interviews with airport and airline representatives were conducted. The combination of quantitative analysis and related research resulted in insightful case studies, with lessons learned and the guidance obtained. The case studies are presented in Chapter 6.

CHAPTER 2

Multi-Airport Regions in the United States

The United States has an extensive system of commercial service airports for communities and regions of various sizes and characteristics. This variety results in very different multi-airport environments, none of which are the same, but which often share similar characteristics. Understanding the differences and similarities among these regions constitutes the first step in this analysis, and provides the basis for identifying choice factors and selecting regions for instructive case studies. This chapter provides an overview of multi-airport regions, their characteristics, and their relationship to the passenger and airline choices that are the focus of this study.

Large markets typically require multiple airports, because it is often not feasible to develop a single airport to an operating capability that will handle all airline traffic for the region. With the exception of Atlanta, all mega-urban areas in the United States are served by multiple airports. In large urban areas, restrictions regarding airport development—such as land availability, airspace restrictions, runway configuration and operational limitations, noise impacts, terminal facility limitation, and surface access congestion—can result in capacity constraints. In those cases, other nearby airports become associated with serving the core urban area.

Smaller, less urbanized regions also can be served with multiple airports, where none is an airline hub. If one of those airports tends to be larger, it can affect the level of service at the other airports in the region. Such consolidations are often the result of individual airline decisions to focus services at one location to reduce cost, concentrate traffic, and enhance the sustainability of services. In such cases, the loss of service at the other airports in the region can have the effect of forcing travelers to drive longer distances to the airport where service has coalesced. If that option is not acceptable, travelers may decide to drive to an airport outside the region's historical catchment area, effectively expanding the catchment area of the alternative airport.

Each region is unique, but some regional characteristics are useful for differentiating among regions and creating a useful typology.

Size of Market Demand

Market size (volume of passenger origination in or destination to) is a primary descriptor of a region, and a driver of airline evaluation of potential air service. In general, greater market demand generates a greater potential for airline revenue. For smaller markets, the reverse is typically the case, unless there is a particular demand feature (i.e., destination, business presence, etc.) that drives air service demand to higher levels than would be typical based on regional population or demographics.

Geographic Size of the Catchment Area

The geographic size of an airport's catchment area can vary significantly, depending on its location relative to other airports that offer effective competitive flight alternatives. In large mega-urban areas served with multiple airports, one catchment area may be relatively small but still contain millions of people. Conversely, in smaller, more rural parts of the country, an airport's catchment area can easily extend to a radius of 150 miles, but include one-tenth as many people as the catchment area of a mega-urban area.

The common factor in both cases is the amount of time needed for travelers to access the airport. In large, congested urban areas, travel times over relatively short distances can be both long and unpredictable, whereas travel distances in more rural areas may be many factors longer, but require the same time and have the benefit of being predictable. The long drive time from some parts of the catchment area to an airport is often a disincentive for air travel, prompting air

travelers to drive to their destination (if feasible) or consider the use of an alternative airport. In more expansive and rural catchment areas, with long distances and few airports, there simply may not be reasonable alternatives.

The viability of an air carrier airport in a geographically large catchment area is typically a function of drive time and service quality: is the long drive to the airport and the air service available there acceptable? If drive time and service quality are not acceptable, it is likely that alternative airports will be considered.

Natural Geographic Boundaries

The convenience of surface access to airports can be substantially impacted by the natural geography. The presence of natural barriers or constraints, such as bodies of water or mountains, increases the drive time and inconvenience for the traveler. Ground access can be improved by transportation infrastructure, such as bridges, tunnels, and new highway routings. The location and quality of such ground access improvements can mitigate access constraints in such situations. Alternatively, geographic barriers that restrict ground access to a region's primary airport can contribute to the viability of the development of another airport that can effectively serve the area that otherwise would have difficult access to air services.

International Border Boundaries

The presence of an international border that travelers must cross to reach an airport on the other side presents a similar impediment. International borders may involve a bridge crossing, which can present congestion that impacts drive time to an airport. Travelers must have appropriate documentation to cross the border, which may reduce the size of the market that can be effectively accessed. However, those travelers seeking to make an airline trip within the country they are driving into can avoid the time and delay often associated with international airport security or preclearance for an international flight.

Nature of Underlying Market Demand in the Catchment Area

Markets can be differentiated based on the nature of market demand using such distinctions as business travel, leisure travel, travel related to family and cultural ties, etc. Balanced markets (i.e., those with a relatively even split between business and leisure travel) may be provided with various service offerings such as low-cost carrier (LCC) and legacy network airlines with international service. However, there are several notable regions of the country with heavy inbound, leisure-oriented travel, and these areas often are served by not just legacy network airlines, but especially by LCCs that can price travel for discretionary leisure travel. Markets that are inbound leisure destinations will have very different service and pricing patterns for their services. The seasonality of traffic also will be a factor, both for inbound and outbound demand and services.

Air service patterns in the primary airports serving such areas—particularly the regions around Orlando, Southern Florida (both Atlantic and Gulf coasts), Phoenix, and Las Vegas—can exert significant effects on the service available at other airports within relatively close proximity. Traffic originating in those locations can thus be notably affected by the gravitational pull of the dominant airport.

Presence of Airline Hub

Often, due to the nature of the actual demand for air service that originates in major metropolitan areas, airlines establish operational hubs in those locations. Depending on the size of the area, more than one airline may hub in an area (e.g., Chicago). Although not strictly a "hub" in a traditional definition, the study team includes major operational bases of larger LCCs in this category as well. Thus, New York, Dallas, Atlanta, and the Washington/Baltimore area also serve as examples.

A variation involves the situation of a large airport in a large urban area that serves as an airline operational hub, with other communities and airports surrounding that larger facility like satellites. Charlotte and Minneapolis/St. Paul are examples. Both cities are ringed by other communities within approximately 100 miles.

Nearby Alternate Airports

Airport congestion also often results in airline decisions to provide service to one or more alternative airports in a region. If the market size is sufficiently large, an airline may establish an operating station at an alternative airport. The airports in Manchester, New Hampshire, and Providence, Rhode Island are examples. Congestion at Boston Logan effectively precluded Southwest from operating there, so MHT and PVD proved to be workable alternatives. In other cases, an airline's presence at an alternative airport may be very modest, provided to respond to competitive services at that airport, or to protect an airline's market position in the region.

Airports with Subsidized Service

At the opposite end of the spectrum from mega-urban areas served with multiple major airports, small communities may receive subsidized service through the Essential Air Service (EAS) program. The presence of such services can have impacts on air service in the region that are beyond the benefits of the

Exhibit 2-1. Characteristics of selected multi-airport regions.

Area	Airports	Market Size (O&D Traffic)	Catchment Area Size (Geography)	Catchment Area Type	Common Airport Ownership	Balanced Market Type	Trans-Border Market	EAS-Subsidized Service
New York City	JFK, EWR, LGA	L	M	M	✓	✓		
Los Angeles Basin	LAX, BUR, LGB, ONT, SNA, PSP	L	L	M		✓		
Washington/ Baltimore	DCA, IAD, BWI, HGR, CHO, MDT	L	M	M		✓		
Boston Area	BOS, PVD, MAN	L	M	M		✓		
Houston	IAH, HOU	L	M	M	✓	✓		
Niagara Frontier	BUF, IAG, ROC, YYZ, YHM	M	L	M		✓	✓	
Central Michigan	LAN, FLT, GRR, DTW	M	L	M/R		✓		
Northwest Florida	PNS, VLP, ECP, MOB, GPT	M	L	M/R		✓		
South Texas	MCA, BRN, HAR, MAT, REY	M	M	R		✓	✓	
Central Texas	SAT, AUS	M	L	M/R		✓		
Coastal Georgia	SAV, BQK, JAX, HHH	M	M	M				
New York North Country	MSS, OGB, WAT	S	L	R		✓		✓
Southwest Florida	TPA, PIE, SQR, PG, SWF	M	L	M				
Southern Louisiana	MSY, BTR	M	M	M		✓		
Front Range Rockies	COS, DEN, CYS	S	L	M/R		✓		
Greater Chicago Area	ORD, MDW, RFD, BMI, SBN, GYY, FWA	L	L	M/R		✓		

Notes:

For Market Size and Catchment Area Size: L=Large, M=Medium, S=Small
For Catchment Area Type: M=Metropolitan, R=Rural

subsidized air service. For example, subsidized service often makes it difficult to attract a second carrier to operate to a second destination from an airport that already has subsidized service. In addition, if the quality of the subsidized service is poor, passengers may opt to drive to alternative services at other airports.

Exhibit 2-1 provides some examples of how multi-airport regions can be classified. Depending on how expansive or restrictive the scope of the region or airports is, such classifications can be somewhat arbitrary. In addition, because not all multi-airport regions are affected by the same summary factors, the inclusion or exclusion of factors can significantly affect analysis and evaluation. The high-level summary shown in Exhibit 2-1 cannot capture other considerations that may figure prominently in passenger decisions—traffic congestion or distance, for example. The exhibit also illustrates that in certain cases regions may overlap and airports may be within the general catchment area of other airports.

CHAPTER 3

Review of Relevant Literature

An extensive review of recent relevant literature was conducted to identify research and analysis that has been performed on the subject of airport choice by airlines and passengers in regions with multiple airports. This review included research with regard to the following:

- Academic and industry journals in airport (and transportation) planning, management, and economics (e.g., *Journal of Airport Management, Transport Policy, Journal of Transport, Economics and Policy, Transportation Planning and Technology,* etc.);
- Airport and transportation planning textbooks;
- Papers published by government and private public policy institutes (e.g., the U.S. GAO, Transportation Research Forum), and industry trade associations (e.g., Airports Council International, American Association of Airport Executives);
- Other private, commercial, and government sources;
- Literature review completed for *ACRP Report 18: Passenger Air Service Development Techniques;* and
- Search engines such as EBSCO HOST, Google Scholar, Academic Search Premier, and SciVerse ScienceDirect.

The key search words used in this review were variations of the following word combinations: airport choice, airport selection, air passenger choice, air passenger behavior, airline choice of airport, airport choice factors, multi-airport regions, passenger airport choice, air passenger behavior, traveler choice of airport, air passenger preferences, airport choice in a multiple-airport region, and airport competition, among others.

The selection of materials for inclusion in this study took the following considerations into account:

- Because it was immediately determined that most of the literature addresses passenger choice factors rather than airline choice factors, the annotated bibliography that was developed focuses on the former;
- It was determined that more emphasis and original evaluation would be required in this study regarding the basis on which airlines make their choices; and
- The literature research focused on materials generated or published after the year 2000, unless a previously published study was of particular importance.

Although not directly related to the scope of this study, the literature review encompassed statistical models related to the analysis of choice factors. Consequently, articles that discuss the appropriateness and use of statistical models for analyzing airport choice factors are included in the annotated bibliography.

The literature review also encompassed materials related to the U.S. Department of Transportation's Small Community Air Service Development Program (SCASDP). Small community airports, airport authorities, cities and city commissions, individual communities and community consortia submitted applications to SCASDP for federal grants to help them address perceived air service deficiencies.

Consistent with the study team's expectations, passenger choice factors relating to airfares, flight frequencies, and ground access to airports are most often revealed in the literature. Choice factors determined by passenger type or purpose of travel were also topics of researcher interest.

Excluding the SCASDP grant applications (many of which related directly or indirectly to problems experienced by non-hub and small hub airports with passenger leakage to larger nearby airports, frequently in search of service from a LCC), the literature review produced a list of more than 50 academic articles concerning passenger choice. A selected sample is as follows:

- Pels, E., Nijkamp, P., & Rietveld, P. (2001). "Airport and airline choice in a multiple-airport region: An empirical analysis for the San Francisco Bay Area." *Taylor and Francis Journals,* 35 (2), 1–9.

- Hess, S., Polak J.W., (2005). "Mixed logit modelling of airport choice in multi-airport regions." *Journal of Air Transport Management,* 11 (2), 59–68.
- Blackstone, E., Buck, A., & Hakim, S. (2006). "Determinants of airport choice in a multi-airport region." *Atlantic Economic Journal,* 34 (3), 313–326.
- Tierney, S., Kuby, M. (2008). "Airline and airport choice by passengers in multi-airport regions: The effect of Southwest Airlines." *Professional Geographer,* 60 (1), 15–32.
- Luken, B.L., Garrow, L.A. (2011). "Multiairport choice models for the New York Metropolitan Area: Application based on ticketing data." *Transportation Research Record 2206,* 24–31.
- Ishii J., Jun S., & Van Dender, K. (2009). "Air travel choices in multi-airport markets." *Journal of Urban Economics,* 65 (2), 216–227.

In addition, there are textbooks concerning the statistical techniques that researchers can apply when examining consumer choices for air travel. Of particular note is the following publication:

- Garrow, L.A., *Discrete Choice Modelling and Air Travel Demand: Theory and Applications,* Burlington, Vermont, Ashgate Publishing, 2010.

The review of relevant literature revealed extensive analysis of passenger choice factors utilizing various analytic approaches and case studies. This literature is documented in Appendix B: Literature Review.

The review of relevant literature with regard to airline choice factors proved inconsequential, so additional focus in this study was placed on the airline choice issues and factors that pertain to multi-airport regions.

CHAPTER 4

Passenger Choice Factors

Notwithstanding the individual considerations involved in each traveler's unique choice, the literature and industry experience indicate that there are common factors that strongly influence such decisions. Researchers and practitioners have analyzed these common factors, including how and why passengers decide which airport to use when they have options available from which to choose.

As the industry has evolved over the past 30 or more years of deregulation, the choices presented to consumers have changed often. An airline that operated at an airport in a region may have ceased operations at that airport, or fundamentally restructured its network, causing it to move its flight operations elsewhere or not offer the city-pair services it once did. Hubs have come and gone as airlines have pursued different strategies to become or remain profitable. Relationships with regional airlines have developed and changed significantly over time, as have airline fleets.

Airports themselves have changed significantly over time. Infrastructure improvements, highway accessibility improvements, more parking options, access by light rail, availability of Internet access, variety and quality of concessions, airline lounges, and security considerations are all factors that can influence whether a traveler opts to use one airport or another. But fundamentally, the following two key choice factors dominate the research and the literature:

- Air service quality (availability, frequency, capacity, and routing); and
- Price (airfare, taxation, and ancillary fees).

Passenger choice factors relate to both the demand and supply perspective. Because demand cannot be satisfied unless adequate supply is offered in the market, airline considerations regarding types and levels of service are fundamental to the options available for passenger choice. The provision of service by an airline requires a significant commitment of resources, taking into consideration such factors as the competitive environment, the strategic fit of the multi-airport market to the carrier's system, and the revenue potential of the multi-airport market resulting from providing service at one or more airports in the market. Chapter 5 addresses the considerations involved in airline choice in greater detail.

In making an air travel choice, the airline customer will evaluate travel options through various sales channels (airline web sites, third-party web sites, corporate travel desk, leisure market wholesalers, and travel agents.) This evaluation will disclose the service options (carriers, frequency, and schedule—including airport(s) available to the desired travel destination). Once a determination of service options is made, fare comparisons can be made. Consideration also may be given to airline frequent flyer programs or other loyalty program preferences. Exhibit 4-1 provides a simplified depiction of these choices, with an unprioritized listing of key choice factors.

The primary drivers of airport choice in a multi-airport market are generally understood to be price, air service quality, airline/alliance loyalty, and airport ground access. The literature review supports this. Air travel consumers will also consider other factors such as parking availability and cost. Although airport service quality and customer service standards impact the travel experience, and to a lesser degree airport choice, these generally are not seen as primary determinants in selecting between airports in a multi-airport market in the United States.

The passenger choice factors evident in the literature review include airfares, flight frequency, accessibility, nonstop flights, airline loyalty programs, previous experience at an airport, airport capacity constraints, group travel, aircraft type, and flight time. Coupled with each of these factors is the matter of trip purpose (leisure or business), which may be the single largest determinant of airport choice.[1]

[1] Trip purpose is the most important "leakage variable" for modelers of airport choice behavior. Most models provide separate estimates for business and leisure travelers given they are often different choice sets. The other leakage variables are shown to have no, or minimal, effect according to Suzuki et al. (2003).

Exhibit 4-1. Passenger choice steps.

Researchers also have come to understand that travelers do not weigh these factors in isolation of each other. Recently, researchers have moved toward analyzing factors in "bundles" according to the trade-offs passengers face. How these factors interact with each other may be a matter of individual mental calculus. The remainder of this chapter summarizes the findings of the literature review in this regard.

Airfares

Airfares are known to have a direct influence on whether passengers opt to choose among flight alternatives. All things being equal, passengers tend to prefer flying from an airport in which they can obtain a less expensive airfare for their trip. For example, Suzuki et al. (2003) reported that an estimated "31% of travelers in the Des Moines International Airport service area leak to larger airports to take advantage of lower fares and more convenient airline services." It also is generally agreed that airfare is a more important consideration for leisure passengers than for business flyers, because fare is often reimbursed by the business passenger's employer. Still, researchers have found that even business travelers can be quite price-sensitive.[2]

Other researchers have found that women, individuals traveling in a group, and high-income earners are less sensitive to fares than are men, individuals traveling alone, and low-income earners, respectively.

Flight Frequency

Passengers generally prefer to use airports in which they have greater flexibility in departure and arrival times, and they value multiple flight frequencies. This is more pronounced with business travelers.

Related to flight frequency, some passengers have shown a demonstrated preference for large airports, based on the notion that they have more options for reaching their destination in the event of a problem (e.g., if the passenger missed a flight, the passenger can get another flight later that same day). Given a choice between two airports in competitive aviation zones, passengers may rank additional flight frequencies above access time. However, this may not be true in less competitive areas. Flight frequency is much less important for passengers traveling to small regional airports. In one study on small community airport choice behavior, the authors found that both leisure and business travelers rank flight frequency relatively low, although business travelers still tend to value this variable slightly higher (Zhang and Xie, 2005).

Accessibility

In general, accessibility refers to the extent to which passengers can get to the airport from their residence or business location. There are multiple dimensions to accessibility.

Length of Time It Takes to Travel There by Surface Transportation (Vehicle or Rail)

Access time is an important factor affecting choice behavior of both business and leisure passengers. Studies indicate that passengers are highly sensitive to this choice variable, and that even relatively small changes in access time, such as a 5-minute reduction, can induce noticeable shifts in air travel demand at an airport and for the airlines serving that airport (Ishii et al., 2009).

One study found that business travelers tend to be less willing to drive long distances to get to an airport and are generally willing to trade increased airfares for less travel time (Hess & Polak, 2005). Another study found that on average, passengers were willing to pay an extra $68 to avoid 1 hour of travel time (Warburg et al., 2006). However, the benefit of reduced access time can be offset by a passenger's experience with individual airports (Windle and Dresner, 1995). That is, a poor experience at an airport, however defined, can cause passengers to choose a less convenient airport.

Assessment of Travel Time Reliability on Ground Access Mode Choices

Travel time reliability is an important factor of mode choice because lower travel time reliability results in a greater likelihood of missing an outbound flight, and imposes a

[2] Zhang and Xie (2005) found "that 60% of leisure passengers and some 45% of business passengers ranked ticket price as the most important factor."

potentially high travel cost on the travelers. Because of uncertainty in access time, travelers must build in a "safety margin" (the difference in time between a traveler's preferred airport arrival time and the expected arrival time), which effectively adds a type of cost. Business travelers place a higher value on their ground access safety margin than do leisure passengers (Tam et al., 2011). However, travel cost was found to be more important than reliability if the cost of one mode was much higher than that of an alternative. Light rail options (such as the Hong Kong Airport Express) are generally perceived to have "high travel time reliability."

Alternative Modes of Access (e.g., Bus)

Alternative modes of access to an airport are often considered an important element in attracting passengers. However, passengers may value those alternatives quite differently, based on their perceptions of travel time reliability and service quality. Some consumers will value low travel cost offered by bus transportation, but passengers with long-haul trips are less likely to use buses due to the unreliability of travel time perceived by departing air passengers. The size of the traveling group also can affect access mode choice decisions. Large groups will opt away from using airport express services and buses.

Access Cost

Researchers have defined access costs in various ways and found different levels of interest. One found that "access time and travel delay, together, make up the main non-air-time cost associated with a flight option" (Ishii et al., 2009). Another found that business travelers are willing to pay additional costs to ensure that they make their outbound flights, noting "departing air passengers, particularly those traveling for business, are willing to pay a higher cost for accessing the airport than for their daily travel" (Tam et al., 2011).

Nonstop Flights

Nonstop flights remove the additional uncertainty or variability associated with missing a connecting flight at a hub airport. In particular, business travelers are more interested in nonstop flights than connecting flights, if given a choice, and are willing to pay a premium to do so. One researcher determined that on average, passengers are willing to pay, "about $69 more for a nonstop flight itinerary relative to a connecting flight itinerary" (Warburg et al., 2006). That same study found that "business travelers stay away from connecting flights, even after controlling for flight times (which includes connection times)." In contrast, leisure passengers are more willing to trade lower airfares for the "inconvenience" of connecting service.

Frequent Flyer Memberships

Passengers in general "prefer airlines with which they are frequent flyers" (Warburg et al., 2006). This "loyalty effect" is greater for travelers who have some elite standing with an airline's frequent flyer program compared to standard- or medium-level members. However, this factor by itself has only a marginally significant effect on airport choice decisions.

Aircraft Type

Researchers have found that passengers' perceived preference for one aircraft type over another (e.g., preference for jets over turboprops) exerts relatively little effect in airport choice decisions. One study found this to be true regardless of whether the passenger was traveling for leisure or business (Zhang, 2005). Another study determined that "business travelers prefer itineraries with standard jets relative to propeller or regional jets, and interestingly, also to wide body jets" and that this was even more pronounced with frequent travelers (Warburg et al., 2006).

Airport Service Quality

The research literature does not address whether the quality of airport services (i.e., ease of use of the airport, level of terminal concessions and services, etc.) is a factor in passenger decisions. Nonetheless, airport operators have increasingly taken steps to improve airport services. Several considerations are involved in such decisions, including the desire to increase non-aeronautical revenue, and improve the image of the airport within the community, etc. Whether such improvements in airport services significantly affect passenger choice among airports is not clear because such an analysis would require equivalent value among all other significant passenger choice factors and specific evaluation of airport service quality as a definable variable. Although there is little doubt that air travelers prefer, and in some cases (i.e., business travelers) place a value on quality of facilities and services at airports, there is not yet an indication in the research literature regarding how that value relates to other valued considerations (i.e., price and quality of air service).

CHAPTER 5

Airline Choice Factors

Airlines choose to serve markets based on the perceived potential contribution to system revenue and ultimate profitability. In that context, various factors influence airline choices in multi-airport markets, including revenue, yield, strategic compatibility, and risk. Strategic compatibility of service in a multi-airport market depends on how that market fits within the airline's business plan and its business model. Is there a market opportunity that can be profitably served at one or more of the airports in the multi-airport region with the product, price, and service offering of the airline? If so, is the revenue potential of the service opportunity of a sufficient size to warrant the selection of the service over other market opportunities available to the airline?

A multi-airport market's strategic compatibility with an airline's business model is dependent on such market characteristics as economic and demographic profile, leisure/business market traffic split, and the region in which it is located. A valid analysis requires a sound understanding of each airline's business model, and how the airline's planners will analyze and evaluate airport choice factors. Ideally, airline planners seek to make decisions that are compatible with, and complementary to, the airline's business plan.

The review of pertinent literature presented in Chapter 3 did not identify research that addressed considerations relating to airline choice. Because airline decisions are made as private business decisions in the context of unique business models and competitive market environments, they are not transparent to external researchers. While the success of a strategy or decision can ultimately be judged by whether the result was profitable and sustainable, it is much more difficult for an observer or researcher to understand and explain the interplay of choice factors and options that were considered. As a result, this study has taken the approach of focusing on the airline business model as the basis for understanding airline choices in general, their relationship to multi-airport markets, and their relationship to passenger choices.

Airline Business Models

All commercial enterprises use business models that define objectives and specify the approach to achieving business objectives. Airline companies operate in complex, diverse, and competitive market environments, and have relatively mobile factors of production (such as aircraft and personnel). Although there are many elements that are common to all airline business models, there are significant differences among airlines regarding their objectives and strategies, and the operating and competitive model used. The relative flexibility of airline business enables each company to use a business model tailored to its particular markets, circumstances, and objectives.

History and Evolution

The past 100 years have witnessed an extraordinary transformation of commercial aviation, from the initial contract mail carriage flights that accommodated passengers as an afterthought, to today's high-capacity and high-technology global airline networks. The airline industry also has evolved in other dimensions as follows:

- From government-owned or sanctioned "flag carriers" to private competitive companies;
- From extensive economic regulation to widespread deregulation;
- From individual companies to transnational conglomerates and alliances;
- From travel agent product sales networks to direct and third-party internet sales delivery; and
- From static pricing to real-time revenue/inventory management systems.

The diversity of business models now being used in the commercial airline business is unprecedented, reflecting

the complexity and segmentation of the passenger air travel market, and the intense competition that is often a key factor as well.

Airline business models adapt to different conditions in each market area. Regions with high traffic growth rates, intense competition, or government protection of airline markets, will each require different responses from each of the airlines involved. In the United States in recent years, airlines have been adapting their business models to meet the challenges of a mature industry that is experiencing consolidation in some sectors, but is also experiencing growth and competition in other sectors. The interplay of these factors in markets served by multiple airports creates another layer of complexity. The choices that an airline makes about service and pricing at an airport in a multi-airport market reflects its business model, the business models of each of its competitors in that market, and how each airline's choice impacts the choices being made by passengers.

Structure

At its highest level of generality, any airline's business model will apply the same basic elements in its evaluation of choices in multiple airport markets, as follows:

- Business objectives, and strategies for achieving them, in the context of the market opportunity;
- Estimation and forecasting of market demand in the region (revenue);
- Evaluation of competitive air services in the region;
- Estimation of appropriate levels of service (aircraft type, frequency, capacity) and the cost of providing different levels of service in the region;
- Evaluation of airport alternatives in the market;
- Forecast of financial performance of alternative service plans; and
- Comparison of alternative service plans with alternative uses of airline's resources.

Fundamentally, airlines choose to serve markets based on their contribution to system revenue and profitability (see Exhibit 5-1). In regions served by multiple airports, the choice of which airport(s) to service revolves around several key considerations:

- Is there an opportunity that can be profitably served at one or more airports in the multi-airport region, based on the product, price, and service to be offered?
- If so, is the revenue potential of this service opportunity of a sufficient size to warrant the selection of the service over other service opportunities being considered by the airline?
- If so, which airport(s) in the multi-airport region provide the optimal opportunity (or opportunities) for service and network profitability?

These considerations are applied to the peculiarities and dynamics of each market. Airlines apply airport choice factors in different ways, based on their business model. At the same time, the airport choice factors considered by airlines are interdependent with choice factors considered by passengers. For example, many passengers will often seek the lowest price service for a particular service. An airline, on the other hand, typically will seek the highest level of revenue contribution to its system. Nonetheless, the airline must compete in the market at a price that meets its need for revenue and the passenger's need for affordability. Passenger choices within a multi-airport market are closely related to airline choices (see Exhibit 5-1), especially with regard to such key factors as price and level of service.

Primary Drivers of Demand

The demand for passenger air transportation is the driving force for business decisions in the airline industry. Passenger air travel demand is the sum of individual decisions by potential air travelers, aggregated to a level that provides sufficient revenue to support the sustainable and profitable

Exhibit 5-1. Airline choice steps.

provision of air service in a market. Passenger airlines seek to tailor their business models to both accommodate this demand and drive the resulting revenue.

Fundamental to any airline consideration of air service in a market is its evaluation of the underlying size and nature of air travel demand. Such evaluation will address the following:

- Size of the overall market;
- Nature of the market (business vs. leisure, propensity to travel, disposable income, etc.);
- City-pair market sizes (past and current);
- Market demand, traffic trends, and causality (growth, stagnation, decline);
- Specialized business demand drivers (corporate headquarters, production facilities, etc.);
- Inbound leisure demand (resort destinations, seasonal traffic, special events, etc.); and
- Ethnic and cultural market affinities (diaspora, family visitation travel, etc.).

These primary characteristics of air travel markets are quantified, evaluated, forecast, and applied to potential air service scenarios as part of airline route planning efforts grounded in the airline's business model considerations.

The most prominent drivers of demand that are inherent in service opportunity evaluation are discussed in the remainder of this section.

Service Networks

The strategy, structure, and purpose of commercial airline networks—and how they drive demand—vary considerably across the range of existing business models. Most full-service carriers operate robust hub-and-spoke networks that offer service to hundreds of destinations around the world, and often have developed over the course of decades. These operations tend to serve primary airports across most key markets. Other mainline carriers transport passengers via more nonstop/point-to-point or linear traffic flows. Regional carriers have historically fed passengers from smaller markets into larger hub-and-spoke networks, although that profile has evolved over the last 10–15 years—primarily due to the introduction of longer range, smaller jet aircraft. Finally, specialized networks continue to exist for purposes such as efficiently transporting large numbers of passengers to leisure destinations or providing short-term capacity for purchase by specialized commercial entities.

Alliances/Partners

An extension of each carrier's network strategy involves their portfolio of marketing and operating alliances (with other carriers), and how these allow carriers to drive demand outside of their core networks. The most prevalent agreements for traditional carriers include

- Partnerships with regional airlines, in which the regional operator provides service (typically branded as the mainline carrier) as an extension of the primary airline's network, and
- Marketing/operating partnerships with international carriers, which are typically used to expand the base carrier's network to international destinations too small to be operated profitably.

These international agreements have resulted in the formation of global airline alliances in which large groups of carriers around the world effectively operate as global virtual single carriers. Carriers utilizing other business models tend to operate as stand-alone entities, although there are several exceptions.

Fleet/Aircraft Type

An integral component of network and demand strategies is the selection of aircraft type(s). The largest fleets—typically operated by full-service carriers—consist of hundreds of aircraft spanning a wide range of aircraft sizes and types to best fit the mission of providing service across various markets and customer profiles. Other mainline operators—often those operating more point-to-point or linear networks—use fleets with single aircraft types (or at least manufacturers), which tends to reduce operating costs and is more consistent with their network profiles. Regional airline fleets are often microcosms of the mainline networks they support, with a range of aircraft types to best serve their various network missions. Specialized and niche carriers typically have limited fleet profiles that best fit their limited mission.

Cabin Configuration

Cabin configuration options, and how they drive demand, also vary across business models. Many mature, full-service carriers with large international networks use various configurations, ranging from single-cabin regional aircraft to two-cabin domestic models—to two-to-three cabin long-haul international aircraft. Some of these full-service carriers have recently introduced "economy-plus" products on long-haul international aircraft, resulting in up to "3½" cabins. Many less traditional mainline operators employ single-cabin configurations across their entire fleet, although some have introduced two-cabin models. Likewise, most regional aircraft are operated with single-cabin configurations, although

two-cabin regional models have begun to appear in some large regional jets.

Pricing

Although base pricing strategies share a lot in common across the majority of commercial business models (primarily in that carriers often match lowest competing fares at an O&D level), there remain high-level differences across the business model spectrum. Many full-service carriers still aggressively attempt to maximize supply and demand opportunities within individual O&Ds, time periods, and passenger types—resulting in a wide range of price points and often higher fares for passengers purchasing at the last minute and/or in less competitive markets. Many less traditional domestic carriers use more basic, mileage-based fare structures, while still selectively capitalizing on "upcharge" opportunities. Many niche and tour/leisure operators primarily use flat-rate pricing, and tend to avoid much of the daily variation in the traditional pricing model. However, across virtually the entire spectrum, individual carriers institute temporary price discounting (fare sales) to support revenue and booking weakness, particularly throughout slow demand periods in the low and shoulder season.

Revenue Management

In tandem with their tactical, O&D-specific pricing strategies (as described above), full-service carriers also tend to employ sophisticated, aggressive revenue management techniques to best maximize aggregate demand. From a consumer perspective, this can result in a wide range of available fares within a given O&D across various dates, days of the week, and times of day—even within an individual flight. Less traditional domestic carriers typically undertake similar efforts—albeit usually on a much smaller, less tactical scale. Many niche carriers and/or tour operators tend to keep consistent with their macro pricing model by maintaining flat-rate pricing or using a very limited number of price points.

Distribution

Although product distribution has evolved considerably over the last 20 years, major elements remain in place within individual business models. Most full-service carriers still maintain global distribution system (GDS) partnerships that allow them to distribute their products through various traditional and online portals, as well as through internal channels (however, due to cost pressure, even these full-service carriers have essentially eliminated the travel agent model over the last two decades). Less traditional domestic carriers tend to distribute their product exclusively through internal channels, although some start-ups have established GDS relationships for purposes of brand awareness and broad product offering. Niche and specialized leisure operators tend to operate through internal and marketing partner channels—although a few in this subset use the traditional GDS outlet.

Scheduling

Scheduling patterns vary across business models primarily in how they fit with each model's target customer base and demand profile. Full-service carriers typically offer frequent daily service to key business destinations from their primary hubs to serve the time-of-day coverage needs of their business passengers as well as to offer enough total capacity for their aggregate customer base. Less traditional mainline carriers tend to offer thinner service patterns in major O&Ds, although there are tactical exceptions to this. Regional carriers—particularly those that provide feeder service to traditional partners—tend to operate service patterns that mimic these partners, although usually without the shuttle-type operations that full-service partners sometimes provide in key markets. Finally, niche and specialized leisure operators tend to offer thin service patterns—often times dropping below daily frequency depending on the particular market or mission.

Loyalty Programs

Loyalty programs in the airline industry have evolved from one-dimensional frequent flyer programs to complex incentive and awards programs that involve much of the travel and consumer products sectors. These programs typically involve airline alliance and other travel industry partners. Their importance in driving demand, and more specifically for the selection by an air traveler of a particular airline, will vary by market and air traveler sector. Frequent business travelers value the class of service upgrades and other preferences that come with high status in airline loyalty programs. Leisure travel has close links to loyalty programs through awards travel and companion travel opportunities.

Secondary Drivers of Demand

In addition to the primary drivers of demand discussed, several other demand drivers vary significantly across business models. Although these are all key passenger experience items, the study team considered them secondary in regard to driving significant passenger demand.

Direct Marketing

Traditional approaches to marketing airline services, such as electronic media advertising, direct mail advertising, bill-

boards, etc., continue to be widely used. These initiatives are often tied to loyalty programs, enhancing the exposure and awareness of loyalty program benefits to targeted audiences.

Airline-Specific Airport/Check-in Experience

Substantial investment has been made by airlines (especially full-service legacy airlines) in improving the check-in and customer service experience at airports. The use of technology, through check-in kiosks and other improvements, is a major contributor to progress in this regard.

Onboard Product

The quality of the onboard product can be a demand driver, particularly on long-haul services and in first class or business-class cabins. Many international markets are served by airlines that place a high priority on onboard product, which tends to drive a competitive environment in some markets.

Aircraft Condition/Age

Fleet condition and age can be a positive demand driver (when new aircraft types are introduced into the fleet) and a negative demand driver (when average fleet age results in the perception of lower standards of service).

Revenue Generation Considerations

The application of the demand-related elements of an airline's business plan directly impacts the generation of revenue (see Exhibit 5-2). Several key considerations are involved in this regard.

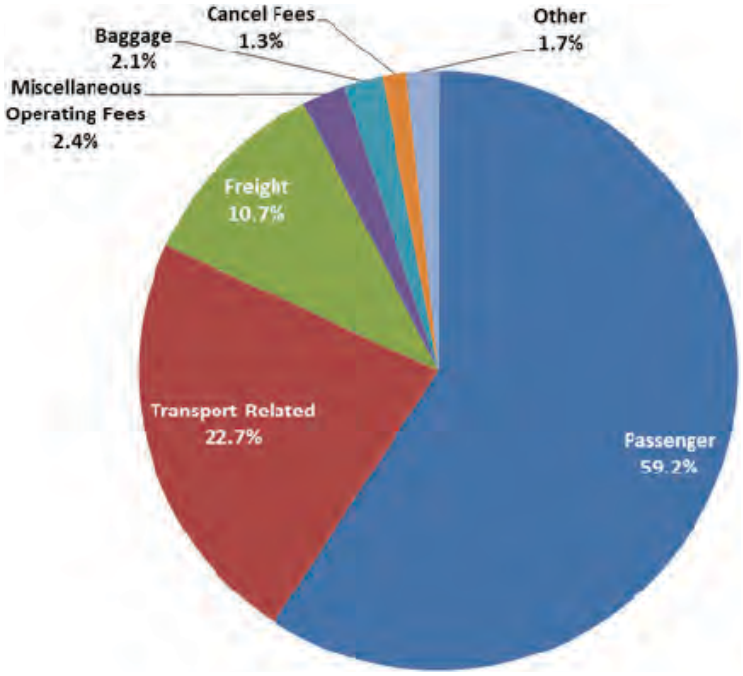
Pricing and Fees

In addition to implementing aggregate pricing strategy drivers previously discussed in relation to demand, carriers across several business models have recently been successful at unbundling pricing for various components of the air transportation product in an effort to generate additional revenue. This new pricing scheme has resulted in incremental pricing for items such as checked baggage, premium seat assignments (even within economy class seating), and advance boarding priority. Meanwhile, some carriers have maintained a traditional "all-in" pricing structure and others have unbundled more items, charging for such items as printed boarding passes and carry-on baggage. The range of various a la carte price/product models does not necessarily conform to traditional business model definitions.

Revenue Management

Full-service carriers invest heavily in extensive revenue management processes, in an effort to serve and optimize their

Exhibit 5-2. Airline revenue sources (U.S. domestic carriers).



Source: US DOT Form 41 YE 3Q 2012, via Diio online portal.

expansive route networks, myriads of aircraft types, and broad customer bases. This investment typically includes multi-million-dollar technology as well as large departments of analytical personnel. Less traditional mainline carriers typically engage in a moderate level of revenue management—although their more limited fleet profiles and range of target customers reduce the need for the massive investment described above. Regional carriers that operate as service providers to full-service airlines typically end up incorporated into the process of their respective partner carrier. Finally, niche and leisure-specific carriers typically invest minimally in revenue management, because their business models tend to rely more on filling seats at a limited number of price points.

Cargo

The variety of cargo revenue strategies tends to correlate more to a carrier's fleet than its business model, although often there is significant overlap between the two. Mainline carriers possess the capacity to carry cargo, mail, and freight within the context of their existing passenger network, and this provides the carrier a secondary revenue stream. Note, however, that cargo revenue is very rarely a driver of scheduling or network decisions. Small regional carriers have less ability to provide these services given the size of their equipment, but can still take advantage of tactical opportunities to carry small items, including mail and freight. Carriers across the spectrum have the ability to offer an express package service product, although full-service carriers tend to do so more frequently.

Sales Distribution

Although the various methods of product distribution were discussed previously in the demand section, it is worth noting their impact on revenue generation. Full-service carriers tend to distribute their products through as many channels as economically feasible in order to maximize revenue generation across their broad networks. Low-cost and niche-market carriers tend to focus on distribution through their own internal sales booking systems. Such carriers focus aggressively on cost containment, and have a less pressing need to distribute to a wide range of target customers.

Primary Drivers of Supply

Providing the right level of supply to accommodate anticipated demand drives the cost of providing air service. An essential element of sustainability is establishing the proper balance between the revenue that can be derived (based on demand characteristics of the market) and the cost of providing the air service. The primary drivers of supply, and therefore cost, are described in the remainder of this section.

Air Service Capacity

The approaches to supplying capacity to the competitive marketplace vary significantly across business models. Full-service carriers tend to use a wide array of aircraft types, with the goal of optimizing supply with demand at an individual route level. Many less traditional mainline carriers tend to use a single or limited number of fleet types, with a heavy focus on minimizing their overall network cost structure. Regional carriers (which serve mainline partners) tend to operate with a hybrid of these previous two strategies, as they require fleet flexibility to offer options to their mainline partners and at the same time have to remain cost competitive.

Once a fleet profile is established, network and scheduling choices drive further variability across models. Traditional carriers operate large hub-and-spoke operations, which result in large amounts of capacity (as well as assets and employees) concentrated in a limited number of markets. Less traditional mainline carriers tend to offer more linear networks while still focusing on several key markets for marketing and commercial purposes. Regional networks that feed large carriers tend to mimic the network profiles of those large carriers, while niche and leisure operators use less defined capacity strategies that primarily chase consumer demand.

Additionally, most large full-service carriers "virtually" expand their networks through their participation in global alliances (in addition to their regional alliance partners). Over the last 15–20 years, these alliances have grown from tactical codeshare agreements to broad world-wide alliances providing carriers with truly global networks. Regional carriers that function as feeders sometimes implicitly belong to multiple global alliances if they offer capacity to multiple full-service carriers. Less traditional mainline carriers have begun to form tactical codeshare alliances with individual international operators to provide limited extension of their capacity offerings without joining the full global products.

Air Service Quality

Although air service quality is a key component of a carrier's overall capacity offering, this metric is no longer strongly correlated with a particular business model. While full-service carriers typically offer more amenities such as premium class seating and elite member club access, some still operate older aircraft with limited economy class seat pitch. Many less traditional mainline carriers—historically known for offering a scaled-down product—now operate newer aircraft with

upscale onboard amenities, particularly in economy class. This trend has begun to extend to regional carriers, as larger regional aircraft have allowed for expanded product offerings, which in some cases include premium class seating. In addition, operating-related quality metrics such as on-time performance, lost baggage, and others show very little correlation with a carrier's business model.

Labor and Staffing

Although capacity decisions are driven primarily by commercial opportunity, existing staffing levels can heavily influence network and planning decisions—particularly at established full-service carriers. For instance, a carrier that has a large number of personnel at an existing location can significantly alter the economic equation when making short-term or seasonal decisions about a particular route—particularly if the carrier is contractually limited in its ability to reduce local staff. For major carriers, another key driver includes pilot agreements that may prohibit or limit the ability to contract flying to regional operators. These limitations can range from macro-level, fleet-wide limitations to market-specific situations. Although these issues may be present across the spectrum of business models, they tend to be more prevalent with full-service carriers.

Airport Real Estate/Ground Handling

Airport real estate strategies and holdings vary across business models and also can impact capacity decisions. Full-service carriers often maintain multi-million-dollar facility investments at their hub locations, which can make it difficult to economically justify significant short-term capacity reductions. Newer mainline carriers have tended to stay away from these large levels of investment (in part due to their more linear route networks), providing more near-term flexibility in making network decisions. Regional networks often are able to use the airport agreements of their full-service partners, while niche/leisure carriers tend to operate under more variable agreements.

Ground handling arrangements often vary significantly, although this tends to correspond more to a carrier's overall presence at a particular airport than their macro-level business model. Full-service carriers will always have internal staff from the ticket counter to the ramp at their hubs and large "spoke" facilities (to best maintain their customer service and product). However, at small outstations, even the largest carriers will occasionally contract personnel from third-party providers (often other carriers). Regional carriers tend to follow a similar model, while traditional and niche carriers usually purchase these services on a variable basis.

Secondary Drivers of Supply

In addition to the items in the previous section, several other supply drivers vary significantly across business models. Although these are all key items in the airline capacity equation, the study team considers them secondary in terms of actually driving capacity decisions.

Aircraft Maintenance

The delivery of planned and scheduled capacity requires well-planned and implemented aircraft maintenance programs. Disruptions in the maintenance program can limit the number of deployable aircraft and the amount of air service capacity.

Airport Facility and Service Quality

Each airline's operation at each airport requires suitable facilities and services. Deficiencies in this regard can limit service expansion and place an airline in a less competitive position. In addition, the capital and operating costs of airport facilities that are considerably in excess of what is needed to accommodate the airport's level of air service also can impact airline service expansion. Airlines consider such metrics as "cost per enplaned passenger" when evaluating the cost-effectiveness of an airline station. Although a relatively small percentage (3-5%) of total airline costs, airport costs undergo ongoing scrutiny and are an aspect of each airline's business model.

Hub and Market Share Protection

The concentration of services at legacy airline hubs and gateways typically creates a tendency for the protection of local market share. This tendency toward protection can become a consideration in decisions affecting levels of capacity.

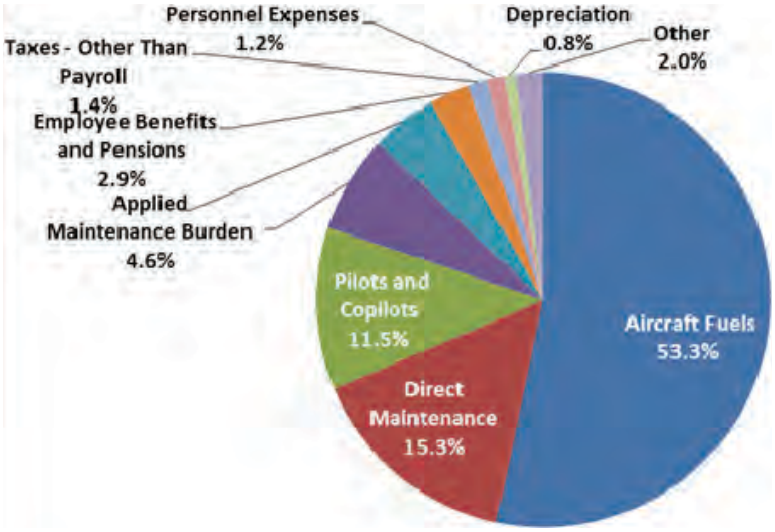
Expense Considerations

The approach to the provision of air service directly impacts the generation of revenue. Several key considerations are involved in this regard as shown in Exhibit 5-3.

Fuel

Fuel expense is a major element of each carrier's expense base. Although the impact and management of fuel expense does vary significantly between carriers, these variations are not the result of the business model being used by the

Exhibit 5-3. Airline expense sources (U.S. domestic carriers).



Source: US DOT Form 41 YE 3Q 2012, via Diio online portal.

carrier. The largest issues driving variances in fuel expense between mainline carriers are aircraft/engine type(s) and aircraft/engine age. Network structure also plays a role. The smaller aircraft size inherent with regional aircraft drives an additional burden for these carriers, because many of these aircraft suffer from higher per-seat fuel expense than their mainline peers. Carriers operating large numbers of 50-seat aircraft take a particularly large hit during periods of high fuel prices.

Carriers with significant financial resources can typically hedge against fuel price exposure. Most carriers choose to hedge only a portion of their future fuel obligation, as there is downside economic risk to hedging during periods of falling fuel prices.

Labor

Labor expense comprises a large percentage of a carrier's expense base, and is only partially controllable. However, unlike fuel, the level of labor expense tends to directly relate to the type of business model being used by the carrier. Traditional full-service carriers employ multiple large and established unionized work groups that drive the majority of each carrier's labor expense budget. Because union contracts are typically several years in duration, carriers do not have the full ability to adjust labor expenses downward during periods of soft demand. In addition, many union agreements contain scope clauses that limit the ability of carriers to contract out labor to other carriers or vendors. Less traditional mainline carriers tend to have more flexible employee agreements, in many cases due to their shorter history. Regional carriers often experience a hybrid of the two scenarios—in many cases, the regional carrier is dependent on its relationship with its parent carrier.

Equipment (Aircraft and Other)

Operating equipment (aircraft, maintenance, ground, etc.) typically drives two types of expense impact—acquisition and operating. Although aircraft acquisition strategies vary by carrier, these approaches do not always correlate to business model. Some carriers (across all models) choose to purchase aircraft, although major volume purchasers tend to get better discounts from key manufacturers. Other carriers lease aircraft depending on their own financial situations, strategies, and operating needs. From an operating expense perspective, newer generation aircraft typically provide lower expense profiles—but, again, this decision does not typically vary across business model. However, some niche leisure providers do purposely acquire older, cheaper (but less efficient) aircraft as a means to minimizing fixed cash-flow requirements.

The need for large amounts of non-aircraft equipment does tend to correlate better with business model, because large mainline and regional carriers tend to have large internal ground staffs, as well as more developed internal maintenance facilities.

Overhead

Management overhead and infrastructure correlates quite well with business model. Traditional full-service carriers usually operate with large management organizations (often built over a period of decades) to manage their complex operating

networks and commercial functions. Less traditional mainline carriers tend to operate with less overhead, because their network structure and commercial strategies do not require as much active management. Regional carriers tend to operate with even smaller staffs, because much of their commercial overhead function is often absorbed by their commercial partners. Niche and specialized leisure carriers typically operate with minimal management staff.

Distribution

As discussed in the section on demand, distribution strategies vary significantly across business models, driving various impacts to a company's expense base. Although full-service mainline carriers tend to use a wide variety of internal and external distribution sources, less traditional operators have tended to focus on internal outlets—resulting in lower distribution expenses. Regional carriers are often marketed in conjunction with their partner (major) carrier, resulting in an implicitly common distribution strategy.

Airline Business Models

Each airline seeks to apply a business model that is uniquely suited to its objectives, strategies, and opportunities. However, for the purpose of understanding how this variability is actually projected into markets, airline business models can be categorized into eight types, as follows with examples of the airlines in each business model type. Each type of business model is summarized in Exhibits 5-4 through 5-11.

- Legacy network (hub/spoke): American, Alaska, United, Delta, US Airways;
- Legacy point-to-point (traffic flow): Southwest;

Exhibit 5-4. Legacy network.

U.S. Airline Examples	American, Alaska, Delta, United, US Airways
Network Structure	Primarily hub and spoke, with gateways for international services and connections to alliance and other codeshare partners.
Alliances	Extensive coordination with alliance partners through formal alliance organizations. Variety of arrangements with other partners for regional feeder services, codeshare partners, interlining agreements, and prorate agreements.
Fleet	Typically consists of hundreds of owned or leased aircraft. Mainline aircraft (more than 100 seats) dominate. Smaller regional aircraft used through subsidiary regional airlines or service agreements with independent regional airlines.
Capacity	Variety of equipment and operational scope enable adjustment of capacity in relation to variable traffic demand (i.e., seasonality, competitive conditions).
Pricing Strategy	Wide range of price points, including traditionally high "walk-up fares" where competitively feasible. Priority to maximize onboard revenue, using revenue management and inventory control models. Services and amenities bundled and unbundled in various ways.
Sales Distribution	Use proprietary web sites, as well as GDSs (i.e., Expedia, Travelocity, etc.). Leisure products also distributed through proprietary web sites, tour operators, and retail travel agents.
Scheduling	Business travel schedule typically used for services in major markets, often resulting in high frequency of service. Hub/spoke services scheduled to maximize connectivity at the hub when possible, in close relation with major market business travel schedules.
Cargo	Focus on belly cargo as additional revenue, especially on larger aircraft services in suitable markets.
Labor/Staffing	Large and complex operation requires labor specialization. Typically highly unionized over many key workgroups.
Airport Real Estate	Signatories to airport use/lease agreements, often with extensive real estate commitments at hubs and major market stations.
Ground Handling	Self-handling at major stations; may be handled by another airline at smaller station.

Exhibit 5-5. Legacy point-to-point.

U.S. Airline Example	Southwest
Network Structure	Extensive point-to-point services, with focus cities for operational support and traffic flow capabilities over multi-stop itineraries.
Alliances	Minimal, if any, partnering for access to markets not served by network. Regional feeder services typically very limited, if any.
Fleet	Typically consists of hundreds of owned or leased aircraft. Mainline aircraft (more than 100 seats) dominate, enabling lower cost per available seat mile (CASM).
Capacity	Mainline equipment predominance, coupled with very limited variety of aircraft, limits ability to adjust capacity except through frequency adjustments.
Pricing Strategy	Several price points, distinguished by levels of service. Priority to maximize onboard revenue, using revenue management and inventory control models. Competitive pricing structure often stimulates market demand, providing incremental revenue with lower average price.
Sales Distribution	Proprietary web site used as predominant sales channel.
Scheduling	High frequency of service designed to serve major markets and reduce non-productive aircraft time.
Cargo	Focus on belly cargo as additional revenue, especially on larger aircraft services in suitable markets.
Labor/Staffing	Large and complex operation requires labor specialization. Typically, highly unionized over many key workgroups.
Airport Real Estate	Signatories to airport use/lease agreements, often with extensive real estate commitments at hubs and major market stations.
Ground Handling	Self-handling.

Exhibit 5-6. New model low-cost carrier.

U.S. Airline Examples	JetBlue, Virgin America
Network Structure	Selected point-to-point services, with focus cities for operational support, product marketing, and sales benefits, and modest traffic flow capability over multi-stop itineraries.
Alliances	Selective partnering for access to markets not served by network, especially for international markets. Regional feeder services typically very limited, if any.
Fleet	Owned or leased aircraft. Count based on requirements for point-to-point operations. Mainline aircraft (more than 100 seats) dominate, enabling lower CASM.
Capacity	Mainline equipment predominance, coupled with very limited variety of aircraft, limits ability to adjust capacity except through frequency adjustments.
Pricing Strategy	Several price points, distinguished by levels of service. Priority on maximizing onboard revenue using revenue management and inventory control models. Competitive pricing structure often stimulates market demand, providing incremental revenue with lower average price.
Sales Distribution	Proprietary web site used as predominant sales channel.
Scheduling	At least daily frequency of service designed to serve major markets and reduce non-productive aircraft time.
Cargo	Focus on belly cargo as additional revenue, especially on larger aircraft services in suitable markets.
Labor/Staffing	Less complex operation requires less labor specialization.
Airport Real Estate	Signatories to airport use/lease agreements in order to provide full services to passengers.
Ground Handling	Self-handling.

Exhibit 5-7. New model ultra-low-cost carrier.

U.S. Airline Examples	Allegiant, Spirit
Network Structure	Selected point-to-point services, with focus cities for operational support and enabling modest traffic flow over multi-stop itineraries.
Alliances	Minimal, if any, partnering. Minimal, if any, regional feeder services.
Fleet	Owned or leased aircraft. Count based on requirements for point-to-point operations. Mainline aircraft (more than 100 seats) dominate, lower CASM.
Capacity	Mainline equipment predominance, coupled with very limited variety of aircraft, limits ability to adjust capacity except through frequency adjustments.
Pricing Strategy	Several price points, distinguished by levels of service, offer simplified pricing. Priority to maximize onboard traffic with lowest possible pricing, enabling sale of other ancillary services and travel products to passengers. Competitive pricing structure often stimulates market demand, providing incremental revenue with lower average price.
Sales Distribution	Proprietary web site used as predominant sales channel for air and ground elements of trip.
Scheduling	Frequency typically daily or less, with time of day dictated primarily by availability of aircraft.
Cargo	Focus on belly cargo as additional revenue, especially on larger aircraft services in suitable markets.
Labor/Staffing	Less complex operation requires less labor specialization.
Airport Real Estate	Typically not signatories to airport use/lease agreements, in order to have flexibility to enter and exit markets and keep overhead cost low.
Ground Handling	Some self-handling, but also extensive third-party handling.

Exhibit 5-8. Regional feeder.

U.S. Airline Example	Skywest
Network Structure	Selected point-to-point services to/from partner airline's hubs on a fee basis, providing traffic feed to the hub carrier and to other feeder carriers. Operational support centers typically at hubs and selected spoke-airport locations. Dimensions of feeder services governed by agreement with partner airline.
Alliances	Partnerships are essential aspect of business model, because revenue is tied to service agreements.
Fleet	Owned or leased aircraft. Count based on requirements for contract flying. Regional aircraft (less than 100 seats) dominate, resulting in higher CASM.
Capacity	Regional equipment predominance. Variety of aircraft sizes enables adjustment of capacity through gauge-change as well as frequency adjustments.
Pricing Strategy	Price in the local and connecting markets set by mainline carrier partner, designed to maximize onboard and network revenue.
Sales Distribution	Uses partner carrier's sales channels as part of codeshare agreement.
Scheduling	Frequency typically several times daily, as planned by the mainline carrier partner. Scheduling closely tied to connecting banks of the hub, as well as local business travel market preferences.
Cargo	Minimal impact due to smaller aircraft.
Labor/Staffing	Complex operation requires labor specialization, especially for companies with large fleets operating significant network feeder systems.
Airport Real Estate	Typically, signatories to airport use/lease agreements in order to provide range of services to passengers as part of the partner airline's system.
Ground Handling	Some self-handling, but also extensive third-party handling.

Exhibit 5-9. Regional at-risk.

U.S. Airline Example	Express Jet
Network Structure	Selected point-to-point services, based on local market demand. Operational support centers at home base.
Alliances	Partnerships are typically unrelated to “at risk” flying.
Fleet	Owned or leased aircraft. Count based on availability of aircraft after requirements for contract flying. Regional aircraft (less than 100 seats) dominate, resulting in higher CASM.
Capacity	Regional equipment predominance. Variety of aircraft sizes enables adjustment of capacity through gauge-change as well as frequency adjustments.
Pricing Strategy	Price in the local market designed to maximize onboard and network revenue.
Sales Distribution	Uses its own proprietary sales channel, or other GDS.
Scheduling	Frequency varies, depending on nature of the market and local business travel market preferences.
Cargo	Minimal impact, due to smaller aircraft.
Labor/Staffing	Less complex operation requires less labor specialization.
Airport Real Estate	Typically, signatories to airport use/lease agreements in order to provide range of services to passengers.
Ground Handling	Some self-handling, but also extensive third-party handling.

Exhibit 5-10. Tour operator.

U.S. Airline Example	Apple Vacations
Network Structure	Selected point-to-point services, based on charter programs organized and sold in the leisure sector.
Alliances	Partnerships among tour operators, receptive tour operators, and travel agents are common in order to structure and sell program packages.
Fleet	Primarily use ACMI lift providers, although some large tour operators have their own leased or owned aircraft. Typically use mainline aircraft (100 or more seats) with medium- to long-haul capability.
Capacity	Mainline equipment predominance, suitable for medium- to long-haul services.
Pricing Strategy	Pricing based on cost-plus-margin required for air and ground elements of program packages.
Sales Distribution	Uses its own proprietary sales channel, travel agencies, or other GDS.
Scheduling	Dictated by charter program package requirements.
Cargo	Minimal impact, due to schedule and itinerary requirement of charter programs.
Labor/Staffing	Primarily focused on development and sale of program packages. Air and ground elements typically outsourced or provided by lift provider.
Airport Real Estate	Typically operate as non-signatories to airport use/lease agreements because of the itinerant nature of operation. May enter into marketing and operational agreements with airports and communities at program destinations.
Ground Handling	Typically handled by third-party.

Exhibit 5-11. Lift provider.

U.S. Airline Examples	Pace, Global
Network Structure	None specific to airline. Selected point-to-point services as determined by charter agreements. Services typically include provision of ACMI.
Alliances	None.
Fleet	Provide a variety of aircraft types, as needed to provide specific types of services.
Capacity	Mainline equipment predominance, suitable for medium- to long-haul services.
Pricing Strategy	Pricing based on cost-plus-margin required for air element of the program packages.
Sales Distribution	Sale of air travel handled by charter program provider (i.e., tour operator).
Scheduling	Dictated by charter program package requirements.
Cargo	Minimal impact due to schedule and itinerary requirement of charter programs.
Labor/Staffing	Complex operation (requires labor specialization in areas of primary activity focus on flying and maintenance).
Airport Real Estate	Typically operate as non-signatories to airport use/lease agreements because of the itinerant nature of operation.
Ground Handling	Typically handled by third-party.

- New model LCC: JetBlue, Virgin America;
- New model ultra-low-cost carrier (ULCC): Allegiant, Spirit;
- Regional feeder: SkyWest;
- Regional at risk: ExpressJet;
- Tour operator: Apple Vacations; and
- Aircraft, crew, maintenance, and insurance (ACMI) lift provider: Pace, Global.

Application of Business Models in Multi-Airport Regions

Each airline's business model is market-facing, and decisions about air service are largely driven by whether the provision of air service can be expected to tap market demand that is sufficient to generate acceptable levels of revenue. Because each airline's business plan objectives and approach are different, and each airline's capability to provide service and compete is different in each market, the choice options available to each airline will vary significantly. Choices are more complex in multi-airport regions, because each service option is driven by its interface with each airline's business plan and its service capability at any given time, in the broader context of industry-wide and regional circumstances at the time of the service decision.

Examples of the choices typically involved in an airline's decision regarding application of its business plan in a multi-airport region are as follows:

- Should the region by served?
- What city-pair market(s) should be served from the region?
- What level of air service (capacity, frequency, aircraft type, classes of service, and schedule) should be offered in each city-pair market to be served?
- What price structure and level should be offered in each city-pair to be served?
- Which airport(s) in the region should be served?
- If more than one airport will be served, what mix of air service and pricing should be offered at each airport?
- What level of facility and station support will be needed at the airport(s) to be served?
- What business relationship should be established with the airport(s) to be served?
- What relationship should be established with the community?

Airlines with relatively less complex business plans (i.e., ULCCs or lift providers) will make decisions regarding such choices somewhat more easily. Many of the choices may already be clearly defined, based on the relatively narrow business objectives, capabilities, and/or market niche of the airline. In

such situations, the choice of which airport, among several, to serve may be the most significant, because it may be one of the few choices regarding service in the region once the decision to serve the region has been made.

Airlines also must adapt to changing conditions in the markets they serve. All of the decisions made in the initial implementation of service to a region are continually reassessed based on the historic and forecasted performance of the services. Among the factors that will impact these ongoing reassessments are

- Financial performance of the services;
- Changes to the airline's overall business plan;
- Competitive environment, including
  - Competitive conditions in the industry,
  - New competitive services in the region,
  - Pricing environment in the region, and
  - Competitive responses to new services in the region;
- Economic conditions in the region and the industry; and
- Operating and business environment at the airport(s) served.

The case studies that follow in Chapter 6 illustrate how the dynamics of airline choice, and resulting passenger choice, interface in the context of five very different multi-airport regions.

CHAPTER 6

Regional Case Studies

Case studies provide a powerful mechanism for understanding how, through revealed preference, choice factors interrelate. A key element of this study is the performance of case studies that are instructive, provide insight, and are applicable to as many airports as possible.

The case study process is described in greater detail in Appendix C. In summary, the case study selection and performance process involved the review and categorization of multi-airport systems in the United States, with the objective of understanding both their diversity and commonality, and thereby selecting a set of case studies that best represents this diversity and provides instructive results. A meticulous process utilizing a series of considerations ("filters") on an initial universe of the 100 largest U.S. population centers was used to determine which case studies should be undertaken. This filtering process resulted in the identification of 59 regions as candidates for case study consideration. Each of the 59 candidate regions was then subjected to a high-level analysis and review, with the objective of identifying trends in traffic that suggest that airlines and significant volumes of passengers changed their airport choice(s) in the region during the study period. This review enabled the research team to reduce the number of potential case study candidates for subsequent review and analysis from 59 to 21.

Regional profiles were prepared for each of the 21 case study candidates. The profiles were prepared to provide an evaluation, at a macro level, of the geographic, traffic/service, pricing, competition, and other defining characteristics of each of the 21 candidate regions and the airports within each region. The research team sought, through this evaluation, to identify those regions that would likely provide the most instructive, relevant, and diverse case studies. The parameters of the regional profiles are described in Appendix C.

After review, discussion, and assessment of the regional profiles, the decision was made to perform five case studies focused on the following regions:

- **Los Angeles Basin** offers several interesting dynamics for further study. The region's core structure—with a major international facility surrounded by several suburban airports offering substantive service options—should provide substantive insight into key facets of both airline and passenger choices.
- **San Francisco Bay Area** has seven airports of very different sizes and service offerings, and has experienced a significant shift in domestic airline service patterns and passenger choice. The dynamic of different fare structures at the airports in the region is also involved—more diverse service and greater volume of capacity appears to be driving traffic trends, notwithstanding fare levels. Other factors, such as ease of ground access and proximity of airport options, also appear to be involved.
- **Western Carolina** represents a classic case of a large major airline hub that dominates surrounding communities. The lack of unique geographic hindrances and the presence of LCCs throughout the region provide an interesting opportunity to analyze the effects of fares, service quality, distance and access time, and other competitive considerations on passenger choice.
- **Northern Gulf Coast** presents the opportunity to assess in detail the factors impacting customer and airline choice for a group of small hub airports, where service at more than one airport may be an option for many travelers. Airline choice factors are in play in this region, with the recent opening of a new airport, the introduction of LCC service, and the short-lived service of an airline offering a "travel company" product.
- **Central Wisconsin,** at its core, consists of five small-to-medium-sized airports offering similar services and pricing across a large, primarily rural region. Although the potential insight to be gained into airline and passenger choice from analysis of the services at the core airports is likely limited, the presence of much larger airports within 2 hours of three of the five core airports adds an additional complexity to the situation that provides for interesting insight into the multiple dynamics of passenger choice.

Case Study 1: Los Angeles Basin

Passenger Choice in a Congested Megalopolis with Multiple Airport Options

The Los Angeles Basin is one of the world's largest metropolitan areas, and is served by a major international airport and several regional airports offering substantial air service from other parts of the region ("the Basin"). Los Angeles International Airport (LAX) serves as the region's primary gateway, with over 800 peak-period daily departures—including over 130 international departures to 30 different countries. Within the core of the Basin, four other airports offer substantive levels of service, primarily to major domestic connecting hubs and regional destinations within California and the Western United States. These regional airports are

- John Wayne Airport (SNA)—in central Orange County, approximately 50 minutes south-southeast of LAX;
- Long Beach Airport (LGB)—in Long Beach, approximately 30 minutes south of LAX;
- Ontario International Airport (ONT)—in the "Inland Empire" area, approximately 65 minutes east of LAX; and
- Bob Hope Airport (BUR)—just west of central Burbank, approximately 40 minutes north of LAX.

Two additional airports serve leisure-oriented communities just outside of the core of the Basin:

- Palm Springs International Airport (PSP)—just west of Palm Springs, approximately 2 hours 15 minutes east of LAX; and
- Santa Barbara Airport (SBA)—several miles north of central Santa Barbara, approximately 2 hours northwest of LAX *(all MapQuest)*.

The drive times indicated do not take into account the impact of surface traffic congestion, which is a major issue across the entire region. While the Basin is home to one of the most developed regional highway infrastructures in the world, traffic congestion permeates many aspects of life across the region—including airport choice by air travelers. Often, time-of-day traffic patterns are a primary factor in airport choice, in addition to other common factors such as air service levels, airfares, etc. Of the five core airports, LAX, SNA, and ONT have service from a broad range of legacy carriers (along with primary LCCs), while LGB and BUR have more limited service patterns.

Overview of the Region

The Los Angeles Basin spans over 150 miles from north to south and 175 miles from east to west *(Great Circle Mapper)*, and is home to over 18 million people *(U.S. Census 2011)*. It represents the second largest metropolitan area in the United States, and the 13th largest in the world. The demographic and economic center of the region is the city of Los Angeles, with more than 3.8 million residents *(U.S. Census 2011)*. In addition, there are other large segments of the region that, if viewed as stand-alone metropolitan areas, would be among the largest in the country. The remainder of Los Angeles County (outside of the city limits) is home to 6.1 million residents *(U.S. Census 2011)*. To the immediate south, Orange County is home to 3.1 million *(U.S. Census 2011)*. To the east, the Inland Empire region of Ontario-Riverside-San Bernardino is home to 4.3 million people *(U.S. Census 2011)*. The smaller, leisure-focused communities of Palm Springs and Santa Barbara provide additional population centers at the northern and eastern edges of the Basin, which is shown in Exhibit 6-1.

The economy of the region is dispersed throughout several large commercial centers/business districts. Throughout Los Angeles County, these include a core center in Downtown Los Angeles, supplemented by secondary centers in Century City, Long Beach, Glendale, Burbank, and elsewhere. Primary Orange County commercial centers include Newport Center (Newport Beach), South Coast Metro (Costa Mesa), and Irvine. Major business districts in the Inland Empire include the central districts of Riverside and San Bernardino. In general, commercial and corporate activity throughout the Basin tends to be more dispersed than is seen in many other major metropolitan areas.

Exhibit 6-2 summarizes recent demographic and employment trends across the region over the period from 2000 to 2010. During this period, the most rapid growth took place in the Inland Empire region, with a nearly 30% increase in population over the 10-year span. Though not identified in this exhibit, this region has experienced a disproportionate impact from the recent economic downturn. Employment trends throughout the period display similar trends.

Personal and household income data throughout the region's metropolitan statistical areas (MSAs) can be seen in Exhibit 6-3. Published income levels are relatively consistent through three of the four defined regions, although there are significant variations in subregions within the defined areas (particularly the large Los Angeles/Orange County MSA). The Inland Empire area consistently generates moderately lower per capita income levels, a trend which has likely continued beyond the time period of the data presented.

Summary of Airports in the Region

The largest airport in the region is Los Angeles International (LAX). LAX serves as a major international gateway, particularly to Asia and the Pacific. As of July 2012, LAX

Exhibit 6-1. Map of the Los Angeles Basin region.

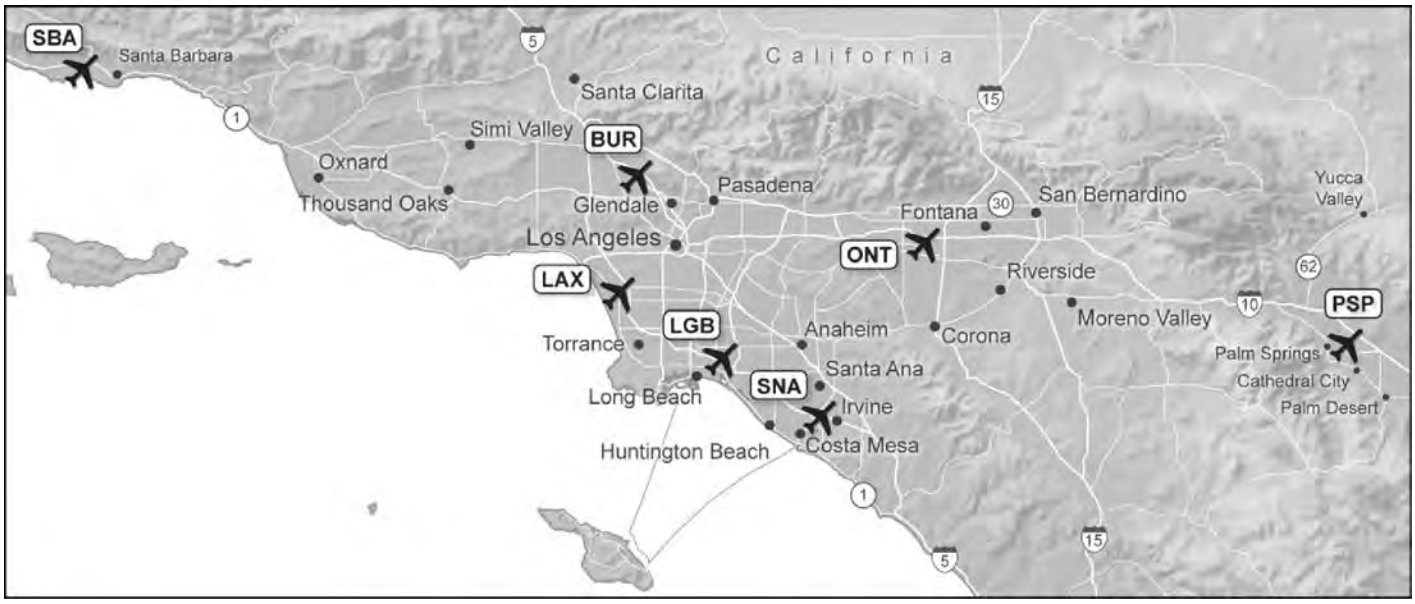


Exhibit 6-2. Change in population and employment by MSA, 2010 vs. 2000 (Los Angeles Basin Region).

	Population (000)				Employment (000)			
			Change				Change	
MSA	2000	2010	#	%	2000	2010	#	%
Los Angeles-Long Beach-Santa Ana, CA	12,392.7	12,849.4	456.7	4%	7,308.5	7,305.4	(3.0)	0%
Oxnard-Thousand Oaks-Ventura, CA	756.5	825.7	69.2	9%	400.8	417.3	16.5	4%
Riverside-San Bernardino-Ontario, CA	3,277.0	4,245.8	968.8	30%	1,373.8	1,608.8	234.9	17%
Santa Barbara-Santa Maria-Goleta, CA	400.0	424.7	24.7	6%	247.5	250.4	2.9	1%
Subtotal	**16,826.2**	**18,345.6**	**1,519.4**	**9%**	**9,330.6**	**9,581.9**	**251.3**	**3%**

Exhibit 6-3. Change in per capita and per household personal income, 2010 vs. 2000 (Los Angeles Basin Region).

	Per Capita Personal Income (2005 constant dollars)				Mean Household Total Personal Income (2005 constant dollars)			
			Change				Change	
MSA	2000	2010	#	%	2000	2010	#	%
Los Angeles-Long Beach-Santa Ana, CA	35,456	40,028	4,572	13%	106,351	119,680	13,329	13%
Oxnard-Thousand Oaks-Ventura, CA	38,201	42,151	3,950	10%	116,778	128,666	11,888	10%
Riverside-San Bernardino-Ontario, CA	26,209	27,402	1,193	5%	80,960	87,909	6,949	9%
Santa Barbara-Santa Maria-Goleta, CA	37,111	41,595	4,484	12%	105,073	119,904	14,831	14%
Average	**34,244**	**37,794**	**3,550**	**10%**	**102,291**	**114,040**	**11,749**	**11%**

offered 824 daily departures to 155 nonstop destinations around the world. LAX offers very high-frequency service to key domestic destinations, as well as many destinations outside of North America.

The other four commercial airports in the core Basin serve as regional complements to LAX, and offer the following varying levels of service:

- John Wayne Airport (SNA) is located in the Santa Ana/Irvine region of central Orange County. Nine carriers currently operate from SNA, operating 118 daily departures to 21 nonstop destinations. Southwest Airlines (WN) operates with the most frequency from SNA—46 daily departures, more than twice as many as any other carrier. Air service at SNA consists primarily of operations into large legacy airline hubs and to key regional destinations.
- Long Beach Airport (LGB) is located just outside of Long Beach off the 405 Freeway, roughly halfway between LAX and SNA. Four carriers currently operate from LGB, with JetBlue (B6) operating 31 of the airport's 43 daily departures to 12 of the airport's 13 destinations. Alaska (AS), Delta (DL), and US Airways (US) also offer service to several hubs, but none with more than five daily departures.
- Ontario International Airport (ONT) is located approximately an hour east of Los Angeles in the Inland Empire region. Seven carriers currently operate from ONT, with a total of 65 daily departures to 15 nonstop destinations. WN is the largest carrier at ONT with 34 daily departures to seven nonstop destinations, six of which are in the Western United States. As recently as August 2008, ONT offered more than 100 daily departures.
- Bob Hope Airport (BUR) is located near the town of Burbank, just to the north of Los Angeles. Six carriers currently operate at BUR, offering 72 daily departures to 11 nonstop destinations, almost all in the Western United States (with the exception of twice daily to JFK). WN is the largest carrier at BUR, with 47 daily departures to six nonstop destinations.

In addition, the two other airports that serve smaller, leisure-oriented communities on the periphery of the region offer the following:

- Palm Springs International Airport (PSP) is located just outside of the town of Palm Springs. Eight carriers serve PSP with a total of 21 daily departures, although seasonal service typically doubles that total in the winter. During the seasonal peak, 10 carriers serve the market—led by UA, with 19 daily departures to five nonstop destinations.
- Santa Barbara Airport (SBA) is located just north of the city of Santa Barbara. Five carriers serve SBA with a total of 33 daily departures to six nonstop destinations (five during the off-peak). UA is the largest carrier at SBA, with 20 daily departures to three nonstop destinations.

Exhibit 6-4 highlights service, traffic, and fare information at each of the area's seven airports, including 10-year traffic growth rates for each.

Throughout the last 10 years, passenger growth in the core area of the Basin has concentrated at LAX and SNA, with total growth of 11% and 12% respectively, and at LGB—which has seen traffic increase more than 300% with the market entrance

Exhibit 6-4. Summary of air service choices at Los Angeles Basin airports.

Airport	Passenger Traffic* (YE 1q 2012)	Flight Frequency (July 2012)	Seats (July 2012)	Average Seats Per Flight (July 2012)	Average Airfare (YE 1q 2012)	Ten-Year Total Traffic Growth*
Los Angeles (LAX)	63,034,644	25,332	3,257,001	142	$227	11%
Orange County (SNA)	8,598,820	3,660	496,822	136	$174	12%
Ontario (ONT)	4,559,424	2,010	252,567	126	$164	-32%
Burbank (BUR)	4,442,596	2,230	262,867	118	$140	-9%
Long Beach (LGB)	3,069,000	1,341	173,968	130	$113	348%
Palm Springs (PSP)	1,597,122	662	40,208	61	$196	27%
Santa Barbara (SBA)	719.322	1,034	45,599	44	$221	7%
REGION TOTAL or AVG	86,020,938	36,269	4,866,442	134	$203	9%
U.S. TOTAL	437,373,548				$172	12%

of B6. The other core suburban airports—BUR and ONT—have both seen declines in traffic, with ONT down more than 30% during the period (and even more from an interim period in mid-2008). Both of the peripheral airports have seen slight-to-moderate increases throughout the period, with PSP up more than 25% and SBA up 7% in the last 10 years.

Inter-Airport Competition in the Region

The five airports in the core area of the Basin fit a basic profile—one major international gateway airport surrounded by several regional facilities serving their respective communities. As a result, much of the passenger choice dynamic revolves around the relative convenience of each of the regional airports compared to the broad service offerings offered at LAX.

As a major international gateway without a true hub pattern of service, LAX offers a diversified carrier service profile. As of November 2012, UA (25%), AA (20%), WN (14%), and DL (13%) combined to offer over 70% of departures, with the remainder coming from a combination of more than 50 other domestic and international carriers. At the three suburban airports (SNA, ONT, BUR), WN maintains a strong departure profile—with more than twice the departures of any other carrier at each airport (including a 66% departure share at BUR). B6 maintains a similar 66% departure level at LGB, which is lacking service from multiple major carriers—including AA, UA, and WN. Finally, the peripheral airports at SBA and PSP offer more of a regional airport service profile, with UA representing approximately 40% of departures at each (although PSP experiences a considerable seasonal service pattern).

Four of the five airports in the core area of the region have similar domestic airfare situations. WN's large presence at LAX, SNA, BUR, and ONT plays a significant role in this dynamic, particularly in regional western and intra-California markets. The one exception to this is LGB, where overall fare levels are primarily influenced by the B6 focus city. LAX and SNA tend to generate higher aggregate average domestic fares, but this is in large part due to the presence of generally longer-haul services at these airports. SBA and PSP tend to produce higher fare levels than the other five airports, because neither airport offers significant LCC service and competing airports are at least 1 hour away by car.

Exhibit 6-5 highlights the top 10 O&D markets (with average fare levels) across the seven facilities for the year ending 1Q 2012. The similarities in the market lists of SNA, ONT, and BUR are notable, reflecting their comparable roles in the regional air transportation system.

Geographic and/or Surface Access Issues

Surface access is a significant passenger choice factor across much of the Basin. The continued development of the regional airports within the Basin is the result, in part, of the heavy congestion and delay situation that is prevalent for many driving trips to LAX. The size of the region, combined with often heavy traffic, contribute to the long drive times.

Exhibit 6-6 details published drive times from various Basin communities to each of the region's airports. However, actual commute times throughout most times of the day are typically much longer than those published.

As is shown by the data in Exhibit 6-6, there are substantial distances between many communities in the region. In addition, traffic conditions can create drive times as much as two to three times the figures indicated, depending on the time of day. The dilemma faced by passengers in more remote communities like Palm Springs and Santa Barbara is the non-optimal choice of using limited service options at their nearby regional airports versus facing long drive times to other airports within the Basin, or even the nearest airport just outside the Basin.

Passenger Choice Dynamics

A summary of key passenger choice dynamics and decision drivers evident in this region follow:

- Surface access issues across most parts of the region—Passenger commute times remain a primary passenger choice driver in the Los Angeles Basin. Given the presence of several regional facilities across the area, the traffic situation in the Basin drives the airport choice for a large proportion of travelers.
- Nonstop service availability from various Basin airports to various destinations—Although the regional airports in the Basin provide passengers with viable alternatives to driving to LAX, these facilities offer varying levels of service (in all cases substantially less than LAX), often presenting passengers with deciding between a more reasonable drive time vs. substantially more diverse nonstop air service offerings.
- Airline presence at various facilities—Airports throughout the region also have different levels of air service by particular airlines, which can at times drive consumer choice (particularly to loyal customers of the various legacy carriers). While LAX and, to a lesser extent, SNA offer service from legacy and many primary LCCs, the other regional facilities have a less comprehensive airline presence.
- Differing dynamics at peripheral airports SBA/PSP—The airports in the outlying markets of Palm Springs and Santa Barbara tend to offer more limited service profiles and are far enough away from the core of the Basin to propel a different passenger choice dynamic. Drive times to the other regional airports and their more robust service offerings are often quite difficult due to the combination of distance and traffic congestion.

Exhibit 6-5. Top 10 destinations by Los Angeles Basin airports—passengers and fares.

LAX		
Destination	Passengers	Average Fare
JFK	2,470,780	$301
SFO	2,003,750	$93
ORD	1,285,690	$180
LAS	1,247,450	$80
SEA	1,000,160	$140
HNL	977,170	$249
DEN	973,270	$121
DFW	953,890	$159
BOS	890,690	$236
IAD	876,000	$249

BUR		
Destination	Passengers	Average Fare
OAK	697,520	$113
LAS	506,270	$102
SMF	397,350	$121
SJC	386,910	$111
PHX	355,480	$104
SEA	273,150	$134
JFK	190,190	$217
PDX	152,610	$144
DFW	108,010	$166
DEN	99,580	$156

LGB		
Destination	Passengers	Average Fare
LAS	385,150	$58
SLC	350,570	$97
SEA	344,420	$109
OAK	275,870	$77
SFO	251,530	$75
PDX	201,250	$114
SMF	183,570	$79
JFK	166,260	$217
IAD	109,960	$195
ORD	92,640	$144

PSP		
Destination	Passengers	Average Fare
SEA	156,450	$140
SFO	152,900	$145
PDX	75,070	$148
BLI	64,560	$128
ORD	59,010	$216
MSP	48,550	$194
DEN	36,770	$184
DFW	31,500	$226
LGA	24,170	$209
SMF	21,680	$126

SNA		
Destination	Passengers	Average Fare
SFO	527,600	$122
SEA	524,620	$133
PHX	502,830	$113
DEN	501,670	$120
SJC	470,230	$126
OAK	433,330	$124
SMF	385,620	$123
ORD	302,180	$198
DFW	295,730	$200
LAS	295,390	$115

SBA		
Destination	Passengers	Average Fare
DEN	71,900	$146
SEA	45,460	$161
SFO	41,460	$213
PHX	38,150	$127
ORD	21,130	$199
JFK	19,520	$244
DFW	18,070	$197
BOS	17,950	$247
PDX	17,150	$184
IAD	15,190	$220

ONT		
Destination	Passengers	Average Fare
SMF	405,970	$121
OAK	402,220	$108
SEA	267,350	$127
PHX	254,920	$106
SJC	246,550	$103
LAS	180,970	$100
PDX	162,580	$136
DEN	154,180	$144
DFW	136,700	$182
SLC	82,360	$151

Exhibit 6-6. Published drive times between key Los Angeles Basin population centers and airports.

	LAX		SNA		ONT		LGB		BUR		SBA		PSP	
City	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)
Los Angeles, CA	19	0:25	40	0:48	40	0:44	25	0:31	16	0:19	105	1:52	110	1:57
Irvine, CA	43	0:50	3	0:06	41	0:47	24	0:30	53	1:04	147	2:38	95	1:44
San Bernardino, CA	76	1:23	51	1:00	21	0:23	67	1:15	67	1:13	160	2:49	57	1:02
Glendale, CA	27	0:37	47	0:58	43	0:49	33	0:42	10	0:13	103	1:49	113	2:02
Santa Barbara, CA	97	1:45	135	2:24	134	2:22	116	2:04	89	1:37	10	0:14	205	3:35
Palm Springs, CA	124	2:13	97	1:48	71	1:15	112	2:03	122	2:11	215	3:46	0.3	0:01
San Clemente, CA	66	1:14	27	0:32	62	1:09	47	0:55	76	1:27	170	3:02	117	2:07
Thousand Oaks, CA	44	0:51	83	1:33	82	1:28	64	1:10	37	0:43	63	1:07	152	2:41

Source: MapQuest.com.

Airline Choice Dynamics

Airline choice dynamics across the region's airports tend to vary based on each airline's business model.

Legacy Carriers

Legacy carriers have tended to structure their LAX services to provide extensive service to/from their domestic hubs and focus cities. Given that the Los Angeles Basin is bounded on one side by the Pacific Ocean, its geographic location is not suitable for an omni-directional domestic hub. As a result, AA, UA, and to a lesser extent DL use LAX as a "gateway" for international and selected domestic destinations. Legacy carrier service choices at the various regional facilities appear to vary somewhat by airport. While SNA and ONT have historically been "must serve" airports due their highly populated immediate catchment areas, the recent economic downturn in the Inland Empire has contributed to reduced service at ONT. The other airports in the region—including SBA and PSP—appear to be evaluated by each legacy carrier based on the fundamental considerations of route-specific economic performance, network contribution, and conformance with their business models.

Niche Domestic Carriers/Low-Cost Carriers

Southwest Airlines has a significant presence at four of the seven airports in the Basin. Other low-cost and niche carriers appear to be making service decisions based to a large extent on their ability to access the largest possible catchment area with the most reasonable operating economics. While multiple carriers are attempting to achieve this goal from LAX (including ULCCs Allegiant and Spirit), JetBlue established a large base of operations at LGB. Interestingly, other than Southwest and JetBlue, LCC presence at the other regional airports is very limited.

Case Study 2: San Francisco Bay

Airline Choice of Airports in an Integrated Region

Air service trends in the San Francisco Bay region, shown in Exhibit 6-7, offer instructive insights into airline choice in a densely populated region with multiple major and secondary airports. The convenient availability of multiple airports and air service options for air travelers located throughout this region, and the competitive environment it fosters, provides an excellent basis for a case study regarding the primary factors and considerations related to airline decisions about airport choice.

Overview of the Region

The San Francisco Bay region is defined for this case study as encompassing an area from the Pacific Ocean to the west to a portion of the Central Valley of California to the east, and from the Sonoma Valley and Napa Valley to the north to the areas south of San Jose/Silicon Valley, extending roughly to the city of Gilmore. The defined region extends approximately 150 miles north to south and approximately 100 miles east to west. Although the region is typically defined as not including areas of the Central Valley, a broader definition is used in this case study in order to include airports that could provide service to populations in the more traditionally defined areas of the region, or that use air services at the major airports in the center of the region.

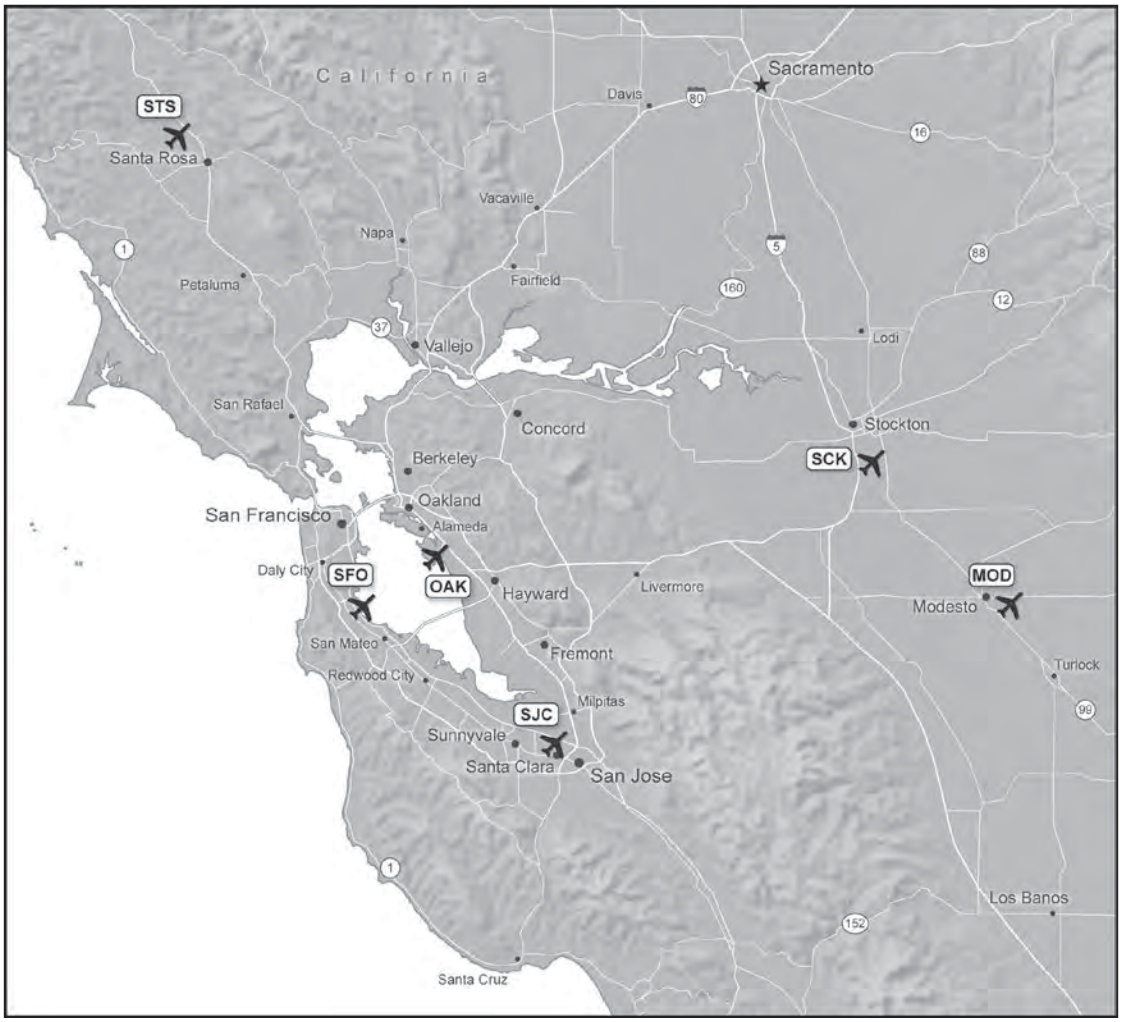
At the center of the region is the San Francisco Bay, which separates the communities on the San Francisco Peninsula from those communities to the east and north. Communities in the southern areas of the region can access both the Peninsula and the eastern areas of the region without having to cross a bridge over the San Francisco Bay.

The region is densely populated, with 7.4 million residents encompassing four MSAs.

- The largest and most central of the region's MSAs is San Francisco/Oakland/Fremont, with a population of more than 4.3 million.
- In the southern part of the region, the San Jose/Sunnyvale/Santa Clara MSA has a population of more than 1.8 million, anchored by the city of San Jose and the adjacent areas that comprise Silicon Valley. The city of San Jose is the tenth largest city in the United States.
- In the eastern part of the region are the Stockton MSA, with approximately 687,000 residents, and the Modesto MSA, with approximately 515,000 residents. These MSAs, although geographically close to the major population centers to the west, are distinct and separate. These communities use air services at Sacramento International Airport (SMF), in addition to the major airports in the western part of the region.
- To the north lie numerous small communities that use air services at the airports in San Francisco and Oakland, and to a much smaller extent, the airports and air services in Sacramento. These communities include the areas north from San Rafael, Novato, Napa, and Sonoma Counties.

For this case study, the Sacramento MSA has not been included in the San Francisco Bay region, or included in this analysis. Although some travelers in the northern and eastern areas of the region use air services at SMF, leakage to SMF from the region as a whole is not of sufficient magnitude to significantly impact the evaluations made in this case study.

Exhibit 6-7. Map of the San Francisco Bay region.



Exhibits 6-8 and 6-9 summarize the change in population, employment, and key income data for each of the MSAs in the region.

For the region as a whole, population grew by 7% during the decade 2000-2010. However, employment declined by 6% during the same period. The decline in employment was most significant in the San Jose MSA (–11%), and somewhat less so in the San Francisco/Oakland MSA (–4%). The high point of employment in the "dot.com" boom, primarily relating to the San Jose MSA, occurred in the year 2000, creating a high base for subsequent comparison, and thereby accounting for much of the negative growth indicated in the data. While population growth was strong in the MSAs to the east, employment growth was modest, with 1% growth in

Exhibit 6-8. Change in population and employment, 2000–2010 (San Francisco Bay region).

	Population (000)				Employment (000)			
			Change				Change	
MSA	2000	2010	#	%	2000	2010	#	%
Modesto, CA	449.5	515.4	65.9	15%	207.4	209.5	2.1	1%
San Francisco-Oakland-Fremont, CA	4,135.9	4,345.3	209.4	5%	2,804.0	2,685.1	(118.9)	-4%
San Jose-Sunnyvale-Santa Clara, CA	1,738.7	1,843.3	104.5	6%	1,295.1	1,146.3	(148.8)	-11%
Stockton, CA	567.9	687.7	119.9	21%	257.1	268.5	11.4	4%
Subtotal	**6,892.0**	**7,391.7**	**499.7**	**7%**	**4,563.7**	**4,309.5**	**(254.2)**	**-6%**

Source: Woods & Poole.

Exhibit 6-9. Change in per capita and mean household personal income, 2000–2010 (San Francisco Bay region).

MSA	Per Capita Personal Income (2005 constant dollars)				Mean Household Total Personal Income (2005 constant dollars)			
			Change				Change	
	2000	2010	#	%	2000	2010	#	%
Modesto, CA	27,049	29,407	2,358	9%	82,272	90,682	8,410	10%
San Francisco-Oakland-Fremont, CA	55,316	55,591	275	0%	144,856	145,642	786	1%
San Jose-Sunnyvale-Santa Clara, CA	61,023	51,133	(9,890)	-16%	179,761	149,222	(30,539)	-17%
Stockton, CA	28,010	28,704	694	2%	84,709	89,950	5,241	6%
Average	**42,850**	**41,209**	**(1,641)**	**-4%**	**122,900**	**118,874**	**(4,026)**	**-3%**

Source: Woods & Poole.

the Modesto MSA and 4% growth in the Stockton MSA over the 10-year period.

A significant decline in personal per capita income occurred during the period in the San Jose MSA (−16%), and mean household personal income declined (−17%) as well. This is likely to have been primarily the result of the severe employment loss in the aftermath of the "dot.com" boom. During this period, these income metrics remained relatively constant in the San Francisco/Oakland MSA, resulting in somewhat higher income metrics for the San Francisco/Oakland MSA than for the San Jose MSA in 2010.

Comparison of data between different MSAs, while providing a broad sense of regional trends, does not provide sufficient detail to distinguish trends occurring within areas of the MSAs. MSAs also do not necessarily define catchment areas for airports within a region, especially within regions that are relatively compact and where access to alternative airports is relatively easy. Likewise, comparisons of MSAs should not be considered comparisons of areas within MSAs, such as cities or counties.

Summary of Airports in the Region

The San Francisco Bay region is served by three large commercial service airports. The region is also served by three smaller airports that have very limited commercial service. All of these airports are geographically dispersed in the region, have evolved into separate air service characteristics, and assumed different roles in the market.

- **San Francisco International Airport (SFO)** is operated by the City of San Francisco, and is located just south of San Francisco on the western shore of the San Francisco Bay. It is the largest commercial service airport in the region, and served more than 41 million passengers in 2011. It is the most used airport for passengers who originate from, or designate their travel to, the region, a connecting hub for United Airlines, and a gateway for international services by both U.S. and foreign flag airlines. To accommodate traffic growth, the airport has undergone extensive development and expansion over the past decade. This development has enabled the expansion of air services and improvement of customer service at the airport, but airspace and airside congestion and delay remain a concern, especially during the morning peak. Approximately one-third of SFO commercial operations are with regional aircraft (primarily United Express). Air traffic congestion and delay at SFO impact airline operations and passenger services, with recent growth of services further exacerbating the situation.
- **Oakland International Airport (OAK)** is operated by the Port of Oakland, and is located within the City of Oakland, on the eastern shore of the Bay. In recent years the airport has served primarily as a focal point for services by LCCs. The airport handled 9,521,862 passengers in 2011, of which 74% flew on Southwest Airlines. OAK was the epicenter of air service competition in the early 2000s, but has experienced a significant decline in passenger levels since 2007. Most legacy carrier services have migrated substantial portions of their services to SFO, due in large part to the introduction of significant competitive services there by Virgin America. The general restraint being exercised by all U.S. airlines regarding air service capacity in an overall environment of soft demand has also been a major factor impacting air service levels at OAK in recent years.
- **Mineta San Jose International Airport (SJC)** is operated by the city of San Jose, and is located within the city of San Jose, in the southern part of the region. Air services at SJC are diversified, handling 8,260,903 passengers in 2011. SJC has undergone major redevelopment and expansion of airport facilities to provide for growth and improve convenience to air travelers. Half of SJC traffic is carried by Southwest Airlines, with various services by other carriers. This diversity of service is in keeping with the broad employment base in the San Jose area, including the Silicon Valley technology center and other business travel drivers based in the San Jose area. Service levels are highest in the California and western U.S. markets, and much less prevalent in long-haul or international markets.

- **Stockton Metropolitan Airport (SCK),** located in San Joaquin County, handled 99,484 passengers in 2011, based on the service provided by Allegiant Airlines. Although Allegiant's services have varied somewhat since its entry in 2006, most of the service has focused on Las Vegas and the leisure market. Travelers to and from this area typically use SMF and the major airports to the west for overall air service.
- **Modesto City-County Airport (MOD),** located due east of San Jose and south of Stockton, handled 45,986 passengers in 2011, based on feeder services by United Airlines (United Express) to SFO, as well as low-fare leisure charter services.
- **Sonoma County Airport (STS),** at the northern part of the region, is located in Santa Rosa. STS, served by Alaska Airlines (AS), handled 214,681 passengers in 2011. The services at STS provide air service alternatives for travel to and from four important destinations: Los Angeles, San Diego, Portland, and Seattle (Alaska Airlines' primary hub). Since the commencement of Alaska Airline services in 2007, STS has experienced rapid growth as area residents in, and visitors to, the northern part of the region have had access to STS as an alternative to SFO or OAK (or alternative air services at Sacramento International Airport).

Geographic and/or Surface Access Issues

Access to the three large commercial service airports in the region is available via major Interstate highways and state highways over various routings. Each of these three airports is within less than a 1-hour drive from most of the region (the most notable exception being access between SJC and the northernmost areas of the region). The other three smaller airports are also well connected with surface access to the broader region, although access is more difficult to those airports for travelers to and from the San Francisco Peninsula.

The two primary inhibitors of access to each of the airports from various points in the region are the presence of

- San Francisco Bay and the resulting need to use bridges or drive around the Bay, and
- Significant roadway traffic congestion on the primary Interstate highways serving portions of the region (i.e., US 101, I-880, I-280, I-580).

The region ranks high among U.S. metropolitan areas regarding traffic congestion, with the San Francisco/Oakland area ranking fourth and the San Jose area ranking thirteenth in Texas Transportation Institute's 2010 Urban MobTravel Time Index. Traffic congestion on US 101 leading south from the Napa and Sonoma County areas is understood to be a significant factor in the growth of air service at STS.

The Bay Area Rapid Transit System (BART) provides access for major population centers in the northern San Francisco Bay area to SFO (direct service) and OAK (via shuttle bus connection from nearest station). CalTrain service to SFO and SJC is available, with the connection to SJC via a free bus link. Access in the southern part of the region is primarily by automobile and bus service. In the Central Valley, stretching to the northern and eastern boundaries of the region, ground access is well developed via Interstate and state highway networks. Estimated drive times and distances are provided in Exhibit 6-10.

Competition among Airports in the Region

Each of the airports in the region is, to some degree, competing with another airport in the region. Nonetheless, all of the five smaller airports are most challenged by San Francisco International Airport (SFO), with its diverse air service offerings. The results of this competition are evident in the passenger traffic trends and shifts that have occurred during the past decade.

During the period 2002–2006, the three largest airports in the region (SFO, OAK, and SJC) experienced similar patterns of air traffic growth. However, since 2007, traffic trend relationships have changed significantly, with SFO experiencing

Exhibit 6-10. Estimated distances and driving times (San Francisco Bay region).

	SFO		OAK		SJC	
City	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)
Santa Rosa, CA	67	1:27	68	1:19	98	1:53
Concord, CA	41	0:53	31	0:42	52	1:02
Hayward, CA	23	0:27	9	0:17	27	0:35
Livermore, CA	47	0:54	28	0:37	30	0:43
Stockton, CA	85	1:29	66	1:12	72	1:23
Modesto, CA	94	1:38	75	1:21	81	1:32

Source: MapQuest.com

steady growth in domestic traffic while OAK and SJC passenger traffic has declined since 2007.

Traffic and Service Levels

A close examination of traffic and service trends at each of the airports in the region is instructive.

San Francisco International Airport (SFO)

United Airlines has operated a hub, international gateway, and operations base at San Francisco International Airport for many decades. During the decade immediately after the reduction in flying in 2001–2002, United maintained a steady level of activity at a level lower than that operated before 2000. For much of that same period, American Airlines and Delta Air Lines were either the No. 2 or No. 3 carrier. However, in 2007–2008, the competitive environment at SFO changed significantly with the expansion of services by LCCs, as well as other legacy carriers.

- In 2007, Southwest Airlines resumed services at SFO, after a 4-year absence. This reentry at SFO coincided with a significant reduction in its services at OAK.
- In 2007, following the US Airways/America West merger, US Airways significantly increased services at SFO.
- In 2008, Virgin America Airlines commenced services at SFO, making it a focus city and base for its operations.
- By 2011–2012, Virgin America and Southwest had become, interchangeably, the No. 2 and No. 3 carriers at SFO (after United).
- As shown in Exhibit 6-11, the levels of traffic carried by United, American, Delta, Alaska, and US Airways were not significantly affected by the service expansions by Southwest and Virgin America, indicating that these service expansions generated traffic stimulation and/or traffic shift from other areas of the region.

Oakland International Airport (OAK)

Oakland was the beneficiary of substantial growth in air service by Southwest Airlines during the period 2002–2007, making Southwest Airlines by far the dominant provider of air service. However, during the 2007–2008 timeframe, Southwest reduced its operation at Oakland in response to competitive developments at SFO, and has since maintained a steady level of activity at this lower level. Accordingly, the timing of Southwest's service reduction at OAK coincided with its reentry and expansion of activity at SFO.

Oakland also benefited from the entry and growth of JetBlue, but on a much smaller scale. JetBlue's traffic at Oakland peaked in 2006, and has declined since then. During the pre-2007 period, other carriers also experienced some growth in traffic, but their subsequent pullback paralleled that of LCCs. Domestic O&D trends for OAK during this period are shown in Exhibit 6-12.

Exhibit 6-11. SFO domestic O&D traffic trends (Q1 2000–Q2 2012).

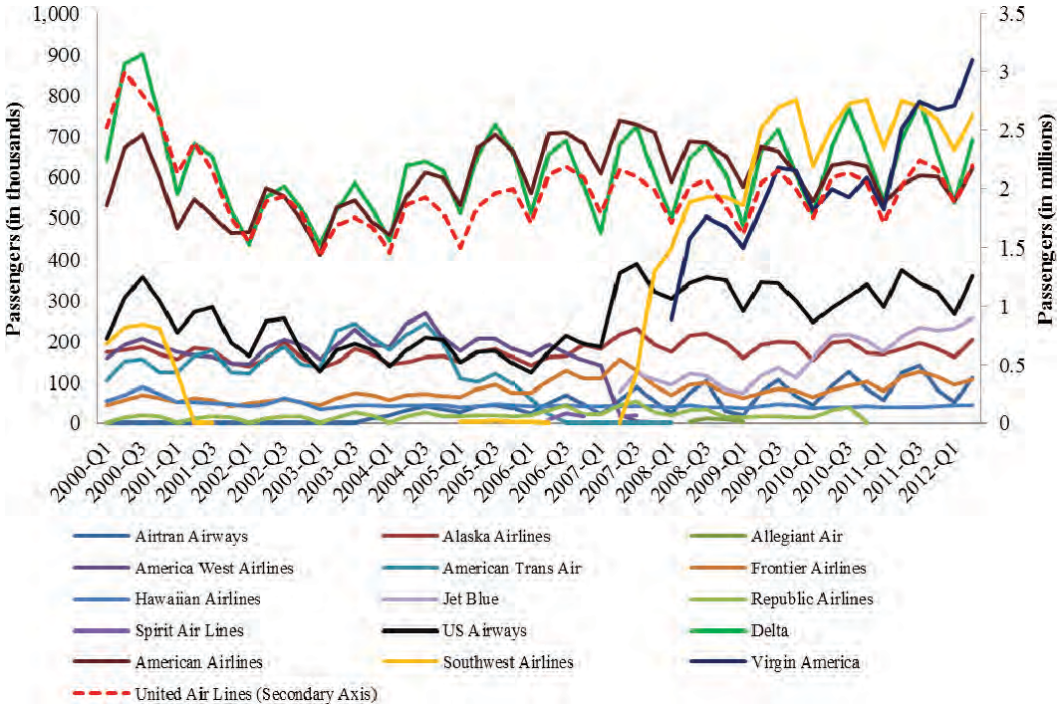
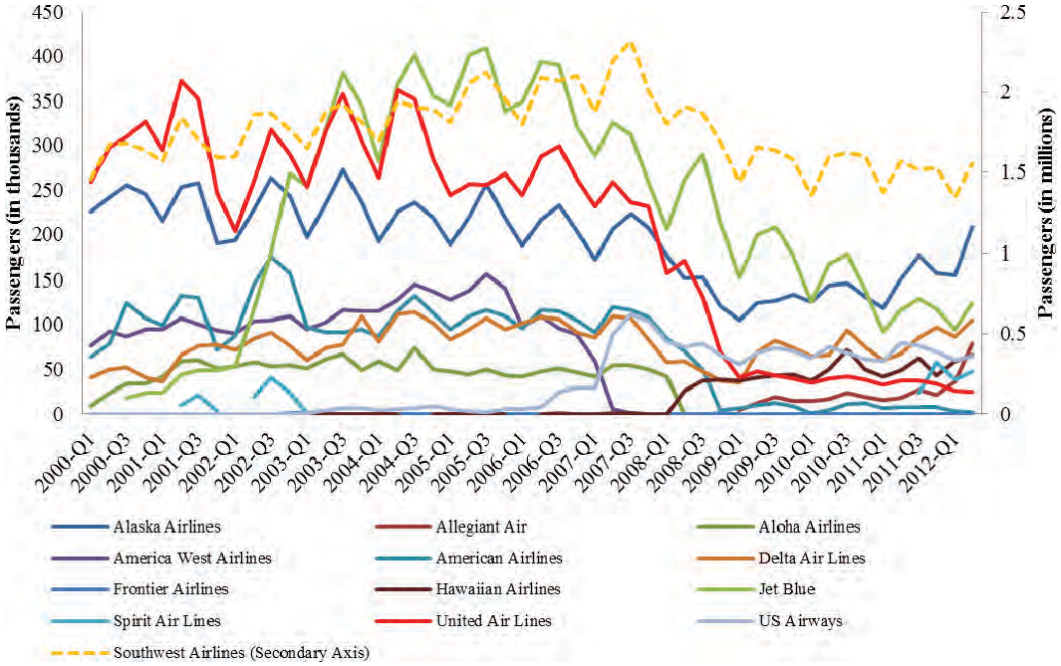


Exhibit 6-12. OAK domestic O&D traffic trends (Q1 2000–Q2 2012).



San Jose (SJC)

Southwest Airlines is the long-standing top provider of air service at San Jose. Over the past decade, Southwest has maintained a steady level of service at SJC. In the 2002–2006 timeframe, American Airlines was the clear No. 2 carrier at SJC, with US Airways a distant No. 3. Other carriers operated at consistent, but lower, levels at SJC throughout the decade, as shown in Exhibit 6-13.

However, since 2008–2009, both American and US Airways activity at SJC has declined to the point where they have traffic levels that are comparable to that of other carriers, with the exception of Southwest. American developed a hub at SJC during the 1990s, but dismantled the hub over time. Subsequently, American shifted a greater share of its regional capacity to SFO; this is understood to have been largely the result of the competitive response of the legacy carriers to the entry and buildup of services at SFO. The loss of service

Exhibit 6-13. SJC domestic O&D traffic trends (Q1 2000–Q2 2012).

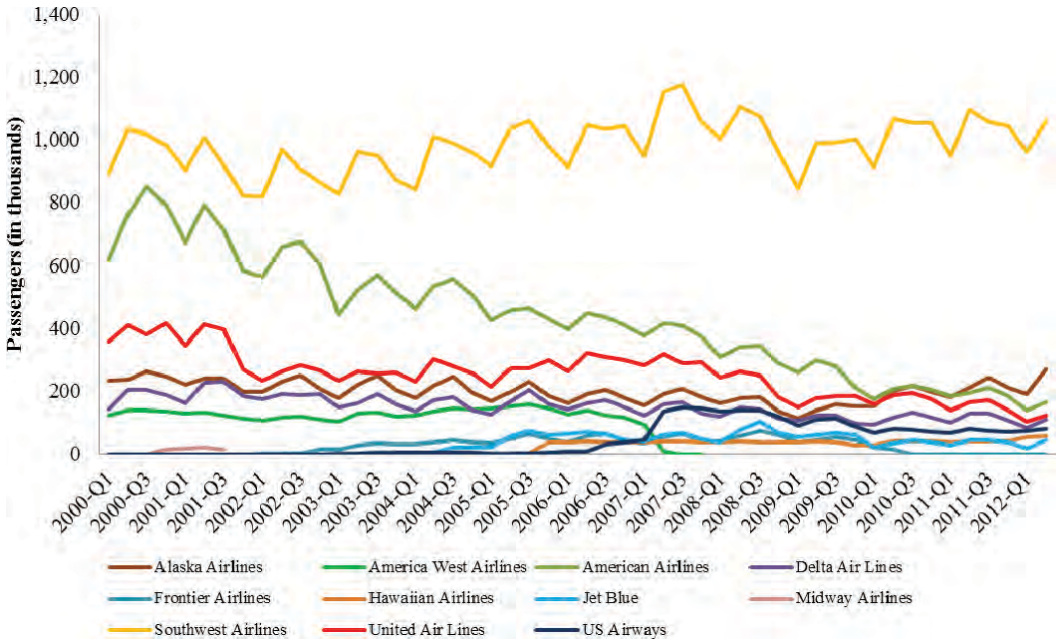
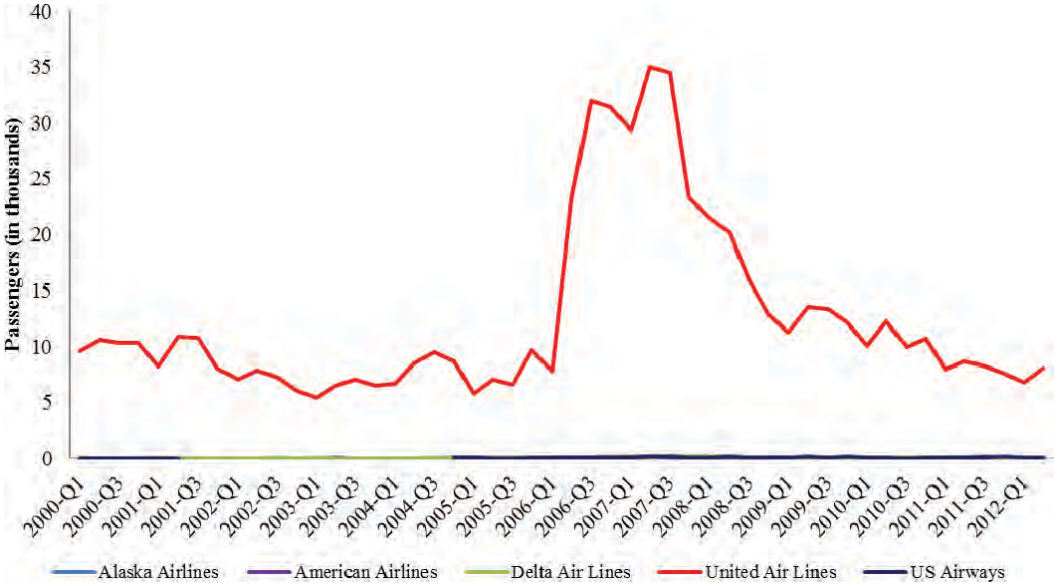


Exhibit 6-14. MOD domestic O&D traffic trends (Q1 2000–Q2 2012).



and capacity at SJC has prompted a substantial shift of air travel (approximately 30%) from the San Jose area to air services provided at SFO. However, notable air service growth at SJC is evident in the past 2 years by Alaska Airlines, including extensive new services to Hawaii and Mexico.

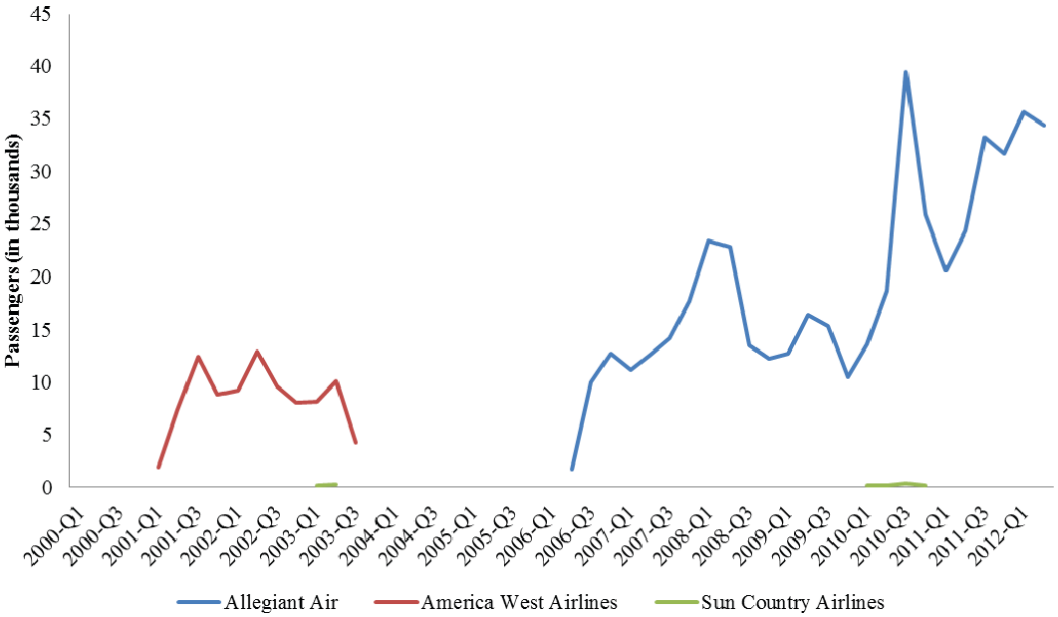
Modesto (MOD)

Scheduled commercial air service at Modesto is provided by United Airlines. As shown in Exhibit 6-14, United's activity tripled in 2006–2007, due to expansion of services. Subsequently, United returned its activity to previous levels and has maintained those levels to date.

Stockton (SCK)

As shown in Exhibit 6-15, in the early years of the study period, America West served Stockton for a short time, but terminated that service in 2003. After several years without commercial air service, Allegiant Airlines entered Stockton in 2006, bringing an immediate jump in traffic activity. Although very reliant on seasonal demand, resulting in large

Exhibit 6-15. SCK domestic O&D traffic trends (Q1 2000–Q2 2012).



swings in activity levels, passenger traffic at Stockton has demonstrated a general upward trend. It is understood that service reductions at SMF have also prompted greater use of Allegiant services at SCK by leisure travelers to and from the Sacramento area.

Santa Rosa (STS)

Santa Rosa Airport (STS) has a long history of commercial service, including both regional feeder services and services to Southern California and Las Vegas. However, such services ended with the cessation of services by United Airlines at the end of 2001. The relatively affluent passenger base, combined with the increasing difficulty of highway access to SFO or OAK, resulted in the entry of Alaska Airlines into Santa Rosa in 2007. This entry was based on the combination of several considerations: Horizon Airlines' ability to make an independent decision about its services, a $1 million incentive package partly funded by a DOT Small Community Air Service Development (SCASD) grant, and the formation of a community ticket bank. As shown in Exhibit 6-16, the Alaska Airlines service (substituting for Horizon) quickly resulted in traffic levels that were four times that which United had experienced earlier in the decade. Alaska's services to its Seattle hub, as well as to other destinations, significantly improved the air service available at the airport, helping the airport to retain air travelers based in, or coming to, the Santa Rosa area of the region. Although services are currently limited by the airport's runway length, additional air services may be offered at STS in the future when runway extension at STS is completed, and if congestion continues to impede surface access from the northern part of the region to SFO.

Fare Competition

The above-noted variety of traffic growth patterns at airports in the region has occurred even as the relationship among average fares at the airports in the region has remained relatively unchanged. SFO has consistently experienced the highest average overall domestic airfares among the six airports, with a significant differential compared to the other airports. However, this differential is largely the result of more long-haul service at SFO, compared to the other airports in the region.

A review of the average fares in the top O&D markets at each of the three major airports provides a better indicator of options available to travelers. Although there are exceptions, pricing in many specific city-pair markets is generally closely aligned among the big three airports. The relatively lower average fares in several SFO markets reflects the competitiveness of services in those markets. However, the differentials are very modest.

Exhibit 6-17 summarizes passenger traffic levels and average fares in the top ten city-pair markets at each of the three major airports in the region.

Notable observations follow:

- The top markets served at SFO include major markets in the eastern areas of the United States. Many top markets to the East enjoy nonstop services at SFO. SFO is a focal point for transcontinental flights (i.e., SFO to New York, Chicago, Boston, Washington, DC). In contrast, the top markets served at OAK and SJC are West Coast or western U.S. markets, reflecting the concentration of short- and medium-haul services that are offered by Southwest Airlines, among other carriers, at OAK and SJC as well as SFO.

Exhibit 6-16. STS domestic O&D traffic trends (Q1 2000–Q2 2012).

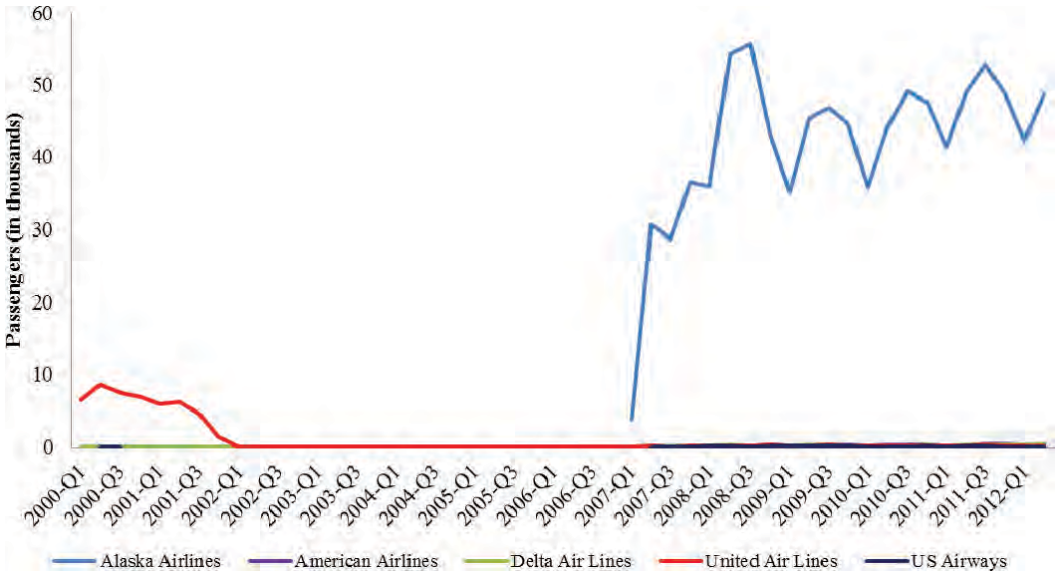


Exhibit 6-17. San Francisco Bay region O&D passenger traffic and average fares in top city-pair markets (YE Q2 2012).

SFO		
Destination	PDEW	Avg O/W Fare
LAX	2,599	$92
JFK	2,402	$283
LAS	1,615	$100
ORD	1,525	$196
SAN	1,445	$97
BOS	1,401	$253
SEA	1,283	$120
IAD	1,143	$265
DFW	980	$161
DEN	974	$140

OAK		
Destination	PDEW	Avg O/W Fare
BUR	931	$112
LAS	880	$90
SAN	838	$108
LAX	830	$107
SEA	809	$112
SNA	581	$123
ONT	541	$107
PHX	531	$133
PDX	474	$133
SLC	402	$143

SJC		
Dest.	PDEW	Avg O/W Fare
LAX	870	$103
SAN	794	$118
SEA	670	$126
LAS	637	$110
SNA	628	$126
BUR	518	$111
PHX	507	$147
PDX	459	$140
DEN	377	$161
ONT	330	$103

- Average pricing levels in West Coast and western U.S. markets are similar at the three airports, suggesting general city-pair pricing relationships that recognize the relative proximity of the three airports and the variety of air service options available to air travelers in these high-volume markets. However, the services from SFO to the eastern United States (involving both nonstop and connecting services) have higher average fare levels, as would be expected with fewer service options in the region and the longer stage length.

Passenger Choice Dynamics

Following is a summary of key passenger choice dynamics and decision drivers that are evident in this region.

Airfares Are Relatively Undifferentiated in Many Markets

The level and diversity of services at the multiple airports in the region result in relatively undifferentiated pricing for air services in many city-pair markets. Major California markets served with substantial capacity by multiple carriers from SFO evidence significantly lower average fares. Otherwise, with the exception of Stockton (with the Allegiant services), choice of airport by passengers does not appear to be clearly impacted by airline pricing.

Surface Access to Airports in the Region Is Generally Convenient

In general, ground access to SFO does not appear to have impeded the growth of passenger traffic. The shift and concentration of air services at SFO resulted in more capacity and service options at SFO than at the other airports in the region, creating a magnet for traffic. Mass transit access and airport landside improvements at SFO (parking and rental car facility expansions) have been made in recent years. Although proximity and convenience to home or workplace is typically a positive factor in airport choice by air travelers, the experience in this region indicates that extensive service offerings by multiple carriers in a competitive environment will draw travelers from anywhere in the region to the preferred air service. However, the STS experience also demonstrates that there is a point at which surface access constraints, combined with alternative air service offerings, will shift some traffic from the dominant airport to the more convenient local airport.

Niche Airline Services Coexist with Large LCC Presence

Notwithstanding the concentration of services at SFO, and the continued prominence of OAK and SJC for Southwest Airlines services, the viability of niche-market services at secondary airports is clearly demonstrated. The Virgin America services at SFO, the Allegiant services at STK, and the Alaska Airlines services at STS demonstrate the ability of differentiated services to thrive in an environment dominated by larger airports and major network and low-cost carriers.

Airline Choice Dynamics

Air Service Shifts Driven Primarily by Consolidation and Competition

During the course of the study period, shifts in air service appear to be driven primarily by airline business model considerations, such as economies of concentration and competitive response, rather than by the buying power of communities within the region. In addition, travelers in the region have

demonstrated their willingness to drive to airports throughout the region for services they prefer.

Strategic and Competitive Considerations in a Relatively Neutral Fare Environment

The relative similarity in airfare levels for comparable air services in the region indicates that substantial competition among a diversity of airlines exists throughout the region. As a result, airport choice is not significantly driven by markedly different airfare environments at the various airports. The revenue profile of air services in the region is only modestly differentiated, so airline choice regarding a particular airport to serve does not appear to be driven by an expectation of significantly different revenue profiles at each airport. Rather, airport choice is driven by strategic and competitive issues. The one exception to this generality occurs at Stockton, where Allegiant provides ultra-low-cost services for the leisure market.

Efficiencies of Service Concentration

The efficiencies to airlines that result from economies of scale are an incentive for concentration of services at fewer airports. SFO's long-standing status as an airline hub and international gateway provided a base of activity for United Airlines' growth and consolidation. The initiation, growth, and concentration of services at SFO by Virgin America also indicate the power of operational concentration. SFO has undertaken the facility development needed to accommodate such concentration, although airspace and airfield capacity remain a concern.

Competitive Responses to ULCC Substantial Market Entry

The establishment at SFO of a base of operation and growth by Virgin America has clearly been a major factor in the consolidation of services at SFO by United and the shift of a substantial share of services by Southwest and JetBlue from OAK to SFO. The emergence of competition at SFO by an airline with a distinct business model (one that seeks to compete with both network and low-cost carriers) has compelled competitive responses by the market-share leaders in the region. The resulting "turf war" continues, and its outcome cannot be predicted.

Case Study 3: Western Carolina

Passenger Choice among Multiple Small Hub Airports and a Major Hub Airport

This region represents a classic case for examining passenger choice between a large major network airline hub and smaller airports in multiple nearby communities with varying service options. Charlotte Douglas International Airport (CLT) is one of US Airways' principal hubs and enjoys service to over 100 destinations, including several international markets. North Carolina airports in Asheville and Greensboro, and South Carolina airports in Greenville-Spartanburg and Columbia, offer competitive alternatives for many area residents.

Service at each of those airports tends to be dominated by US Airways and Delta Air Lines. The other legacy network carriers also provide nonstop services to one or more of their hubs. To the extent that the smaller airports enjoy service from LCCs, it is generally offered by Allegiant to various locations in Florida. In early 2011, Southwest Airlines commenced service at Greenville-Spartanburg. Asheville enjoyed service from AirTran for several years, but that service was dropped in early 2012 following the merger with Southwest.

The region is interconnected with Interstate highways that provide good surface access to each of the region's airports. Surface access generally is not considered to be congested, and there are no unique geographic considerations such as large bodies of water that hamper access. As a result, the choices that residents and visitors make when flying to or from the region's several airports are most likely driven by personal calculations involving airfares, frequency, service quality, and convenience (accessibility).

Overview of the Region's Population and Economy

The Western Carolina region, spanning the western borders of both North Carolina and South Carolina, has at its center the Charlotte metropolitan area, a financial and transportation hub in the U.S. Southeast. The region stretches 185 miles north to south (Greensboro to Columbia) and 170 miles from west to east (Asheville to Greensboro) as shown in Exhibit 6-18. The region's population of more than 5.5 million has grown over the past decade at twice the U.S. national rate.

Charlotte is the largest city in North Carolina and the 17th largest in the United States. With a population of roughly 1.8 million in the MSA, the city is a major financial center.

On the western edge of the region is Asheville. The largest city in western North Carolina (MSA population more than 425,000) and near Great Smoky Mountains National Park, this area has a growing, affluent retirement population.[3]

To the north, the region is bounded by Greensboro, Winston-Salem, and High Point, North Carolina. Collectively referred to as the Piedmont-Triad, the region's economy has

[3] http://www.ashevillecvb.com/marketing-public-relations/accolades-media-praise/.

Exhibit 6-18. Map of the Western Carolina region.

historically been known for furniture manufacturing, textiles, and tobacco. The combined area is home to over 1.2 million people.

To the southwest in South Carolina, is the Greenville-Spartanburg area. Greenville is the largest city of the Greenville-Spartanburg-Anderson combined statistical area (CSA), which had a population of 1,266,995 at the 2010 census, making it the largest CSA in South Carolina. Greenville's economy, formerly based largely on textile manufacturing, is now the North American home of BMW and Michelin, as well as several other major international firms.

Finally, to the southeast is Columbia, South Carolina's capital and largest metropolitan area (nearly 800,000). Columbia's diverse economic base includes 31 Fortune 500 companies, and the city serves as a service center for the insurance, telecommunications, computer, and real estate industries.[4]

Exhibits 6-19 and 6-20 summarize the change in population, employment, and key income data for each of the MSAs in the region. The region's population growth between 2000 and 2010 was nearly double the national average. Total employment in the region's MSAs also grew, but not at the same rate as its population. Partly as a result, two key measures of income decreased slightly. Per capita income and average household income are greater in the Charlotte area than in the other MSAs within the region. Average incomes rose over the period in Asheville, Columbia, Greenville, and Spartanburg, but declined elsewhere.

Summary of Airports in the Region

As shown in Exhibit 6-21, the region is dominated by Charlotte Douglas International Airport (CLT), a large hub that serves as a major international gateway for US Airways. CLT dwarfs the other airports in the region in terms of enplanements and operations. It is the 7th largest U.S. airport in terms of operation and 11th largest in passenger traffic. As of September 2012, CLT received service from nine carriers, and offered passengers 672 daily scheduled departures to 142 nonstop destinations.[5]

[4] http://www.city-data.com/us-cities/The-South/Columbia-Economy.html.

[5] http://charmeck.org/city/charlotte/Airport/AboutCLT/Pages/Fast%20Facts.aspx. Retrieved 3 January 2012.

Exhibit 6-19. Change in population and employment, 2000–2010 (Western Carolina).

	Population (000)				Employment (000)			
			Change				Change	
MSA	2000	2010	#	%	2000	2010	#	%
Charlotte-Gastonia-Rock Hill, NC-SC	1,339.9	1,764.3	424.4	32%	930.5	1,047.8	117.3	13%
Columbia, SC	649.6	769.9	120.4	19%	421.6	451.3	29.7	7%
Greensboro-High Point, NC	645.4	725.3	79.9	12%	437.5	426.0	(11.5)	-3%
Greenville-Mauldin-Easley, SC	561.4	638.6	77.1	14%	363.1	381.3	18.2	5%
Winston-Salem, NC	423.5	478.4	54.9	13%	262.6	263.1	0.5	0%
Asheville, NC	370.6	425.5	54.9	15%	215.3	235.6	20.3	9%
Hickory-Lenoir-Morganton, NC	343.2	365.4	22.2	6%	221.2	190.8	(30.4)	-14%
Spartanburg, SC	254.4	284.7	30.3	12%	148.0	148.3	0.3	0%
Subtotal	**4,588.1**	**5,452.2**	**864.1**	**19%**	**2,999.8**	**3,144.2**	**144.4**	**5%**

Source: Woods & Poole.

Exhibit 6-20. Change in per capita and mean household personal income, 2000–2010 (Western Carolina).

	Per Capita Personal Income (2005 constant dollars)				Mean Household Total Personal Income (2005 constant dollars)			
			Change				Change	
MSA	2000	2010	#	%	2000	2010	#	%
Charlotte-Gastonia-Rock Hill, NC-SC	37,015	35,180	(1,835)	-5%	94,728	90,908	(3,820)	-4%
Columbia, SC	30,799	31,775	976	3%	77,920	79,635	1,715	2%
Greensboro-High Point, NC	32,235	32,141	(94)	0%	79,163	78,443	(720)	-1%
Greenville-Mauldin-Easley, SC	30,472	31,243	771	3%	76,108	78,318	2,210	3%
Winston-Salem, NC	33,668	32,799	(869)	-3%	81,870	79,972	(1,898)	-2%
Asheville, NC	29,957	31,278	1,321	4%	69,964	72,351	2,387	3%
Hickory-Lenoir-Morganton, NC	28,679	28,018	(661)	-2%	71,890	69,638	(2,252)	-3%
Spartanburg, SC	27,743	28,333	590	2%	70,303	72,072	1,769	3%
Average	**31,321**	**31,346**	**25**	**0%**	**77,743**	**77,667**	**(76)**	**0%**

Source: Woods & Poole.

Exhibit 6-21. Summary of air service choices at Western Carolina's airports.

Airport	Average Daily Flights (October 2011)	Average Daily Seat Capacity (October 2011)	Average Seats per Flight (October 2011)	Average Fare (Domestic)
Charlotte (CLT)	617	58,891	95	$174
Greensboro (GSO)	53	3,300	62	$166
Greenville (GSP)	51	3,568	70	$173
Columbia (CAE)	33	1,899	57	$232
Asheville (AVL)	25	1,338	54	$169

Exhibit 6-22. Estimated distances and driving times (Western Carolina).

	AVL		CAE		CLT		GSO		GSP	
	Miles	Drive time (hr:min)	Miles	Drive time (hr:min)	Miles	Drive time (hr:min)	Miles	Drive time (hr:min)	Miles	Drive time (hr:min)
Asheville, NC	15	0:17	160	2:35	125	2:08	167	2:46	78	1:20
Columbia, SC	143	2:15	7	0:13	95	1:38	191	3:14	103	1:42
Charlotte, NC	112	2:03	103	1:47	8	0:14	100	1:44	92	1:37
Greensboro, NC	179	3:00	193	3:15	96	1:40	11	0:19	177	3:00
Greenville, SC	48	1:00	106	1:46	97	1:43	196	3:20	14	0:18

Source: MapQuest.com

Passengers also are able to choose from service at four other small hub airports in the region (At each of those airports, service is largely dominated by Delta and US Airways):

- **Asheville Regional (AVL)** is the smallest of the airports in terms of departures, capacity, and enplanements. It is dominated by service from Delta and US Airways. As of the fourth quarter of 2011, AVL had nonstop service to 11 locations, including Orlando (Sanford), served weekly by Allegiant.[6] All of those destinations also were served at CLT. AVL is understood to leak passengers primarily to CLT, and secondarily to Greenville-Spartanburg.
- **Piedmont-Triad International Airport (GSO),** located roughly equidistant from the downtown areas of Greensboro, Winston-Salem, and High Point, has service from all legacy network carriers along with Allegiant. GSO had nonstop service to 15 locations, all of which also were served at CLT. Allegiant offered service to Punta Gorda and Orlando (Sanford). GSO most commonly leaks about half of its passenger traffic to Charlotte (30%) and Raleigh-Durham (20%).
- **Greenville-Spartanburg International Airport (GSP)** is distinct from the other airports in the region, with service by Southwest that commenced in January 2011. With the arrival of service by Southwest, passenger traffic at GSP has increased significantly, and the airport has unveiled a new $115 million Terminal Improvement Program that will double the airport's size.[7] GSP has nonstop service to 22 locations. Historically, GSP most commonly has leaked passengers to Atlanta and Charlotte.
- **Columbia Metropolitan (CAE)** is the second smallest of the airports in the region in terms of departures, capacity, and enplanements. It is dominated by service from Delta and US Airways. CAE has nonstop service to 10 locations, each of which was also served at CLT. At the end of 2011, it had no service from an LCC. CAE most commonly leaks passengers to Charlotte.

[6] Data for the number of nonstop destinations served represents actual airports served during the 4th quarter of 2011.

[7] http://www.goupstate.com/article/20120719/ARTICLES/120719633.

Geographic and/or Surface Access Issues

The region has no unusual geographic or surface access issues that impede passenger access to any of the airports. All of the metropolitan areas are linked by Interstate highways, and each airport is close to Interstate highways.[8] As a result, no location within the region is more than approximately 2 hour's drive to CLT, making a trip to Charlotte for air service a competitive option, as shown in Exhibit 6-22. In addition, GSP also is relatively close to both AVL and CAE, increasing the competitiveness of its service offerings to travelers at those locations.

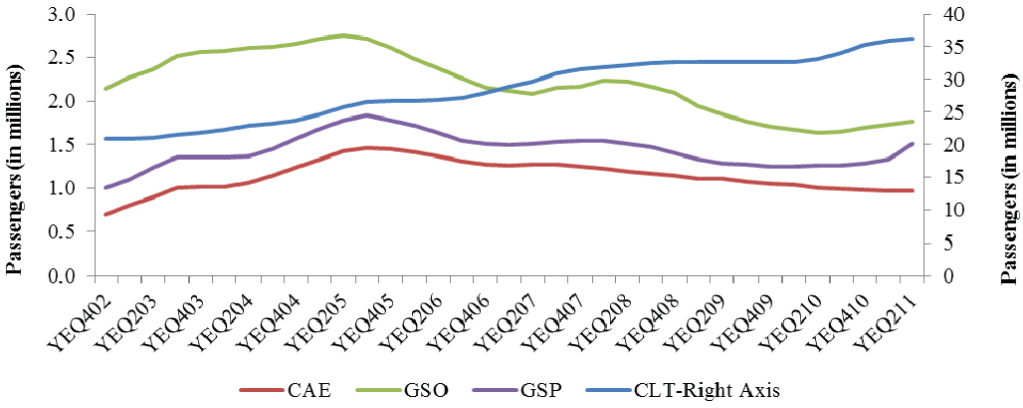
Key Airline Choice Dynamics

US Airways and Delta dominate service in the region. Each airport has nonstop service to the key hubs, CLT, and Hartsfield-Jackson Atlanta International Airport (ATL), as well as service from either airline to New York's LaGuardia Airport. Until the merger of Northwest and Delta, several of the airports had service to both Cincinnati and Memphis, but in general those services have been abandoned as Delta has consolidated its operations in Atlanta. GSO retains a daily flight to Cincinnati to support specific commercial relationships between the two areas.

American and United generally serve each of the airports in the region with flights to one or more of their hubs, typically with regional aircraft. This provides nonstop service to those hubs for passengers originating in the region whose business or leisure demands may take them there, and for frequent flyers on those networks whose destinations are in the region. However, in the same way that the post-merger Delta has rationalized some of its service, the merged United-Continental has also realigned some of its services. In 2012, United announced that it was dropping service to Greensboro and Asheville from Houston.

[8] None of the airports are served by local rail systems. The long-range transportation plan for the Charlotte Mecklenburg area includes light rail access from the city center to CLT. See Destination: 2030—Charlotte Area Transit System. Each of the airports has ground service from taxis, limos, and local municipal buses, except for GSP and CAE, which have no scheduled bus service.

Exhibit 6-23. Trends in passenger traffic at Western Carolina airports.



At the end of 2011, each airport in the region except Columbia also had service from an LCC. Columbia has had LCC service at different times since 2009 (Allegiant, Spirit, and Vision). However, none of the LCC airlines have remained in CAE over an extended time. At CLT, JetBlue and AirTran both operated multiple daily flights to several destinations. The other airports in the region had service from Allegiant to one or more Florida destinations. Vision Airlines also operated briefly in 2011 at AVL, CAE, and GSP. Arguably the most interesting development in the region's air service was the commencement of services by Southwest at GSP in the first quarter of 2011, with the launch of services to Baltimore, Houston, Chicago, and Nashville.

Local airports may find it difficult to influence the perceptions that airline planners have about their area's economy. Those perceptions directly influence the amount and type of service or capacity that airlines are willing to commit to an airport. At Asheville, for example, it has been noted that the area continues to be regarded principally as a seasonal leisure destination, despite the growing local economy and increasing affluence.

Changes in Passenger Traffic and Service

Over the past 10 years, passenger traffic has generally declined at all airports in the region, with the notable exception of Charlotte. Traffic at CLT has grown steadily over the period and now surpasses 35 million, an increase of over 15 million (74%) since 2002. Traffic at AVL also grew steadily for a while, but then declined significantly when AirTran discontinued its service there at the beginning of 2012.

Between the middle of 2005 and the first half of 2011, GSO, CAE, and GSP experienced marked decreases in traffic. Beginning in early 2011, however, GSP's traffic began to rebound, due mostly to the entry of Southwest in the first quarter. Indeed, since Southwest's entry, GSP has reported significant growth in year-over-year traffic, as shown in Exhibit 6-23. GSO's traffic also began to improve, which is attributable to improvement in the local and national economy.

Fare Competition among Airports in the Region

Differences in airfares are generally considered to be the most important reason for passengers to use one airport over another. Passengers typically face the question of whether the difference in fares offered at a particular airport is great enough to influence their behavior. At what point is the price difference great enough to convince a passenger to drive to an alternative airport to save money? This is an individual passenger choice, dependent on the hierarchy of choice factors for that individual in the context of air service in a region.

Average airfares at the region's airports differ significantly, (by $66 one way or nearly 40%), ranging from $166 at GSO to $232 in CAE.[9] Some of the difference is attributable to the absence of LCC service at CAE, but broad averages mask the issue that matters most to an individual traveler's choice: fare levels in specific city-pair markets. In addition, average fare data reveal little about what may be important to business travelers: the level of fares purchased shortly before the date of travel ("walk-up fares").

Average fares in many major city-pair markets differed dramatically among airports in the region. Exhibit 6-24 summarizes the average fares in the largest 10 markets (in terms of passenger traffic) in the region. The exhibit also shows the percentage difference between the highest and lowest average fares. In some cases, the highest average fare was more than double the lowest average fare.

Although average fares from Columbia are often higher than other airports in the region, they are often competitive with fares provided at Charlotte. For example, the average fares from CAE to Dallas-Ft. Worth and to Los Angeles International were lower than those at CLT. Also, the difference in

[9] Fare data shown throughout the chapter are for calendar year 2011.

Exhibit 6-24. Average fares in selected top markets from Western Carolina airports (in current dollars).

Destination	Origin Airport					%
	AVL	CAE	CLT	GSO	GSP	difference
Baltimore-Washington - BWI	$154.96	$239.69	$141.65	$149.95	$120.97	98%
Boston Logan - BOS	$183.80	$219.71	$129.72	$133.00	$183.71	69%
Chicago O'Hare - ORD	$95.20	$232.72	$200.19	$198.73	$168.29	144%
Dallas/Ft. Worth - DFW	$193.01	$201.35	$219.08	$228.00	$207.82	18%
Las Vegas McCarran - LAS	$201.52	$229.10	$198.92	$203.20	$195.32	17%
Los Angeles - LAX	$213.47	$244.79	$261.24	$221.17	$220.91	22%
New York LaGuardia - LGA	$159.62	$160.45	$137.25	$130.10	$152.64	23%
Newark Liberty - EWR	$172.93	$230.01	$211.48	$195.50	$172.57	33%
Orlando - MCO	$110.30	$228.05	$128.23	$152.86	$119.10	107%
Philadelphia - PHL	$170.21	$279.61	$205.56	$162.59	$237.94	72%

average fares between the two cities is relatively small in other markets, such as PHL, EWR, and LAS. CAE's average fares also compare relatively well with fares offered in some markets from GSP, where Southwest Airline's presence affects pricing in many markets. It is apparent that the fares at Columbia and Asheville, although on average higher overall, are often very competitive with fares at other airports in the region in key city-pair markets.

As expected, the presence of an LCC at an airport exerts downward pressure on pricing. At GSO and GSP, Allegiant's services to Orlando-Sanford (SFB) and St. Petersburg/Clearwater (PIE) help check fares offered by other airlines to Orlando (MCO) and Tampa (TPA). Southwest's service at GSP also provides price competition on routes to Baltimore, Chicago, Houston, and other locations. It is understood that, since AirTran ceased service at AVL, there has been a growing perception that fares have risen, which is causing substantial passenger leakage.

Key Passenger Choice Dynamics

The significant effect of new lower fares on passenger choice can be seen by examining the influence that the entry of Southwest has had on passenger traffic in the region.

Effect of Entry of Southwest at GSP

Southwest began service at GSP in the first quarter of 2011 with seven daily flights to five locations: Baltimore-Washington International (BWI) and MDW (double dailies) and single frequencies to BNA, HOU, and MCO. Allegiant Airlines, which had moved its Orlando service from Sanford to MCO in 2010, switched back to SFB. WN's entry provides three daily one-stop flights to Boston Logan International Airport, Denver International Airport, and McCarran International Airport in Las Vegas.

According to press reports, prior to Southwest's entry, GSP had struggled to attract passengers, leaking about two-thirds of its local air passenger base to the major airports in Atlanta and Charlotte. It is widely agreed in the community that these losses were attributable to a lack of direct flights, airline service reductions, and air travelers seeking lower fares.[10]

With the new Southwest flights, the airport's traffic has increased 43% since the start of services. The airport experienced some of the "traditional Southwest effect" of traffic stimulation due to lower fares, and Southwest's entry helped GSP stem the tide of passenger leakage to alternative airports. GSP's September 2012 leakage study found that leakage had dropped by roughly 10 percentage points, and that the airport was attracting new passengers from Tennessee, North Carolina, and other areas in South Carolina.

Traffic to Southwest's nonstop destinations and key beyond points jumped significantly. Exhibit 6-25 shows the change in passenger traffic and average airfares for the airports that Southwest serves nonstop from GSP, as well as in selected Southwest one-stop markets. Except for the Orlando market that was already served by Allegiant, traffic increased significantly in each one, and fares generally fell. The exhibit also includes data for traffic and fares at other airports near those served by Southwest (e.g., Houston Bush Intercontinental as a point of comparison to Houston Hobby, Chicago O'Hare as a point of comparison to Chicago Midway).

Sources in the community are convinced that Southwest has stimulated the business of the airport's other carriers. Not all of the growth in GSP's traffic has been due solely to Southwest; traffic increased for other carriers as well. Southwest's presence also encouraged the incumbents to adjust their prices in order to retain their valued business passengers.

Southwest's entry at GSP provided new passenger choice options for travelers that might otherwise have used AVL, CAE, and CLT. Asheville sources indicate that Southwest's

[10] http://www.goupstate.com/article/20120304/articles/203041019.

Exhibit 6-25. Change in passenger traffic and average fares in selected markets at GSP.

	Passenger Traffic			Average Fares		
Destination	Q3 2010	Q3 2011	% Change	Q3 2010	Q3 2011	% Change
BWI	1,420	18,990	1237.3%	202	118	-41.8%
DCA	8,460	5,860	-30.7%	182	203	11.5%
Baltimore/Washington Total	*9,880*	*24,850*	*151.5%*	-	-	-
HOU	500	5,860	1072.0%	297	159	-46.3%
IAH	6,960	9,130	31.2%	235	197	-1630.0%
Houston Total	*7,460*	*14,990*	*100.9%*	-	-	-
MCO	24,130	11,080	-54.1%	53	120	127.0%
SFB	-	14,350	-	-	43	-
Orlando Total	*24,130*	*25,430*	*5.4%*	-	-	-
MDW	710	17,710	2394.4%	208	130	-37.4%
ORD	10,590	12,960	22.4%	215	166	-22.7%
Chicago Total	*11,300*	*30,670*	*171.4%*	-	-	-
BNA	940	7,530	701.1%	284	111	-60.9%
BOS	4,250	6,000	41.2%	184	171	-7.0%
DEN	6,650	10,160	52.8%	229	187	-18.1%
LAS	4,940	8,030	62.6%	193	196	1.2%

Note: Data are for the third quarter of each year. Fares are shown in nominal dollars.

entry at GSP has had a negative effect on AVL's traffic, although some of that effect was compounded by other shifts in operations at the airport. AVL's Houston passenger traffic, for example, dropped by 40% between the third quarter of 2010 (before WN's entry) to the third quarter of 2011. On the other hand, AVL has not lost much of its Chicago-bound traffic, with traffic to Chicago increasing over the period. In this respect, there appears to have been a measured competitive response by United, with more capacity and larger aircraft being provided in the AVL-ORD market. The data suggest that some traffic at Charlotte also may have moved to GSP; passenger traffic to Chicago, in particular, declined roughly 10% in CLT; average fares from CLT to both MDW and ORD were notably higher than those at GSP.

Differences in Service Quality at Airports in the Region

Travelers also tend to consider the quality of air service in weighing differences in airfares. Although there is significant subjectivity regarding how passengers assess "air service quality," the commonly accepted industry measures include nonstop flights (vs. connecting service), aircraft size, and flight frequency. Service reliability (i.e., flight cancellations) at nonhub airports also can be a major factor that contributes to passenger leakage. All of these issues are prevalent in Western Carolina.

CLT, as a major network airline's hub, offers significantly more flight options than any of the other airports in the region. CLT received service from nine carriers, and offered passengers 672 daily scheduled departures to 142 nonstop destinations.[11] For the major markets in the region, CLT offers far more daily nonstop flights than any of the other airports. Exhibit 6-26 summarizes the number of daily frequencies offered at each airport.

Many of the destinations served from the smaller airports only have service by regional jet (RJ) equipment, which for the purposes of this report, is defined as any aircraft that holds less than 100 passengers. Only the LCCs tend to use larger aircraft, with Allegiant operating 150-seat MD80-series aircraft, Southwest operating various Boeing 737s (122 to 143 seats), and AirTran previously operating Boeing 717s (117 seats). Delta also operated large mainline aircraft in its service to ATL from each of the airports except AVL.

Despite the new travel options presented by Southwest at GSP, it is recognized locally that it will continue to be difficult for GSP to compete against CLT for passengers based in the populated areas between Charlotte and GSP because CLT offers so many more service frequencies and nonstop destinations. In addition, many passengers will not want to make a short flight from GSP to CLT only to wait for an hour for a connecting flight. Those passengers will simply drive to CLT for the first segment of their flight instead.

[11] http://charmeck.org/city/charlotte/Airport/AboutCLT/Pages/Fast%20Facts.aspx. Retrieved 16 November 2012.

Exhibit 6-26. Nonstop destinations and flight frequencies from smaller airports in Western Carolina compared to Charlotte.

Market	AVL	CAE	GSO	GSP	CLT
CLT	8	7	9	7	-
ATL	8	9	9	9	20
ORD	2	3	4	3	16
LGA	1	1	6	1	15
DFW	-	3	3	3	13
PHL	-	3	5	3	10
EWR	2	-	4	2	13
DTW	1	1	3	3	11
IAD	-	3	3	3	11
DCA	-	3	3	3	11
IAH	1	1	2	2	12
BWI	-	-	-	2	11
MIA	-	-	1	-	10
MCO	1	-	-	1	9
CVG	-	-	1	1	8
CLE	-	-	-	1	8
BNA	-	-	-	1	8
MDW	-	-	-	2	-
HOU	-	-	-	1	-
PIE	-	-	-	1	-

Note: CLT also includes service to other destinations not served at any of the other regional airports. CLT has no nonstop service to Chicago Midway Airport (MDW), Houston Hobby Airport (HOU), or St. Petersburg/Clearwater (PIE).

Case Study 4: Northern Gulf Coast

Passenger Choice in a Multi "Small Hub Airport" Region

The Northern Gulf Coast region encompasses a multi-state area (Florida, Alabama, and Mississippi) east to west of approximately 235 miles, spanning the beaches of Northwest Florida, across Mobile Bay in Southern Alabama and into Southeast Mississippi. On its southern border is the Gulf of Mexico; to the north is primarily land in agricultural use and undeveloped woodlands. The region, shown in Exhibit 6-27, represents a market area with fragmented air traffic demand served by a series of airports that have traditionally captured their respective core markets (within a 1-hour drive from each airport), while competing for passenger traffic generated by neighboring markets. The overlapping air service catchment areas are characterized by the concentration of population centers proximate to the Interstate 10 (I-10) corridor. The competition for airline passengers within this region is facilitated by the general ease of access to multiple airports for passengers.

In the last 5 years, the region's air service has been impacted by major changes in the airline industry, including consolidation, the fluctuations in U.S. domestic air carrier capacity (primarily among legacy carriers), and hub consolidation and closure. Major changes also have occurred within the region, most notably the May 2010 opening of a new airport at Panama City (Northwest Florida Beaches International Airport, ECP) and the arrival of new LCC services by Southwest Airlines. At Northwest Florida Regional Airport (VPS), Vision Airlines introduced its travel company product that offered customers short-haul service to multiple markets during 2011. The acquisition of AirTran by Southwest Airlines changed the focus of the long-standing AirTran service in the region at Pensacola, and brought to an end its operations at Gulfport. The dynamics of passenger choice continue to evolve as the profile of the air services offered at the region's five airports continues to adapt to changes in the airline industry.

Overview of the Region's Population and Economy

The MSAs in the region, from west to east along I-10, are Gulfport, Mobile, Pensacola, Fort Walton Beach and Pan-

Exhibit 6-27. Map of the Northern Gulf Coast region.

Exhibit 6-28. Change in population and employment, 2000–2010 (Northern Gulf Coast).

MSA/County	Population (000)				Employment (000)			
			Change				Change	
	2000	2010	#	%	2000	2010	#	%
Crestview-Fort Walton Beach-Destin, FL	171.2	180.7	9.5	6%	111.8	120.2	8.4	7%
Gulfport-Biloxi, MS	247.0	249.7	2.6	1%	150.9	148.8	(2.1)	-1%
Mobile, AL	400.1	413.3	13.2	3%	217.8	228.1	10.4	5%
Panama City-Lynn Haven-Panama City Beach, FL	148.4	169.3	20.9	14%	82.8	97.5	14.7	18%
Pensacola-Ferry Pass- Brent, FL	413.1	450.0	36.9	9%	211.6	220.3	8.7	4%
Escambia, AL	38.3	38.3	(0.0)	0%	18.9	16.9	(2.1)	-11%
Calhoun, FL	13.0	14.6	1.6	12%	4.3	4.7	0.4	9%
Gulf, FL	14.6	15.8	1.3	9%	4.5	5.4	0.9	21%
Walton, FL	40.8	55.2	14.5	36%	16.6	26.3	9.8	59%
Washington, FL	21.0	24.9	3.9	18%	8.3	8.6	0.3	4%
George, MS	19.3	22.7	3.4	18%	6.6	7.9	1.3	20%
Jackson, MS	132.0	139.7	7.7	6%	65.5	67.9	2.4	4%
Subtotal	**1,658.8**	**1,774.2**	**115.4**	**7%**	**899.6**	**952.7**	**53.1**	**6%**

ama City. The region's total population (see Exhibit 6-28) is over 1.77 million residents. The region's economy (see Exhibit 6-29) is anchored by the military, health care, aerospace, defense, and tourism/hospitality sectors. To varying degrees, each of the markets in the region is primarily reliant on these sectors to drive economic activity and demand for air service.

The Gulfport MSA and Biloxi MSA at the western boundary of the Northern Gulf Coast, are, respectively, the second and fifth largest areas in Mississippi. The main drivers of the economy in the Gulfport/Biloxi area are the gaming and tourism sectors, seafood industry, and the military. Keesler Air Force Base is the major public sector employer in southern Mississippi.

Across the Florida/Alabama state line and west of Mobile Bay is the Mobile MSA, the second largest metropolitan area in Alabama. Mobile is Alabama's major seaport, with an MSA population of 400,000. Mobile is also home to a diverse group of companies including Airbus North America, ThyssenKrupp Stainless Steel, Aker Solutions, Austal Limited, and Ryla, Inc.

Further east on I-10, the Pensacola MSA, with a population of 450,000, is the largest metropolitan area in the Northern Gulf Coast region. Naval Air Station Pensacola, the cradle of naval aviation, is a major employer in the region. Other major employers include health care providers and financial services companies.

East of Pensacola is the Fort Walton Beach-Destin MSA, the home of Eglin Air Force Base. Fort Walton Beach and the nearby beach community of Destin, Florida, are major tourist markets for visitors from the U.S. Southeast and Midwest.

On the eastern edge of the region in Florida is the Panama City MSA, the smallest of the five markets in the region, with a population of 169,270. Its economy is anchored

Exhibit 6-29. Change in per capita and mean household personal income, 2000–2010 (Northern Gulf Coast).

MSA/County	Per Capita Personal Income (2005 constant dollars)				Mean Household Total Personal Income (2005 constant dollars)			
			Change				Change	
	2000	2010	#	%	2000	2010	#	%
Crestview-Fort Walton Beach-Destin, FL	30,589	37,732	7,143	23%	76,676	92,221	15,545	20%
Gulfport-Biloxi, MS	27,181	31,800	4,619	17%	69,805	81,315	11,510	16%
Mobile, AL	24,335	28,715	4,380	18%	63,625	73,859	10,234	16%
Panama City-Lynn Haven-Panama City Beach, FL	26,996	32,903	5,907	22%	65,902	79,705	13,803	21%
Pensacola-Ferry Pass- Brent, FL	26,718	31,989	5,271	20%	67,694	79,666	11,972	18%
Escambia, AL	21,287	24,667	3,380	16%	53,356	62,303	8,947	17%
Calhoun, FL	18,182	20,614	2,432	13%	47,190	53,406	6,216	13%
Gulf, FL	19,052	24,003	4,951	26%	43,884	58,946	15,062	34%
Walton, FL	21,325	27,944	6,619	31%	50,368	66,894	16,526	33%
Washington, FL	20,046	21,632	1,586	8%	50,086	55,493	5,407	11%
George, MS	21,421	24,608	3,187	15%	59,787	68,209	8,422	14%
Jackson, MS	25,732	31,767	6,035	23%	70,138	84,356	14,218	20%
Average	**23,572**	**28,198**	**4,626**	**20%**	**59,876**	**71,364**	**11,489**	**19%**

by the hospitality industry, real estate development, and the defense sector. Tyndall Air Force Base, east of Panama City, is the home of the 325th Fighter Wing and a major employer. The St. Joe Company, the largest private landowner in Florida, is headquartered in the market. In the last decade, the market began an economic transition from timber and agriculture business to a greater reliance on tourism, the military, and the service sectors of the economy. Port Panama City offers services for general, bulk, and containerized cargo that provides the market with access to the global market.

Summary of Airports Serving the Region

Five commercial service airports operate in the three-state region of the Northern Gulf Coast. A key characteristic of the region is the lack of a dominant airport (medium or large hub airport within the region offering high-frequency nonstop service to multiple markets, that includes a major presence by one or more LCCs) that air travelers would likely chose over other options due to significantly greater air service offerings.

Gulfport-Biloxi International Airport—Gulfport, Mississippi

Gulfport-Biloxi International Airport (GPT) is the smallest commercial service airport, measured in passenger traffic, in the region. A regional airport authority operates the airport. Delta is the largest air carrier, followed by American, United, and US Airways. As with all other airports in the region except ECP, there is daily nonstop service to Dallas/Fort Worth International Airport (DFW), Houston's George Bush Intercontinental Airport (IAH), Hartsfield-Jackson Atlanta International Airport (ATL) and Charlotte Douglas International Airport (CLT). In addition, Vision Airlines offers limited nonstop service to Tampa-St. Petersburg.

Mobile Regional Airport—Mobile, Alabama

The Mobile Airport Authority operates Mobile Regional Airport. American, Delta, United, and US Airways offer service to ATL, DFW, IAH, and CLT. Unlike the other four airports in the region, MOB has not had scheduled service from an LCC during the last 5 years.

Pensacola International Airport—Pensacola, Florida

PNS is the busiest airport in the region in terms of passenger traffic and airline capacity. The City of Pensacola operates PNS. Delta Air Lines is the largest carrier at PNS, along with a full range of legacy network carriers with nonstop service to nine destinations. AirTran, one of the region's two LCCs, offers nonstop service to Atlanta.

Northwest Florida Regional Airport—Fort Walton Beach, Florida

Okaloosa County, Florida, operates VPS at Eglin Air Force Base under a joint-use agreement with the United States Air Force. American, Delta, United, and US Airways offer nonstop service to ATL, CLT, DCA, DFW, and IAH.

Northwest Florida Beaches International Airport—Panama City, Florida

The new Panama City airport (ECP) opened in March 2010, replacing the downtown airport (PFN). ECP is located 40 miles from I-10 and 22 miles from the center of Panama City. The airport is served by Delta Air Lines to Atlanta and Southwest Airlines to Houston Hobby, BWI, BNA, MDW, and STL, seasonally. ECP is the only airport in the region where Delta does not capture the largest share of passenger traffic or offer the greatest seat capacity.

Surface Access Issues

As shown in Exhibit 6-30, each of the five airports in the region is no more than a 2-hour drive from at least two other airports, and adjacent airports are within a 60- to 90-minute drive east or west. As a result of this close geographic proximity, the market experiences overlapping airport catchment areas. Passengers can take advantage of this ease of access to more than one airport to take advantage of nonstop services

Exhibit 6-30. Estimated distances and driving times (Northern Gulf Coast).

	ECP		VPS		PNS		MOB		GPT	
City	Miles	Drive Time (Hr:Min)	Miles	Drive Time (Hr:Min)	Miles	Drive Time (Hr:Min)	Miles	Drive Time (Hr:Min)	Miles	Drive Time (Hr:Min)
Panama City, FL	22	0:23	69	1:36	134	2:30	202	3:35	256	4:20
Valparaiso, FL	58	1:19	4	0:06	63	1:08	130	2:14	185	2:59
Pensacola, FL	124	2:10	69	1:11	6	0:12	75	1:19	130	2:04
Mobile, AL	170	2:53	116	1:55	57	1:01	12	0:23	72	1:10
Gulport, MS	243	4:00	189	3:02	130	2:08	68	1:13	4	0:07

Exhibit 6-31. Northern Gulf Coast airline domestic market shares summary (YE Q2 2011).

Airport	AA	CO	DL	UA	US	WN	FL	Other
Gulfport (GPT)	13.9	16.4	48.0	-	11.9	-	8.1	0.7
Mobile (MOB)	13.8	17.3	55.6	2.5	10.7	-	-	N/A
Pensacola (PNS)	12.7	8.7	45.9	4.1	10.3	-	15.2	N/A
Ft. Walton (VPS)	20.1	8.8	56.3	1.2	13.2	-	-	0.4
Panama City (PFN/ECP)	-	-	42.3	-	-	57.7	-	N/A
Region	12.7	8.8	50.4	2.0	10.9	6.7	6.1	2.4

not available at the airport nearest to their offices/homes, and to shop for the most advantageous airline ticket pricing.

Each of the airports in the region is accessible via I-10, with GPT the nearest to I-10 (2 miles) and ECP the farthest (40 miles). In most cases, access via I-10 to each of the airports in the region offers air travelers the option of utilizing two or more airports for their air travel needs. Drive times between the airports vary from 70 to 92 minutes.

The lack of ground access congestion,[12] coupled with the LCCs such as AirTran (at PNS) selling the market as the "Pensacola/Gulf Coast" and Southwest (at ECP) selling it as the "Northwest Florida Beaches Area," indicates the airlines' recognition that ease of movement between airports and markets can expand passenger access to LCC service options.

Overlapping Catchment Areas

Passenger choice in the Gulf Coast region is impacted by the presence of overlapping airport catchment areas (an air service market area with airports located within 60 to 90 minutes of other airport(s) where customers have the choice of multiple airports in the region). Each airport in the region serves a core market area within approximately 1 hour of the airport. It is not uncommon in markets with multiple small hub airports, such as this region, for the airports to compete aggressively through local advertising, airline incentive packages, revenue guarantees for airlines, customer loyalty rewards programs, and partnerships with local business and government entities. Each airport in the region offers an airline incentive package either independently or in conjunction with its community partners. Local advertising and customer loyalty programs are also offered by some of the airports to attract and retain customers from the Northern Gulf Coast. Marketing efforts are targeted to the airport's core market area and adjacent or overlapping market areas, as in the Gulf Coast region, to the east and west of the airport.

[12] Of the top 111 metropolitan areas in the United States, only the Pensacola Ferry Pass MSA, of the five markets in the Gulf Coast region, was evaluated by the Texas Transportation Institute Urban Mobility Study. Pensacola ranked 98th of the 111 metro areas and its delay factor was in line with the overall average for small metro markets.

Each airport's marketing efforts better inform customers of the air services available at each airport, and the pricing options available. Over time, customers readily recognize the benefit of considering air travel at both their local airport as well as other airports in the region.

On third-party travel sites (i.e., kayak.com, priceline.com, expedia.com), the region is sold via the multiple airports in the market. These distribution channels offer the air travel consumer a range of fares at airports within the region. This choice highlights the highly competitive nature of this multi-airport market and its overlapping catchment areas.

Air Service in the Region

Air service at each airport has the common element of service by Delta Air Lines to its Atlanta hub. Delta's service to Atlanta at each of the airports in the region offers the largest pool of nonstop seats. All airports, with the exception of Panama City, have service by AA, UA, and US to one or more hubs. At each of the airports in the region, again with the exception of Panama City, Delta captures 45% or more of the passenger traffic. Delta's overall share of passenger traffic at the five airports is 50%, as shown in Exhibit 6-31.

As shown in Exhibit 6-32, the largest carrier in the region, Delta offers each market multiple daily nonstop flights to

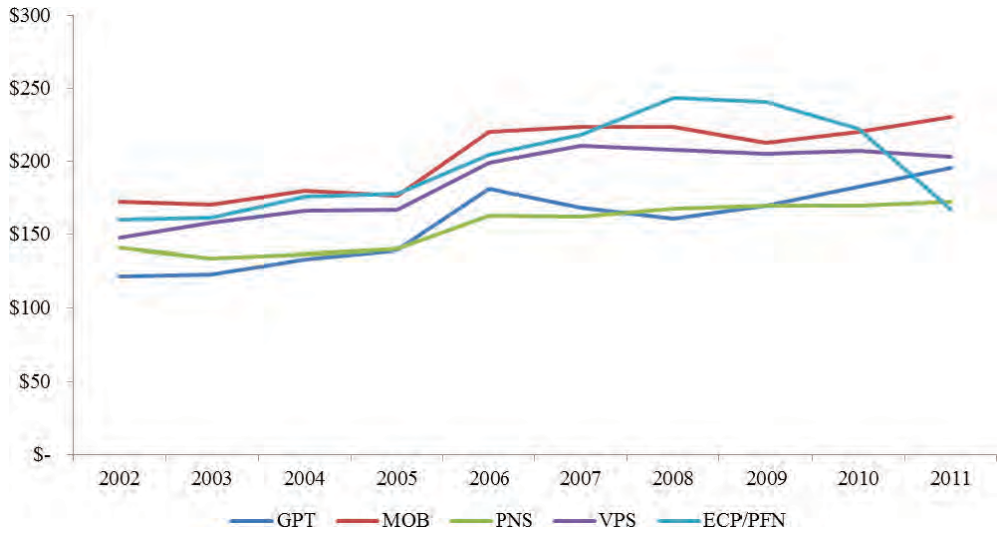
Exhibit 6-32. Nonstop services offered (Northern Gulf Coast).

Airport	GPT	MOB	PNS	VPS	ECP
IAH	Yes	Yes	Yes	Yes	
HOU					Yes
DFW	Yes	Yes	Yes	Yes	
IAD			Yes		
DCA			Yes	Yes	
CLT	Yes	Yes	Yes	Yes	
TPA			Yes		
MCO			Yes		
STL					Yes
BWI					Yes
BNA					Yes
PIE	Yes				
ATL	Yes	Yes	Yes	Yes	Yes

Note: Yes = narrowbody service.

Source: OAG, Nonstop Schedules.

Exhibit 6-33. Northern Gulf Coast average domestic airfares (YE Q2 2002–YE Q2 2011).



its hub in Atlanta. Prior to Delta's acquisition of Northwest Airlines, the five airports in the region each enjoyed nonstop service to Northwest's hub at Memphis (MEM). Delta's 2008 acquisition of Northwest Airlines further solidified its position in the region. Delta expanded its frequent flyer customer base and, in 2012, consolidated its services in the region to ATL.

Each of the five airports in the region has different service levels. Delta Air Lines offers mainline service with narrow body equipment (i.e., B737, MD-80 series, or comparable). United/Continental, American, and US Airways each served the airports in the region with small and large regional jets. AirTran's service at PNS to ATL since 2001 has been offered with B717 aircraft, with seasonal up-gauging to B737 aircraft. Southwest Airlines operates an all-B737 fleet on its services at ECP.

Delta's mainline service offerings at each airport, including first-class cabin and, more frequency/seat capacity, combined with the strength of its domestic and international network at ATL, are powerful competitive tools.

The pattern of air service by the major legacy carriers at the five airports in the region has been relatively stable since 2007. The Delta/Northwest merger and consolidation in 2008 resulted in the loss of nonstop services that had been provided by Northwest Airlines.

Until May 2010, Pensacola International Airport was the only airport in the region with a consistent pattern of scheduled low-cost-carrier service. At PNS, AirTran Airways (now wholly owned by Southwest) has offered nonstop service to Atlanta since 2001. At the opening of ECP in May 2010, a second major low-cost-carrier option became available to passengers in the region, with Southwest Airlines service to four nonstop markets year round and one seasonally. Overall annual scheduled airline capacity in the Northern Gulf Coast region measured in available seat miles (ASMs) was up 3.8% from 2007 (5,620,994 ASMs) to 2011 (5,835,733 ASMs).

Airfares

The pattern of air service in the region, predominantly offered by legacy network carriers, has a direct impact on the passenger's choice of airline ticket pricing. Traditionally, the region's average fares are higher than average U.S. fares.

The regional market has not benefited from the presence of a large LCC at any of its airports. Easy access to a medium or large hub airport with a major LCC presence is also not present. A large LCC presence[13] in a regional market or at a nearby easily accessible medium-sized or larger hub airport can provide effective competition and airfare discipline to the market. As indicated in Exhibit 6-33, average fares have trended down at ECP as service has been offered by Southwest, due to market stimulation. However, this downward fare trend at ECP has not translated into broadly lower fares at other airports in the region. The overall capacity being offered by Southwest Airlines at ECP does not offer the region's air travelers a level of low-cost service options that would bring about competitive response from legacy network carriers at nearby airports. In addition, the location of ECP at the eastern end of the region limits its potential impact on service and fares at other airports in the region that are much farther to the west. For the period ending in the 2nd quarter of 2012, the average fares at ECP remained

[13] Adequate LCC seat departures relative to the overall market size. The presence of Southwest Airlines at ECP and AirTran at PNS and during part of the period from 2007-2011 at GPT offered customers lower air fares, but not a level of LCC capacity to drive down fares overall in the region.

above the U.S. average of $174. The ECP average fare, slightly above the U.S. average, was the lowest in the region at $176, followed by PNS at $194, VPS at $216, GPT at $220, and MOB at $235.

It is widely accepted that price is generally the primary driver of passenger choice among air travel providers. In a multi-airport market such as the Northern Gulf Coast, comprised of five non-hub and small hub airports, traffic demand will respond to airline pricing. Exhibit 6-34 shows the impact of new services and the airline pricing structure at ECP, with a substantial increase in traffic levels. For the year ending December 31, 2011, ECP traffic increased 232% compared to the historic traffic levels for the last full calendar year (2009) of operation at (now closed) PFN.

Airports with LCC service experienced increased passenger traffic as follows:

- Increases in traffic occurred at GPT in 2008, 2009, and again in 2010.
- At VPS, the entry of low-cost service by Vision Airlines had a positive impact on overall traffic levels in 2011. Service was introduced in December 2010, targeting inbound travel to the Gulf Coast at VPS. In March 2011, Vision added 15 nonstop destinations from VPS. Vision's service peaked with 22 markets in the summer of 2011, but by the fall of 2011, the service was discontinued.
- AirTran's service from PNS to Atlanta has contributed to the growth in traffic there. Also, during this period, American Airlines added service from PNS to Miami (MIA).
- The most dramatic impact on traffic levels can be seen at ECP, where Southwest Airlines began service in May 2010. Along with Southwest Airlines, Delta's competitive response at ECP helped drive increased passenger demand.

Passenger Choice Dynamics

The region's airports have competed vigorously over the past 5 years to retain and attract new airline services. Three of the airports (along with their respective local partners) succeeded in attracting new or returning LCC services during this period. Passenger choices in the market (see Exhibit 6-35) were impacted by these efforts, and, reciprocally, those passenger choice impacts played a role in demonstrating the viability of these services. However, the sustainability of each airline service will ultimately be largely determined by the combination of underlying demand for the air service, and the compatibility of the market and airport choices made by each airline in the context of its business model.

Vision Airlines at VPS—In December 2010, Vision Airlines began seasonal service between VPS and Niagara Falls. As part of an overall business strategy to expand its service offerings to include scheduled service, Vision then announced the launch of nonstop service at VPS to 15 predominantly short-haul markets in the East and Midwest as of March 2011. The Vision service was designed to stimulate demand in markets that did not have nonstop service to any of the airports in the region. Vision's services were offered on

Exhibit 6-34. Northern Gulf Coast onboard passenger trends.

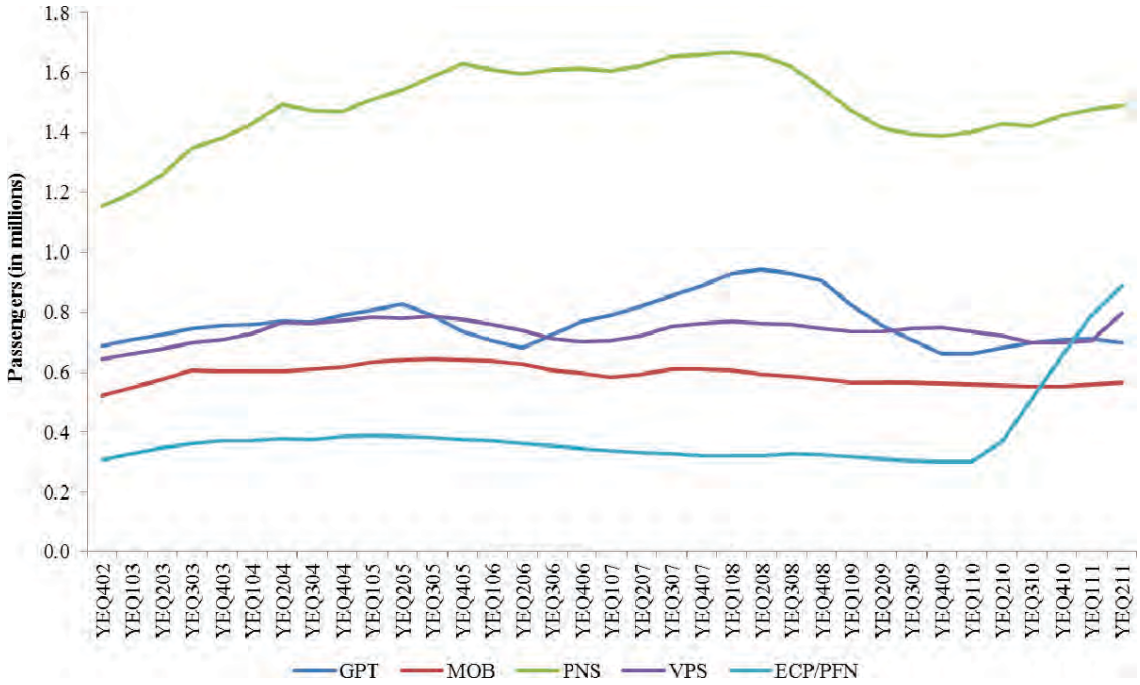


Exhibit 6-35. Northern Gulf Coast onboard traffic and capacity (2007–2011).

	Total Onboard Passengers						
Airport	2007	2008	2009	2010	2011	Percentage Change 2007 - 2011	Percentage Change 2009 - 2011
ECP/PFN	318,914	321,929	300,785	649,989	900,534	182.38%	199.39%
GPT	879,548	884,388	655,855	706,075	660,639	-24.89%	0.73%
MOB	605,363	569,498	556,959	548,567	572,671	-5.40%	2.82%
PNS	1,647,213	1,487,320	1,315,750	1,445,855	1,487,795	-9.68%	13.08%
VPS	756,181	742,558	745,391	694,389	843,551	11.55%	13.17%
Regional Total	4,207,219	4,005,693	3,574,740	4,044,875	4,465,190	6.13%	24.91%

	Total Onboard Seats						
Airport	2007	2008	2009	2010	2011	Percentage Change 2007 - 2011	Percentage Change 2009 - 2011
ECP/PFN	465,503	488,052	381,640	937,979	1,270,693	172.97%	232.96%
GPT	1,154,766	1,253,586	871,629	933,362	856,263	-25.85%	-1.76%
MOB	851,356	857,040	827,359	784,724	783,605	-7.96%	-5.29%
PNS	2,121,492	1,935,556	1,709,035	1,861,152	1,838,840	-13.32%	7.60%
VPS	1,027,877	1,108,503	989,588	963,586	1,086,332	5.69%	9.78%
Regional Total	5,620,994	5,642,737	4,779,251	5,480,803	5,835,733	3.82%	22.11%

Data source: U.S. Department of Transportation, T-100 database, 2007 to 2011.

a less-than-daily basis in many of the markets in the region. Vision's service at VPS was strongly encouraged and supported by the airport operator, the local tourism board, and economic development organizations. At its peak during 2011, Vision offered service to 22 markets from VPS with a mix of mainline jet (B737) and regional turbo prop (Dornier 328) aircraft. Vision ceased offering service at VPS in April 2012, in conjunction with its announcement to cease all schedule operation and return its focus to the charter market.

AirTran at GPT—AirTran offered nonstop services in 2007 and 2008 from GPT to ATL, TPA, and FLL. The services were withdrawn at the beginning of 2009 following the expiration of an agreement with local casino operators. In January 2010, AirTran returned to GPT under a block space agreement with local casinos to provide service (three flights per week) to Atlanta and Tampa. The service was discontinued in March 2011, following the expiration of the agreement with the local casinos and the announcement of the acquisition of AirTran by Southwest Airlines.

Southwest Airlines at ECP—In May 2010, Panama City opened a new airport, at a capital cost of $330 million. The new airport (Northwest Florida Beaches International Airport or ECP) is the first entirely new commercial service airport in the United States designed and constructed in the last 11 years. The airport's inaugural flight was operated by Southwest Airlines, offering its first service to the Northern Gulf Coast region. The service from Southwest Airlines at ECP was secured by an agreement between Southwest Airlines and the St. Joe Company, a major landowner in Northwest Florida. The agreement provided a revenue guarantee to Southwest Airlines in exchange for a commitment to a minimum level of service. Other public and private entities in the Panama City area supplemented this commitment.[14] The agreement with Southwest Airlines resulted in the availability of new lower fares in the eastern Florida panhandle, as well as more nonstop options and service on mainline equipment.

At ECP, the Southwest Airlines' service initially provided nonstop service in four markets: BWI, BNA, HOU, and MCO. Subsequently, Southwest added seasonal nonstop service to STL (in 2011), and ceased service to MCO. The entry of Southwest Airlines, and the competitive response of Delta Air Lines, has resulted in ECP traffic growth of nearly 200% during the period 2009–2011.

Airline Choice Dynamics

Airline Consolidation Impacts on Air Service Quality

Small hub markets with easily accessible and nearby competitive airports are understood to have experienced significant impacts on service levels and passenger choice, in large part due to airline industry consolidation. In the past 10 years (2002 to 2012), the U.S. airline industry has experienced widespread mergers and failures. In the Northern Gulf Coast region these mergers have resulted in decreased inter-hub competition and a general decrease in air carrier capacity in the region.[15]

Prior to the Delta/Northwest merger, each airport in the region enjoyed service by Northwest Airlines to Memphis. As

[14] "Strategic Alliance Agreement For Air Service between Southwest Airlines Co. and St. Joe." St. Joe Company, United States Securities and Exchange Commission, 8-K filing, October 21, 2009. Agreement terminated July 2, 2012.

[15] See "Northern Gulf Coast On-Board Traffic and Capacity 2007 to 2011."

of July 2012, no airport in the region had service to Memphis. Delta's realignment of its overall domestic system, including its Memphis hub, caused the region to lose nonstop service to Memphis.

The United and Continental merger resulted in an increase in service from the combined airline. Continental Airlines used to offer nonstop service to Houston (IAH) from GPT, MOB, PNS,[16] and VPS. Prior to the merger, United only served the region with PNS service to Washington, D.C. (IAD). The United/Continental combination enabled the carrier to leverage its combined systems to offer a greater range of services to the Northern Gulf Coast market. At the time of this writing, United offers nonstop service at PNS to IAD, IAH, and seasonally to ORD. MOB service by United will be expanded to include nonstop service to ORD in April 2013. These expanded options for travelers in the region are expected to provide greater inter-hub competition and resulting expanded passenger choice.

LCC Services Involving Community Incentives

The mix of LCC services (i.e., scheduled or charter operations) at the region's airports has evolved during the period 2007 to 2012, as follows:

- AirTran Airways at GPT—2008, 2009, 2010;
- Vision Airlines at GPT—2012;
- AirTran Airways at PNS—from November 2001;
- Vision Airlines at VPS—2010, 2011; and
- Southwest Airlines at ECP—from May 2010.

A common aspect of community efforts to attract these services was a risk-mitigation (incentive) package offered by the airport operator and/or its regional partners. In each case, the carrier decided to institute service following agreement on the risk-mitigation package. Most notably, the offer of a risk-mitigation package was instrumental in convincing Southwest Airlines to initiate service for the first time at ECP, which was one of the first "small" stations (i.e., less than 10 departures per day) opened by the airline.

Case Study 5: Central Wisconsin

Smaller Airports with Similar Air Services Compete with Hub Airports on the Region's Periphery

Central Wisconsin is served with six airports in Green Bay, Appleton, Steven Point/Wausau, La Crosse, Eau Claire, and Rhinelander. Not far to the south, in the more heavily populated portion of the state, are the large metropolitan areas of Madison and Milwaukee, both of which have airports that are significantly larger than any other airports in the state. To the west, just across Wisconsin's border with Minnesota, is the Delta hub at Minneapolis-St. Paul.

As is often the case with small airports, there are relatively few nonstop service options available for travelers. Such flights are typically to network carrier hubs, where flights from spoke airports can connect to outbound flights across the network. The choice that passengers from small airports make then generally is simplified to choosing among different hubs over which they prefer to connect. The competing airports may all be served by the same carriers operating over the same hubs. Slightly larger airports may have service from additional carriers operating over different hubs. Another dimension in Wisconsin is the presence of a ULCC operating at one airport that is relatively centrally located, which draws passengers from throughout the region for leisure destinations in Florida and the Southwest.

To the extent that fares are comparable, passenger choice becomes focused on service differences and convenience, especially flight frequencies and times (which can depend on hub connections), ease of access to the airport, and aircraft type. In northern Central Wisconsin, however, passengers find that lower fares (and more flight options) are available at Milwaukee, and are often choosing to drive there to use that service.

Overview

Shown in Exhibit 6-36, this region encompasses several airports throughout central and northern Wisconsin. The area ranges approximately 200 miles east to west and roughly 250 miles north to south and includes several relatively small population centers.

Central Wisconsin includes several relatively small MSAs, many of which are contiguous. These include the Green Bay MSA (population 306,241), Appleton MSA (population 225,666), Oshkosh-Neenah MSA (population 167,100), Fond du Lac MSA (population 101,665), Wausau MSA (population 134,063), and Eau Claire MSA (population 161,151). The La Crosse MSA, on the western edge of the region, has a population of 133,896. The six-county region surrounding the airport at Rhinelander does not constitute an MSA; the population in that entire area is less than 130,000. The Fond du Lac MSA area lies between Appleton and Milwaukee.

On the southern edge of the region are the state's two largest urban areas, the regions surrounding Madison (including the Janesville area, population 792,258) and Milwaukee (including the Sheboygan and Racine areas, population 1,868,226). These are the dominant economic areas of the state. See Exhibits 6-37 and 6-38 for population/employment and income summaries.

[16] Gulfstream, now Silver Airways, displayed the CO and UA code on its PNS-TPA and MCO services.

Exhibit 6-36. Map of Central Wisconsin.

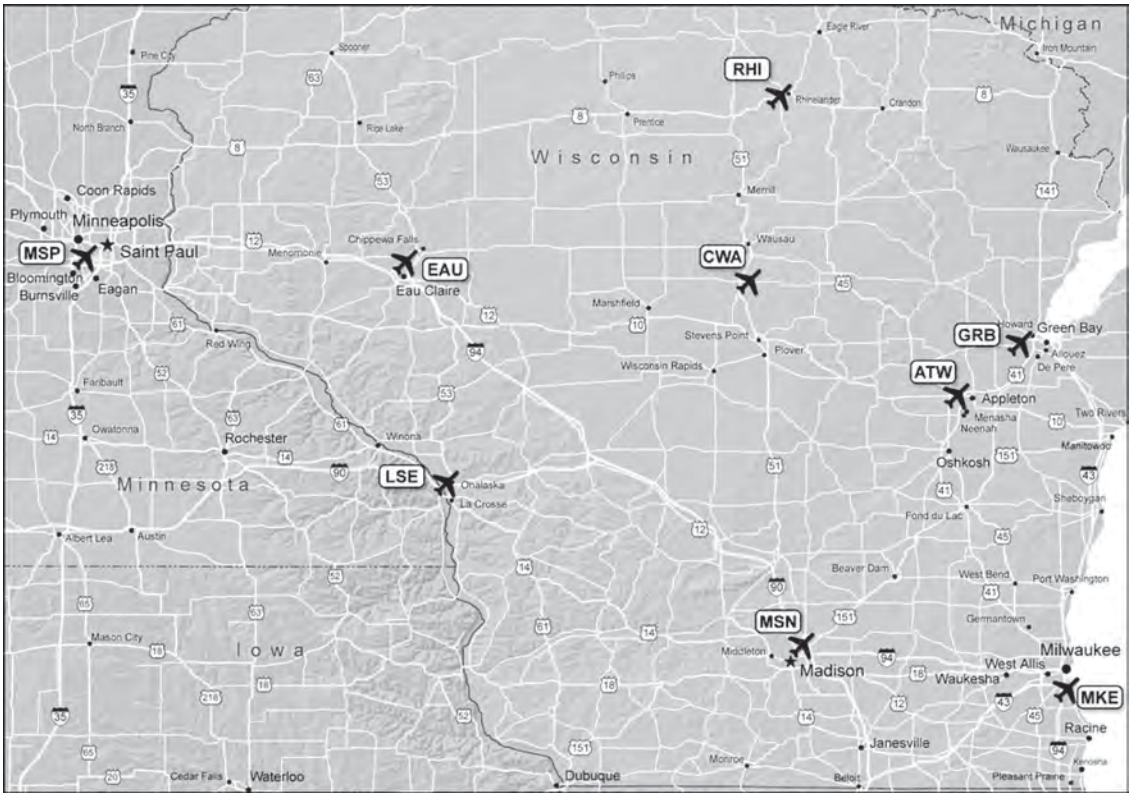


Exhibit 6-37. Summary of population and employment (Wisconsin).

MSA	Population (000)				Employment (000)			
			Change				Change	
	2000	2010	#	%	2000	2010	#	%
Appleton, WI	202.6	226.0	23.3	12%	131.9	146.3	14.3	11%
Eau Claire, WI	148.7	161.4	12.8	9%	99.6	103.2	3.6	4%
Fond Du Lac, WI	97.4	101.7	4.3	4%	60.7	57.1	(3.6)	-6%
Green Bay, WI	283.3	306.7	23.4	8%	195.7	202.4	6.6	3%
Madison, WI	503.7	569.9	66.2	13%	387.1	425.9	38.8	10%
Milwaukee-Waukesha-West Allis, WI	1,502.4	1,557.2	54.8	4%	1,002.4	966.3	(36.1)	-4%
Oshkosh-Neenah, WI	157.1	167.1	10.0	6%	106.1	107.9	1.8	2%
Sheboygan, WI	112.7	115.5	2.7	2%	75.8	73.8	(2.0)	-3%
Wausau, WI	126.0	134.1	8.1	6%	84.7	85.6	0.9	1%
Subtotal	**3,133.9**	**3,339.6**	**205.7**	**7%**	**2,144.1**	**2,168.4**	**24.3**	**1%**

Source: Woods & Poole.

Exhibit 6-38. Summary of key income statistics (Wisconsin).

MSA	Per Capita Personal Income (2005 constant dollars)				Mean Household Total Personal Income (2005 constant dollars)			
			Change				Change	
	2000	2010	#	%	2000	2010	#	%
Appleton, WI	32,945	33,932	987	3%	86,645	85,793	(852)	-1%
Eau Claire, WI	29,357	31,625	2,268	8%	73,480	76,840	3,360	5%
Fond Du Lac, WI	31,533	32,776	1,243	4%	80,054	79,534	(520)	-1%
Green Bay, WI	32,724	34,326	1,602	5%	82,796	84,537	1,741	2%
Madison, WI	37,380	40,517	3,137	8%	89,752	95,603	5,851	7%
Milwaukee-Waukesha-West Allis, WI	37,027	39,466	2,439	7%	92,786	97,022	4,236	5%
Oshkosh-Neenah, WI	31,817	34,105	2,288	7%	78,020	80,593	2,573	3%
Sheboygan, WI	32,666	34,700	2,034	6%	82,252	84,586	2,334	3%
Wausau, WI	30,960	32,797	1,837	6%	80,699	81,863	1,164	1%
Average	**32,934**	**34,916**	**1,982**	**6%**	**82,943**	**85,152**	**2,210**	**3%**

Source: Woods & Poole.

Exhibit 6-39. Air service summary (Central Wisconsin).

Airport	2011 Enplanements	Carriers	Avg. Daily Departures	Non-stop Destinations	Destinations
Green Bay	352,157	AA, DL, UA	18.7	4	CLE, DTW, MSP, ORD
Appleton	222,795	DL, G4, UA	14.6	6	ATL, AZA, DTW, LAS, MSP, ORD
Central Wisconsin	135,965	AA, DL, UA	9.4	3	DTW, MSP, ORD
La Crosse	102,958	AA, DL	8.1	3	DTW, MSP, ORD
Rhinelander	26,764	F9	1.6	1	MKE
Eau Claire	19,097	UA	2	1	ORD
Milwaukee	4,671,976	AA, AC, DL, FL, F9, UA, US, WN	120.2	34	See note below

Note: Enplanements are from CY 2011. Airlines, average daily departures and nonstop destinations are from September 2012. United has announced that it will discontinue its CLE-GRB service.

Summary of Airports in the Region

Six commercial airports are included in this region as shown in Exhibit 6-39. In descending order of passenger volume, these are as follows:

- Austin Straubel International Airport (GRB) at Green Bay receives service from American, Delta, and United. Beginning in October 2012, it started to receive service from a new tour operator to Orlando. Frontier formerly served GRB, but discontinued service in November 2011.
- Appleton—Outagamie County Regional Airport (ATW) has service from Delta Air Lines (MSP, ATL, and DTW) and United (ORD). ATW is the only airport in the region with service from an LCC; it is the "regional home" of Allegiant Airlines.
- Central Wisconsin Airport (CWA) is a regional airport located roughly equidistant between Stevens Point and Wausau. It is currently served by three airlines: Delta, United, and American.
- The La Crosse Municipal Airport (LSE) offers nonstop airline service by American Airlines and Delta Air Lines.
- Rhinelander/Oneida County Airport (RHI) has EAS-subsidized service to Milwaukee, which is currently provided by Frontier. The airport serves the northeastern section of the state.
- Chippewa Valley Regional Airport (EAU), located outside of Eau Claire, has two EAS-subsidized daily nonstops on United Express to Chicago O'Hare.

Travelers in the region also have service options available at the much larger airports at Madison and Milwaukee. Those in the western half of the state also have service available at Minneapolis-St. Paul International Airport.

- Madison and south-central Wisconsin is served by Dane County Regional Airport (MSN). In September 2012, MSN had nonstop service from four airlines—American, Delta, Frontier, and United—to 12 different airports.
- Milwaukee General Mitchell International Airport (MKE), the largest airport in the state, has service from eight airlines, including all of the major legacy network airlines, Frontier (which operates a hub at the airport), Southwest, and Air Canada. As of September 11, 2012, MKE had nonstop service to 34 airports.
- Minneapolis-St. Paul International Airport (MSP). One of Delta's largest hubs, MSP served 33 million passengers and accommodated 436,506 landings and takeoffs in 2011. MSP is the 12th busiest airfield in the United States. In July 2012, airlines at MSP operated scheduled nonstop services to 138 U.S. cities, 8 Canadian cities, and 3 European cities.

Geographic and/or Surface Access Issues

All of the metropolitan areas are connected by a network of U.S. and state highways. Traffic congestion is not a consideration, given the rural nature of the region. Three of the region's airports are very close to one another. Green Bay and Appleton are within 30 minutes of each other, and CWA is roughly 90 minutes from both GRB and ATW. Each of these airports is conveniently located adjacent to major highways. Distance and drive time are shown in Exhibit 6-40.

For passengers going to or from the Eau Claire area, CWA and LSE are within relatively short drives, as is MSP. Each is less than 2 hours' drive. Passengers in the Eau Claire area tend to leak to MSP rather than other Wisconsin airports. Rhinelander is more geographically isolated. Despite that, it is understood that passengers from that area leak to the airport in Milwaukee and to other airports in the region.

Fare Competition among Airports in the Region

Between Appleton and Green Bay, where passengers generally have more flight options compared with the other smaller north-central airports, average airfares have tended

Exhibit 6-40. Distance and driving time between airports (Central Wisconsin).

	ATW		CWA		EAU		GRB		LSE		RHI		MKE	
City	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)	Miles	Drive Time (Hr: Min)
Appleton, WI	5	0:08	90	1:35	196	3:23	29	0:36	170	2:23	158	2:46	114	2:01
Mosinee, WI	89	1:33	2	0:04	99	1:50	100	1:43	156	2:49	71	1:15	182	3:11
Eau Claire, WI	199	3:21	112	1:53	5	0:11	193	3:15	86	1:50	155	2:39	252	4:13
Green Bay, WI	35	0:41	100	1:44	189	3:16	8	0:15	201	3:55	152	2:38	127	2:13
La Crosse, WI	171	3:22	156	2:48	90	1:53	199	3:51	7	0:15	224	3:58	216	3:29
Rhinelander, WI	159	2:45	72	1:17	153	2:40	153	2:39	226	4:02	4	0:08	252	4:23
Milwaukee, WI	107	1:52	175	3:02	250	4:10	118	2:01	209	3:31	243	4:12	9	0:16

to be generally competitive. Fare differentials in many markets were often around $10. Average fares to Las Vegas from ATW were certainly influenced by Allegiant's presence in the market. Average fares available at ATW and GRB are generally less than those at both CWA and LSE.

However, passengers also may consider travelling via Milwaukee or Madison, both of which generally offer more flight options at lower average fares. In each of the 10 markets examined, average fares from Milwaukee were less expensive than those at both Appleton and Green Bay. In 7 of the 10 markets, average fares were less than those at both ATW and GRB. For example, the average fare from ATW to DEN is $63 greater than that at MKE, and $86 greater to ATL. Similarly, compared to the average fare to Phoenix from CWA, the average fare offered from MKE was $65 cheaper.

Exhibit 6-41 summarizes the average fares in the top passenger markets for the smaller airports in northern and central Wisconsin and compares them to the average fares from Milwaukee. The column labeled "% difference" shows the difference in average airfares between MKE and the highest fare available at other Wisconsin airports.

As a result of these fare differentials and the LCC options available at MKE, it is widely recognized that each of the airports tend to leak passengers to Milwaukee. This includes leisure and business travelers. Because of their price sensitivity, leisure passengers—particularly if they are traveling as a family to a destination in Florida or the Southwest—are willing to drive several hours to reduce their travel cost. Business passengers are not indifferent to airfares, and may drive to MKE, especially if they are able to use a nonstop at a lower fare than is otherwise available at one of the smaller airports in the region.

For leisure passengers traveling to leisure destinations, ATW's nonstop service from Allegiant to Phoenix or Florida offers a clear alternative to the other airports' connecting options via network airlines. ATW draws leisure passengers from throughout the northern parts of the state, and as far away as the Upper Peninsula of Michigan, for this service.

Exhibit 6-41. Average fares in top markets compared to fares available at MSN or MKE.

	Origin Airport					
Destination	ATW	GRB	CWA	LSE	MKE	% Difference
LAS	$141	$185	$205	$220	$140	-36%
DEN	$180	$164	-	$187	$117	-37%
ATL	$217	$226	-	$255	$131	-49%
DFW	$203	$191	$217	$227	$150	-34%
PHX	$181	$177	$201	$208	$136	-35%
MCO	$159	$169	$192	$211	$129	-39%
LAX	$227	$220	-	$272	$159	-42%
ORD	$99	$121	$171	$107	$66	-61%
DTW	$257	$230	-	-	$166	-36%
LGA	$179	$174	-	-	$110	-38%

Note: Average fare data were not available at EAU or RHI because of data limitations—each had less than 5 Passengers Daily Each Way (PDEW) in each market. Similarly, average fares are not shown from CWA for markets with less than 5 PDEW.

Passenger Choice Dynamics

Similar Levels of Air Service at Each of the Airports in the Region

The airports in Central Wisconsin are similar in terms of the limited number of nonstop destinations served, but differ somewhat in terms of the number and capacity of daily flights. Only ATW offers flights to ATL, which draws passengers from throughout the region for the convenience of nonstop service and the extensive connections available at ATL to destinations not available via DTW or MSP. Otherwise, passengers flying out of Central Wisconsin can choose among three options for connections to their destinations. For example, passengers flying to Portland, Oregon, can choose to connect at Chicago O'Hare on American or United or to connect at Detroit or Minneapolis on Delta. This decision may be based on convenience to the nearest airport, frequent flyer affiliations, or flight frequencies.

Exhibit 6-42 shows that Green Bay offers the greatest number of daily flight frequencies, and passengers may opt for the flexibility offered there. DL uses larger regional jets in its operations to GRB and ATW compared to other airports in the region, so passengers with a strong preference for business-class seating may use one of those two airports.

The two airports in the region that are served by EAS-subsidized flights—Eau Claire and Rhinelander—face particular challenges in attracting and retaining passengers. They are served by only one carrier to one destination: EAU has service on United Express to ORD, and RHI has service on Frontier to MKE.

Limited Fare Options and Hub-Access Opportunities

The biggest challenge at these airports involves relatively high fares and limited connecting opportunities. Both EAU and RHI urge local passengers to check the service and fare options available at the local airport before assuming that the best travel option requires a long drive to another airport. However, both airports also have confronted issues with passengers' affinity for a particular airline's frequent flyer program. EAU's service had formerly been provided by Mesaba to MSP. After Mesaba discontinued that service, the Department of Transportation awarded it to United Express. It is understood that some travelers who had frequent flyer benefits from Northwest/Delta are now driving to MSP for service on DL rather than switching to United's program. At RHI, EAS service transitions to Delta in January 2013. Local expectations are that enplanements will increase after the transition because passengers will have better connecting opportunities and frequent flyer program affiliations.

Airports Compete for Traffic by Offering Amenities

The smaller airports compete with one another by providing various amenities to passengers. LSE, for example, advertises its "close, convenient and low-priced parking, modern and comfortable terminal facilities, hassle-free security lines, and—most importantly—friendly people." GRB launched a "FlyGRB" marketing initiative in 2012 aimed at local business and leisure passengers. ATW offers a loyalty award program that allows travelers to earn points redeemable for free parking and prizes. For all passengers, ATW provides free Wi-Fi, and touts its "shorter security lines and comfortable surroundings." CWA says that passengers " . . . won't have to drive for hours, put up with big-city traffic, deal with congested drop-off areas, pay outrageous parking fees and taxi fares, or wait in long lines at airline check-in counters and security points" and it markets "Fly CWA First." Each airport tries to remind its travelers that the local airport is close to home—something that matters after a long trip.

Air Service Reliability Concerns

In general, local concerns about losing passengers because of unreliable service are not evident. However, the flight times are often frustrating to business travelers. Often, the

Exhibit 6-42. Average daily flights and available seats from Wisconsin airports to key hubs.

	Daily Schedule of Flights and Seats							
	ATL		DTW		MSP		ORD	
Airport	Flights	Seats	Flights	Seats	Flights	Seats	Flights	Seats
Green Bay	-	-	5	302	4	288	8	389
Appleton	2	128	3	185	3	173	5	268
Central Wisconsin	-	-	2	97	3	140	5	226
La Crosse	-	-	1	42	3	142	4	194
Eau Claire	-	-	-	-	-	-	2	100
Rhinelander	-	-	-	-	-	-	-	-
Milwaukee	11	1,462	5	477	9	1,228	12	575

Notes: Average daily flights rounded to nearest whole number. Rhinelander only has flights to MKE.

first flights out and last flights back are ill-timed for same-day, round-trip travel. Concerns also are expressed about schedule completion with the last flight back to the airport, which, if a sufficiently regular occurrence, results in business travelers avoiding the local airport and driving to the hub to ensure that they would not be marooned at the hub on their return trip.

Airline Choice Dynamics

Spoke-to-Hub Services at Smaller Airports Fit the Legacy Carrier Business Models

Each of the smaller airports in Wisconsin is a spoke to one or more hubs in airline networks. Except for the two EAS airports (EAU and RHI), which are only served by one carrier, the airports have service from at least two network carriers. Delta is the dominant carrier at ATW, CWA, GRB, and LSE. Both Delta and United serve all of the airports to their hubs in Chicago, Detroit, and Minneapolis. ATW is the one smaller airport with service to Atlanta. American operates to Chicago from CWA, GRB, and LSE. Among the legacy network airlines, only US Airways does not offer service at any of the smaller airports in the region (except via codeshare with United).

Milwaukee is fundamentally different from the other airports in the region. MKE had previously served as a hub for Midwest Express, which was taken over by Republic (Frontier) in 2010. In early 2004, Midwest Express operated to 45 destinations. By the fall of 2010, the number of destinations served by Frontier at MKE had fallen to 33. In 2011, the parent company of Frontier, Republic Airways Holdings, announced that it was eliminating the hub service at MKE, and has since dropped the number of nonstop destinations served to four.

Historically, MKE also had considerable service from other LCCs. AirTran's operations grew from 5 destinations in 2004 to 23 in mid 2011. And as Frontier's operations have declined, Southwest's presence at MKE has grown. Southwest launched service at MKE in early 2010 with service to 6 locations, and has expanded at the end of 2012 to a total of 15.

ULCC Can Serve the Region from One Airport

Outside of MKE, there is limited service from LCCs in the region. Allegiant effectively serves the entire region through its operations at Appleton. Appleton's relatively central location within the more heavily populated area in the eastern central region of the state enables Allegiant extensive market access in the region. Allegiant provides year-round service to Las Vegas and seasonal service to Florida. It added service to Phoenix-Mesa in early 2012.

CHAPTER 7

Findings and Conclusions

The U.S. airline industry has undergone major changes in recent years, in response to events and trends impacting both the revenue and the expense environments. Since 2001, these changes have sometimes been dramatic and sometimes subtle. A review of the most significant changes is instructive:

- The events of September 11, 2001, caused an instantaneous drop in the demand for air transport, as the shock of those events affected the industry and its users, and the general public and policymakers.
- The subsequent imposition of extensive passenger security screening processes at airports detrimentally affected air travel demand by increasing total trip time and passenger inconvenience and stress.
- U.S. border crossings have become more tightly controlled, increasing total trip time on international arrival and preclearance.
- Rising and fluctuating oil prices have translated into historically high and unpredictable airline expenses for airlines, causing higher fares in some markets, and service reductions in price-sensitive markets and on long-haul domestic routes.
- The rise of fuel prices has detrimentally impacted the economics of regional jet aircraft, especially older and smaller models (i.e., 50 seats or less) that are less efficient to operate and lack the capacity to spread operating costs over more revenue passengers.
- The combination of these impacts has resulted in numerous bankruptcies, acquisitions, mergers, downsizings, and other actions by airline management as they have tried to weather the storm.
- The financial crisis of 2008, and the ensuing Great Recession, further depressed the demand for air travel, resulting in additional consolidation of the industry.
- Airlines have focused on remaining disciplined in their efforts to balance capacity with demand on a market-by-market basis to achieve the goals of greater efficiency, high load factors, pricing power, and a return to profitability.
- New airline entry in the United States during this period has been minimal, and typically unsuccessful, as capital sources avoided the risky airline environment and incumbent carriers employed strong competitive responses to protect their services as needed.
- Several ULCCs and travel companies have been able to successfully implement business models that thrive on point-to-point leisure traffic, offering leisure travelers limited alternatives to higher priced services by legacy carriers.
- As the U.S. economy has gradually recovered and demand for air travel improved, airlines have continued to cautiously restrain seat capacity to preserve the newly found discipline that offered pricing power and profitability.

These events and trends have impacted each airline's perspective on and approach to implementing its business plan and deploying air services. Airlines continue their cautious approach regarding the addition of capacity on existing routes or start-up of new services. Decisions on capacity expansion are now made with ever greater analytic and strategic consideration.

Regions with multiple airport options pose additional choices to both airline decisionmakers and air travelers. The research undertaken and the case studies performed through this study reveal the nature of these choice factors, some of which are of widespread applicability and others of which are unique to each situation. In summary, the research and case studies yield the following key findings.

Airline Choice in Multi-Airport Regions

Airlines Prefer to Concentrate Services at as Few Airports in a Market as Possible

The concentration of airline services at the fewest number of airports is favored by airlines. The benefits of service concentration at a particular airport, especially to achieve

efficiencies, economies of scale, and competitive responses to significant new entrant threats, are central to the achievement of legacy and network airline business models. See Case Study 2: San Francisco Bay case study

Vigorous Competitive Response is Likely if Incumbent Airline Feels Threatened

The entry of a new competitive airline at the dominant airport in a region is likely to precipitate competitive responses by the dominant airline at that airport, as well by other airlines that are significant players in a region. The competitive response may include the shifting of services from alternative airports in a region to the dominant airport. See Case Study 2: San Francisco Bay.

Niche Services at Alternative Airports Need Business Model Compatibility and Good Surface Access

The diversification of airline services at alternative airports in a region is motivated by two primary drivers: the suitability of the alternative airport for niche services to be offered by the niche carrier, and ease of surface access to the alternative airport. The presence of traffic congestion and other access constraints regarding the major airports in a region can further encourage niche carrier services at alternative airports. See Case Study 2: San Francisco Bay.

Niche and Ultra-Low-Cost Carriers Tend to Be More Opportunistic in Airport Choice

Niche and ULCCs are more likely to establish a single (or limited number of) regional gateway(s) to serve their targeted market segments. Their limited resources and focus on point-to-point traffic flows result in the choice of serving an entire region through one gateway. See Case Study 1: Los Angeles Basin and Case Study 2: San Francisco Bay.

Large Carriers Have the Resources to Serve More Than One Airport in a Region if Needed

Legacy carriers, as well as some larger LCCs, have the capability to operate services at more than one airport in a large metropolitan region, as demand, economics, and competitive factors dictate. Such multiple service points in a region can occur even when the airports are less than 50 miles apart. However, carriers will reduce or eliminate service at one or more of the regional facilities if economic performance deteriorates, consistent with their overall preference for as few airports as possible. See Case Study 1: Los Angeles Basin.

Small Airports Will Generally Face a More Challenging Network Environment in the Near Future

Services at small airports are generally comparable in quality and pricing, and typically involve limited service options to a few hubs. As carriers consolidate services and remain risk averse, passengers at small airports are likely to have few competitive choices, and more travelers will be inclined to consider driving to larger facilities, if available, that offer lower fares and more service alternatives. See Case Study 5: Central Wisconsin.

Passenger Choice in Multi-Airport Regions

Airfare Parity Can Balance out Other Differences among Airports

Substantial airfare parity among the airports in a region removes a key differentiator in passenger choice. Whatever the reasons for such parity, passengers are more inclined to use air services at airports that are more remote or less convenient if the services being provided there are of comparable price. Lack of fare differentiation between proximate airports tends to negate other competitive choice factors. Airfare parity (or advantage) at the dominant airport in a region reinforces that airport's dominance. See Case Study 2: San Francisco Bay, Case Study 4: Northern Gulf Coast, and Case Study 5: Central Wisconsin.

Convenient Nearby Hub Airport Will Prompt Traffic Leakage from Areas Served by Smaller Airports

The varied service options available at nearby hub airports will exert strong influence on passenger choice in a region. Depending on a traveler's true point of origin or destination, the mileage and time needed to drive to a hub airport may not offset the resulting flight convenience. However, if both service level and fare at the hub airport for the desired city-pair travel are better than at the smaller airport, the influence on leakage will be even stronger. This is particularly true for leisure passengers, who discount the value of time more so than do business travelers. See Case Study 5: Central Wisconsin.

Long and Difficult Drive to a Major Airport Invites Choice of Inferior Service at Nearby Smaller Airports

Surface congestion and lengthy drive times to a major airport can result in passengers choosing inferior airline service offerings (i.e., connecting vs. nonstop service), rather than enduring the drive to the dominant airport. If one airport in the region offers substantially more service than any other airport in the region, passengers will have to choose between

the difficult drive from the region's peripheral areas to the major airport or the inferior air travel itinerary and price at a more convenient airport. See Case Study 1: Los Angeles Basin and Case Study 2: San Francisco Bay.

City-Pair Service Advantages Can Overcome Drive Time Concerns

An airport's air service product advantage can become significant enough to overtake surface access congestion as a primary decision factor. Passengers will justify dealing with excessive surface access drive times to an airport if it offers significantly better service options, especially if the city-pair service is nonstop and uses preferred aircraft. See Case Study 1: Los Angeles Basin.

Balanced Services at Multiple Airports Can Create a Competitive Environment

Diversity of services at the airports in a region can offer air travelers various air service options. The location of the traveler's origination/destination point in the region is a major consideration regarding the traveler's preferred airport, all other service and price considerations being equal. Overlapping catchment areas across a region also facilitate passenger choice, with more than one airport being convenient to most airline customers. If the airports in the region are well situated to offer a balanced and convenient supply of air service to residents throughout the region, the airports and their services can better compete for traffic from most areas of the region. See Case Study 2: San Francisco Bay and Case Study 4: Northern Gulf Coast.

Small Airports Can Retain Less Price-Sensitive Local Travelers through Convenience

Small airports tend to capture a relatively large percentage of business travelers who either originate in, or are destined for, the immediate area. These travelers are willing to trade off, in varying degrees, higher fares in exchange for convenience. Price-sensitive leisure travelers, on the other hand, are less willing to make such a tradeoff, and opt to drive to the airport served by the lowest fare service. Smaller airports attempt to offset the difference in fares, nonstop destinations, and frequencies by touting the convenience of the airport, better customer experience, and the community's loyalty. See Case Study 3: Western Carolina and Case Study 4: Northern Gulf Coast.

Airline Service Reliability Concerns Prompt Travelers to Airports with More Flight Frequency

Perceptions of service unreliability (i.e., flight cancellations, delays, missed connections) contribute to leakage problems at small airports. Some travelers believe that the time and expense of driving to a better-served airport is offset by the expectation of greater flight reliability and the availability of a larger number of nonstop flight options. Because large airports typically provide multiple daily nonstops to a broad array of markets, passengers believe that they are more likely to complete their trip to their destination. At small airports, even if a carrier offers multiple trips to its hub, the longer time between flights (with less connectivity) and high load factors (with the risk of not being accommodated after an earlier flight cancellation) raise concerns among travelers. See Case Study 3: Western Carolina.

Conclusions

The research, case studies, analyses, and reviews of airline and air travel trends performed in this study lead to a series of interrelated conclusions about passenger and airline choice in multi-airport regions. They also raise fundamental issues for those who seek to improve air service to U.S. communities, especially in small communities or small airports in multi-airport regions. Some conclusions are applicable to most, if not all, multi-airport regions, while others are only relevant to regions with similar characteristics. In their totality, they present a changed landscape for communities, airports, airlines, and air travelers, and the need for alternative air service strategies.

- **Airline Industry Maturation**—The U.S. airline industry has experienced 40 years of evolution since regulatory reform and subsequent deregulation. In that time, the industry has matured to a point where multiple, varied, and specialized airline business models, each designed to serve different segments of the air travel market, are in place. Airlines are successfully calibrating capacity and pricing to serve demand at levels that conform to their business model, and thereby achieving profitability and sustainability. Although there are several airlines whose business models seek to stimulate demand in existing markets and tap new markets, these airlines are, at least for now, peripheral to the major traffic flows of the major airlines, and not a significant threat to their profitability.
- **Air Travel Market Maturation**—Air travel demand levels have soared since deregulation, and especially since the expansion of low-cost-carrier services during the past 20 years. Markets have been stimulated through new service and competition during that period, but there have been widespread setbacks in many markets as a result of the above-noted maturation of the industry. Although some leisure markets will continue to benefit from service expansion by airlines that focus on that segment, overall it can be expected that domestic air travel in the United States will grow in

tandem with the growth in gross domestic product (GDP), as manifested in demographic and economic growth in various regions.

- **Airline Risk Aversion—**The careful balance that airlines have achieved among capacity, demand, and sustainable pricing, combined with the traumatic experiences they experienced during the past decade or so, has created a high level of aversion to risk. As a result, expansion of air services in city-pair markets or regions must now meet very high suitability to an airline's expansion strategy and competitive requirements. Decisions about service expansion are more complex and difficult when made in the context of a multi-airport region, with intricate competitive considerations and multi-faceted risks involved for each choice option. Airline expectations regarding risk-mitigation packages from airports and communities remain high, even in markets with clearly demonstrated air service deficiency and upside potential.
- **Airline Pricing Power—**Airline industry maturation, risk aversion, and consolidation place airlines in a position of improved pricing power in most markets. Capacity constraint by incumbent airlines, and minimal threat of new entrant airlines, provide further pricing freedom, limited only to the extent that competitors decide to price more aggressively. Although this environment creates the potential for price discounting to increase market share and stimulate traffic, only niche or leisure-focused services are pursuing such strategies, and typically without significant impact on major carrier interests.
- **Fewer Airline Hubs—**Airline industry maturation and consolidation has resulted in the downsizing or dismantling of numerous hub locations. Whether the result of merger/integration or self-imposed downsizing, fewer hubs have resulted in the need for less aircraft and less overall capacity in the network. Flying by regional partners also will be affected as hub reductions translate into less need for regional feeder services, and high fuel prices continue to challenge the operating economic of small regional jets. This trend contributes to the overall effort to calibrate capacity and traffic in the context of each airline's business model. Some point-to-point services have sprung up in markets large enough to support them, but not to the extent that it has affected hub consolidation.
- **Fewer Hub Service Options—**Fewer hubs and reductions in regional equipment result in fewer hub service options, especially for small communities and for small airports in multi-airport regions. Duplicative services from several airports in a multi-airport region to an airline's hub(s) can degrade the profitability of such services. Efficiency requirements tend to minimize the number of airports in a region that will receive service to a hub, and the flight frequency and seat capacity that will be provided. Service from an airport to multiple hubs also will be a challenge, given the replication of services and excess capacity that can result.
- **Drive to Alternative Airport—**Static or reduced service levels at small airports in a region will fuel greater traffic leakage to an alternative airport. This is especially the case if the levels of service are significantly higher at the alternative airport, and if the drive time and ground access are reasonable. Consolidation of services at hubs and other large airports will continue, and may exacerbate, the negative impacts on air service at affected communities. Multi-airport regions, with numerous airports within a reasonable drive time of each other, have additional complexity and challenges for small airports.
- **Fewer Passenger Options—**Passenger choice options are increasingly circumscribed by airline decisions regarding where and how to serve markets with multiple airports. The conclusions noted above, in the aggregate, are generally resulting in fewer passenger options. However, each region is unique, and is affected differently by the choices that each airline makes in that context. With price as the key driver of choice, passengers will use the service that takes them to their destination at the lowest cost. Service quality, with its many aspects (i.e., schedule, itinerary, aircraft, reliability, etc.), is no doubt a factor in passenger choice, but will vary with each discreet choice and in each circumstance.

Each of these conclusions regarding passenger and airline choices is applicable to multi-airport regions, but in different degrees and in different ways for each region. The study clearly revealed the diversity of each multi-airport region, and that the choices available to passengers and airlines will differ in each case.

At this point in the evolution of the U.S. airline industry and the air service that it provides, one broad conclusion is evident. More than ever, airline choices precede passenger choices. While this sequence is logical and natural (the service must be available before it can be purchased and used), supply is now the predominant driver of airline business planning in the U.S. air travel market. The discipline being exercised by airlines with respect to their business models and business strategies has created an environment in which supply (and the associated cost and risk of providing it) is the primary driver (in both a positive and a negative sense) of airline decisions on air service. Highly selective, severely restrained, and very risk-averse approaches to providing air service, while appropriately instrumental to achieving airline profitability and sustainability, are resulting in deficient air service in many communities that generate (or are capable of generating) more demand for air services than airlines are willing to provide.

This new air service era presents formidable challenges for many communities and their airports, and suggests the need for new and revised air service development strategies. This is particularly the case in multi-airport regions, where airlines may not be inclined to serve multiple airports or all airports in the region, and the resulting inter-airport competition is vigorous.

The following are among the most prominent challenges that need to be addressed:

- Greater recognition and understanding of the business model that is driving each airline's choices, and how a region, community, and airport fit (or do not fit) into those choices.
- Greater attention to performing the detailed analysis and service-specific evaluation that can support a detailed business case to a particular airline about a specific city-pair air service opportunity.
- Greater and better-defined involvement of community interests in the support of air service development, with the airport operator in the lead. The ability to present a substantial and targeted risk-mitigation program to an airline for a specific service opportunity can bring that airline to overcome its inherent tendency toward extreme caution.
- Higher priority by small airports on public information efforts in the local market to ensure that local residents and businesses understand the services available at the local airport. Such public information efforts also should address the benefits of using the local airport (i.e., time savings, total trip cost savings, convenience, ease of parking, etc.) as compared to using larger airports that require a long drive.
- Support for the introduction of new entrant airline services as a means to developing services in underserved markets and improving the competitive environment in a region or at an airport. Care must be taken that the business model of the new entrant will ultimately be viable and sustainable, that any support provided is non-discriminatory, and that the air service that is provided is used by the flying public.
- Provision of the most efficient airport operation possible, consistent with the requirements of public interest and services. Lower airport costs to airlines can help meet airline objectives, and at the same time counter, in part, airline tendencies toward consolidation of services. As air carrier business models evolve, the one constant that can be anticipated is the continuing objective of the lowest possible cost of operation by the airlines, including airport cost.
- Institution of educational outreach programs for stakeholders on trends in the domestic air travel market and the impact of these trends on airline and passenger choice.

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APPENDIX A

Glossary of Terms, Abbreviations, and Acronyms

(Items in bold are airport codes)

ACMI	Aircraft, crew, maintenance, and insurance
Affinity Program	Airline program designed to increase customer brand loyalty
AS	Airlines
ASM	Available seat miles
ATL	**Hartsfield-Jackson Atlanta International Airport, Atlanta, GA**
ATW	**Outagamie County Regional Airport, Appleton, WI**
Average Fare	Average fare paid, taking into account all sold city-pair itineraries (nonstop and connecting itineraries)
AVL	**Asheville Regional Airport, Asheville, NC**
BART	Bay Area Rapid Transit
BUR	**Bob Hope Airport, Burbank, CA**
BWI	**Baltimore-Washington International Airport, Hanover, MD**
CAE	**Columbia Metropolitan Airport, Columbia, SC**
Capacity	Aircraft seats offered for sale
CASM	Cost per available seat mile
Catchment Area	Geographic area from which passengers are drawn to the air services at an airport
City-Pair	Cities that are the origination and termination of an itinerary
CLT	**Charlotte Douglas International Airport, Charlotte, NC**
CNL	Cross-nested logit
Codeshare	Arrangement for sale of seat on a carrier operating the service by a carrier that is not operating the service (often through alliance arrangement)
CSA	Combined statistical area
CWA	**Central Wisconsin Airport, Mosinee, WI**
DEA	Data envelopment analysis
DEN	**Denver International Airport, Denver, CO**
DFW	**Dallas/Fort Worth International Airport, Dallas/Ft Worth, TX**
DTW	**Detroit Metro Airport, Detroit, MI - Metro/Wayne County**
EAS	Essential Air Service (U.S. government subsidized air service program for small communities)
EAU	**Chippewa Valley Regional Airport, Eau Claire, WI**
ECP	**Northwest Florida Beaches International Airport, Panama City Beach, FL**
ERSA	European Regional Science Association
ETI	Evaluation And Training Institute
FLL	**Fort Lauderdale-Hollywood International Airport, Fort Lauderdale, FL**
GDP	Gross domestic product
GDS	Global Distribution System (Internet-based means of marketing and selling air travel tickets)
GIS	Geographic information system
GPT	**Gulfport-Biloxi International Airport, Gulfport, MS**

GRB	**Austin Straubel International Airport, Green Bay, WI**
Ground Handling	Servicing of aircraft and processing of passengers at an airport (by an airline, the airport, or a handling agent)
GSO	**Piedmont-Triad International Airport, Greensboro, NC**
GSP	**Greenville-Spartanburg International Airport, Greenville, SC**
GTR	**Golden Triangle Regional Airport, Columbus, MS**
HKIA	**Hong Kong International Airport**
HOU	**William P. Hobby Airport, Houston, TX**
IAH	**George Bush Intercontinental Airport, Houston, TX**
Incumbent Airline	Airline already serving an airport
Itinerary	Routing of the trip (from origination to destination) either nonstop or with connection(s)
JFK	**John F. Kennedy International Airport, New York, NY**
LAX	**Los Angeles International Airport, Los Angeles, CA**
LCC	Low-cost carrier
LGB	**Long Beach Airport, Long Beach, CA**
LOS	Level of service
LSE	**La Crosse Municipal Airport, La Crosse, WI**
MAR	Multi-airport regions
MAS	Multiple-airport system
MCO	**Orlando International Airport, Orlando, FL**
MDT	**Harrisburg International Airport, Middletown, PA**
MDW	**Chicago Midway International Airport, Chicago, IL**
MEM	**Memphis International Airport, Memphis, TN**
MHT	**Manchester-Boston Regional Airport, Manchester, NH**
MIA	**Miami International Airport, Miami, FL**
MIDT	Marketing Information Data Transfer
MKE	**General Mitchell International Airport, Milwaukee, WI**
MMNL	Mixed multinomial logit
MNL	Multinomial logit
MOB	**Mobile Regional Airport, Mobile, AL**
MOD	**Modesto City-County Airport, Modesto, CA**
MSA	Metropolitan statistical area
MSN	**Dane County Regional Airport, Madison, WI**
MSP	**Minneapolis-St. Paul International Airport, Minneapolis, MN**
New Entrant	Airline newly serving an airport
Niche Carrier	Airline with business plan designed for specific air travel market segment
NL	Nested logit
Non-Signatory	Airline that is not a party to the Airport Use Agreement (contract between airline and the airport operator)
O&D	Origination and destination (passenger traffic in a city-pair market)
OAG	Official Airline Guide
OAK	**Oakland International Airport, Oakland, CA**
ONT	**Ontario International Airport, Ontario, CA**
ORD	**O'Hare International Airport, Chicago, IL**
PCMNL	Probabilistic choice set multinomial logit
PDEW	Passengers daily each way
PFN	**Panama City-Bay County International Airport, Panama City, FL**
PIE	**St. Petersburg-Clearwater International Airport, St Petersburg, FL**
PNS	**Pensacola International Airport, Pensacola, FL**
PSO	Public service obligation
PSP	**Palm Springs International Airport, Palm Springs, CA**
PVD	**Theodore Francis Green Memorial State Airport, Warwick, RI**
RASM	Revenue per available seat mile
RHI	**Rhinelander–Oneida County Airport, Rhinelander, WI**

RJ	Regional jet
RP	Revealed preference
SBA	**Santa Barbara Municipal Airport, Santa Barbara, CA**
SCASD	Small Community Air Service Development
SCASDP	Small Community Air Service Development Program
SCK	**Stockton Metropolitan Airport, Stockton, CA**
SFB	**Orlando Sanford International Airport, Sanford, FL**
SFO	**San Francisco International Airport, San Mateo County, CA**
Signatory	Airline that is a party to the Airport Use Agreement (contract between airline and the airport operator)
SJC	**San Jose International Airport, San Jose, CA**
SMF	**Sacramento International Airport, Sacramento County, CA**
SNA	**John Wayne Airport, Santa Ana, CA**
SP	Stated-preference
STK	**Crosson Field Municipal Airport, Sterling, CO**
STL	**Lambert–St. Louis International Airport, St. Louis County, MO**
STS	**Charles M. Schulz - Sonoma County Airport, Sonoma County, CA**
SWA	Southwest Airlines
Tour Operator	Travel company that organizes, markets, and sells air travel (typically leisure); sometimes also provides and operates the air service
TPA	**Tampa International Airport, Tampa, FL**
UA	United Airlines
ULCC	Ultra-low-cost carrier
US DOT	United States Department of Transportation
VPS	**Northwest Florida Regional Airport, Ft. Destin, FL**
WN	Southwest Airlines
Yield	Air travel passenger revenue per mile

APPENDIX B

Literature Review

The research team reviewed articles from journals and on search engines including the following:

- Academic and industry journals in airport (and transportation) planning, management, and economics and
- Search engines such as EBSCO HOST, Google Scholar, Academic Search Premier, and SciVerse ScienceDirect.

Key search words consisted of variations of the following word combinations: airport choice, airport selection, air passenger choice, air passenger behavior, airline choice of airport, airport choice factors, multi-airport regions, passenger airport choice, traveler choice of airport, air passenger preferences, airport choice in a multiple-airport region, and airport competition, among others.

The team's focus was on articles published after 2005, unless a previously published study was of particular importance. Articles on passenger choice factors were given precedence over airline choice articles due to the complexity of passenger choice factors in multi-airport regions. Unrelated to either airline or passenger choice factors, but also potentially of interest, were statistical models related to analysis of choice factors. Consequently, the team included articles that discuss the appropriateness of statistical models for analyzing airport choice factors. Studies with data collection from both international and U.S. locations were examined.

Consistent with expectations, the study team found that the passenger choice factors of airfare, flight frequencies, and access time are most often studied. Choice factors determined by passenger type or purpose of travel were also topics of interest to researchers. Concerning frequently studied locations, data are used from the San Francisco Bay area in multiple reports, with other studies using passenger data collected from international locations. This appendix provides a review of relevant literature identified by the study team.

Adler, N.; Berechman, J. (2001). Measuring airport quality from the airlines' viewpoint: An application of data envelopment analysis. *Journal of Transport Policy,* 8 (3), 171–181.

> **Abstract:** The main objective of this paper is to develop a model to determine the relative efficiency and quality of airports. This factor seems to have a strong effect on the airlines' choice of hubs. Previous studies of airport quality have used subjective passenger data whereas in this study, airport quality is defined from the airlines' viewpoint. Accordingly, the researchers solicited airlines' evaluations of several European and non-European airports by means of a detailed questionnaire. Statistical analysis of the median score has shown that these evaluations vary considerably, relative to quality factors and airports. The key method used in this study to determine the relative quality level of the airports is data envelopment analysis (DEA), which has been adapted through the use of principle component analysis. Of the set of West-European airports analyzed, Geneva, Milan, and Munich received uniformly high, relative efficiency scores. In contrast, Charles de Gaulle, Athens, and Manchester consistently appear low in the rankings.

Albers, S., et al. (2005). Strategic alliances between airlines and airports—Theoretical assessment and practical evidence. *Journal of Air Transport Management,* 11 (2), 49–58.

> **Abstract:** Strategic alliances are now widespread. This paper shifts the focus from alliances among airlines toward strategic alliances involving passenger airlines and airports. Following a conceptual path analyzing motives, potential benefits and problems, potential fields of cooperation are identified along with three basic classes of airline–airport alliances. Capacity-based, marketing-based, and security based cooperation models

are assessed with regard to benefits for the participating airline and airport partners. This expands the existing literature that has largely neglected the airline–airport relationship and its potential for developing their respective competitive strategies. The case of the alliance between Lufthansa and Munich airport serves as an illustration.

Alder, T., et al. (2005). Modeling service trade-offs in air itinerary choices. *Transportation Research Record 1915: Journal of the Transportation Research Board,* 20–26.

Abstract: The application of a mixed logit approach using stated-preference survey data to the development of itinerary choice models is described. The models include the effects on itinerary choices of airline, airport, aircraft type, fare, access time, flight time, scheduled arrival time, and on-time performance. The empirical results demonstrate the importance of explicitly accounting for traveler preference heterogeneities by using segmentation by trip purpose, interaction effects involving frequent flyer status, and random parameter specifications. Explicitly including preference heterogeneity by using the mixed logit specification results in significant statistical improvements and important coefficient differences as compared with using a standard fixed-parameter logit model. The calculated marginal rates of substitution show the relative importance that travelers assign to key service variations among itineraries. All service features that were included in the model had significant values to travelers, and the values were affected, as would be expected, by the traveler's frequent flyer status. Although current reservation and ticketing services provide information to prospective travelers on most of these itinerary features, most services do not report on-time performance, which, however, can be an important selection criterion for travelers.

Barrett, S. D. (2004). How do the demands for airport services differ between full-service carriers and low-cost carriers? *Journal of Air Transport Management,* 10 (1), 33–39.

Abstract: There has been a considerable increase in the share of air traffic within Europe that is carried by LCCs. This paper explores the nature of the demand function for the services of such carriers and contrasts it to that of the more traditional European airlines. It pays particular attention to the links that airlines have with airports and how that will need to change in the future with the growth of the LCCs.

Basso, L. J.; Zhang, A. (2008). On the relationship between airport pricing models. *Transportation Research Part B: Methodological,* 42 (9), 725–735.

Abstract: Airport pricing papers can be divided into two approaches. In the traditional approach the demand for airport services depends on airport charges and on congestion costs of both passengers and airlines; the airline market is not formally modeled. In the vertical-structure approach instead, airports provide an input for an airline oligopoly and it is the equilibrium of this downstream market that determines the airports' demand. The study proves, analytically, that the traditional approach to airport pricing is valid if air carriers have no market power, i.e., airlines are atomistic or they behave as price takers (perfect competition) and have constant marginal operational costs. When carriers have market power, this approach may result in a surplus measure that falls short of giving a true measure of social surplus. Furthermore, its use prescribes a traffic level that is, for given capacity, smaller than the socially optimal level. When carriers have market power and consequently both airports and airlines behave strategically, a vertical-structure approach appears a more reasonable approach to airport pricing issues.

Bazargan, M.; Vasigh, B. (2003). Size versus efficiency: A case study of U.S. commercial airports. *Journal of Air Transport Management,* 9 (3), 187–193.

Abstract: The paper presents a productivity analysis using data envelopment analysis (DEA) of 45 U.S. commercial airports selected from the top 15 large, medium, and small airports. Financial and operational data, such as aircraft movements, number of airport gates, the annual number of enplaned passengers and runway capacity, are used. Initially, a DEA is deployed to analyze the efficiency and performance measures of airports within each group by comparing and cross-referencing them with each other. The analysis is then extended to identify those airports that are not efficient and are thus dominated by other airports that are more efficient.

Blackstone, E., et al. (2006). Determinants of airport choice in a multi-airport region. *Atlantic Economic Journal,* 34 (3), 313–326.

Abstract: The Civil Aeronautics Board was dismantled on the premise that competition and the threat of entry would restrain airline prices. If consumers do not search for low fares, then the threat of entry will have

little impact. The entry of a low-fare carrier will reallocate flyers within but not between airports. Telephone survey data were used to estimate probit models for the use of BWI, Newark International, JFK International, and Philadelphia International Airports to evaluate the effect of low fares on consumer behavior. In airport usage, age and gender do not matter. Although survey participants reported that airfare is an important consideration, actual searching for a low fare was unimportant. The availability of nonstop flights, wait at check-in, income, and distance from home were important.

Carlsson, F.; Lofgren, A. (2006). Airline choice, switching costs and frequent flyer programmes. *Applied Economics,* 38 (8), 1469–1475.

Abstract: Switching costs are costs that customers face when switching from one firm to another. In markets such as the airline market where repeated purchases are common, switching costs may be substantial. In this paper, the switching costs are estimated for domestic airline routes in Sweden between 1992 and 2002. In addition, the determinants of these switching costs are tested for, in particular, to what extent factors such as frequent flyer programs and flag carriers have an effect on switching costs. A substantial switching cost is found. Although a large part of this calculated switching cost can be attributed to perceived quality differences, it is also found that frequent flyer programs contribute a non-negligible part of the switching cost. The paper ends with a brief discussion on the welfare consequences of switching costs, where the connection between habit formation and switching costs is discussed.

Ciliberto, F.; Williams, J. W. (2009). Limited access to airport facilities and market power in the airline industry. *Journal of Law and Economics.* Available at SSRN: http://ssrn.com/abstract975955.

Abstract: This paper investigates the role of limited access to airport facilities as a determinant of the hub premium in the U.S. airline industry. The researchers used original data from competition plans that airports are required to submit to the Department of Transportation in compliance with the Aviation Investment and Reform Act for the 21st Century. Information on the availability and control of airport gates, leasing arrangements, and other restrictions limiting the expansion of airport facilities was collected.

The paper finds that the hub premium is increasing in the ticket fare, and that control of gates is a crucial determinant of this premium. Limits on the fees that airlines can charge for subleasing their gates lower the prices charged by airlines. Finally, control of gates and restrictions on sublease fees explain high fares only when there is a scarcity of gates relative to the number of departures out of an airport.

Derudder, B., et al. (2010). A spatial analysis of multiple airport cities. *Journal of Transport Geography,* 18 (3), 345–353.

Abstract: This paper presents a detailed empirical description of airport connectivities in four major multiple-airport cities (London, New York, Los Angeles, and San Francisco). The analysis draws on data derived from a previously largely untapped information source, the so-called Marketing Information Data Transfer (MIDT). This dataset contains information on actually flown transnational routes, which allows for a thorough assessment of the chief connectivity characteristics of specific airports. Combined with information derived from several other sources, our results point to functional divisions among airports, both in terms of their geographical scale (e.g., national, regional, and international airports) and their specific role in the airline network (e.g., origin/destination versus hub airports). The implications of the results are discussed, and some avenues for future research are considered.

Dresner, M. (2006). Leisure versus business passengers: Similarities, differences, and implications. *Journal of Air Transport Management,* 12 (1), 28–32.

Abstract: As low-cost air carriers increase their market share, the percentage of leisure to total passengers will increase. Data from an airport passenger survey are analyzed to document differences and similarities between leisure and business passengers. Surprisingly, the two groups of passengers are quite similar in terms of their reasons for choosing to fly from the airport surveyed, their parking requirements, and the number of bags they checked. These similarities indicate that airline and airport managers may not be obliged to make significant adjustments to their operations to account for the changing passenger mix.

Fuellhart, K. (2007). Airport catchment and leakage in a multi-airport region: The case of Harrisburg International. *Journal of Transport Geography,* 15 (4), 231–244.

Abstract: This paper presents a spatial analysis of the market area of Harrisburg International Airport (MDT) in south-central Pennsylvania using a zipcode-level

spatial database of a sample of airport customers. Using a geographic information system (GIS) and regression techniques, a description of MDT's market area is presented in relation to various demographic and geographic variables. The results show clear patterns of possible airport substitution—particularly between MDT and BWI. These results are corroborated with a simple route-level regression analysis showing relative passenger levels at MDT versus BWI in relation to fare differences and other factors.

Fuellhart, K. (2003). Inter-metropolitan airport substitution by consumers in an asymmetrical airfare environment: Harrisburg, Philadelphia and Baltimore. *Journal of Transport Geography,* 11 (4), 285–296.

Abstract: Airfares vary significantly over space, and can even vary substantially between airports in relatively close proximity to one another. With the spread of various Web tools, consumers are armed with more information than ever to assess fare and service differences between competing airlines and competing airports. This leads to the possibility of airport substitution for particular routes. Linear regression models are developed that suggest, despite the 70 to 90 mile distance, that passenger substitution may be occurring from Harrisburg and Philadelphia to Baltimore based as a result of differential fares, low-fare service, and other factors.

Gelhausen, M. C. (2011). Modelling the effects of capacity constraints on air travellers' airport choice. *Journal of Air Transport Management,* 17 (2), 116–119.

Abstract: This paper analyzes the effects of limited capacity on air travelers' airport choice. The analysis is based on a market segment specific airport choice model that accounts for limited capacities. The region of Stuttgart in Germany serves as a case study to examine the impact of limited airport capacity on air travelers' airport choice. Air travelers' choice depends on the supply of flights and accessibility of the airports in their choice set as well as on their preferences and willingness to pay. To elaborate the effects of limited airport capacity, scenarios relating to the capacity situation at airports serving the air travel demand of the Stuttgart region are analyzed. This paper reveals the mutual dependence among airports. Capacity constraints at one airport cause spill-over effects and thus influence air travel demand served at other airports. In some cases this may even lead to new capacity constraints elsewhere.

Gelhausen, M. C. (2009). The influence of limited airport capacity on passengers' airport choice in a decentralised airport environment. *Journal of Airport Management,* 3 (4), 366–383.

Abstract: This paper examines the impact of limited airport capacity on the airport choice of individual air travelers. The quantitative analysis is based on a nested logit model, enhanced to allow for capacity constraints at airports and to improve model applicability in the real world. The paper starts by describing the main idea of the model and goes on to consider airport choice behavior in the Cologne region in a capacity-constrained decentralized airport environment. To elaborate the impact of limited airport capacity on passenger choice, three different scenarios are analyzed. In this manner, it is possible to illustrate the complex distributional changes in airport choice by market segment, trip origin, and trip destination. This research aims to show the mutual dependence among airports operating in a decentralized environment in which some airports do not have the capacity to meet their full demand potential. In such an environment, capacity constraints at one airport may lead to spill-over effects and thus influence air travel demand served elsewhere. In some cases, this may even lead to new capacity constraints at these airports.

Gillen, D.; Lall, A. (2004). Competitive advantage of low-cost carriers: Some implications for airports. *Journal of Air Transport Management,* 10 (1), 41–50.

Abstract: In this paper, the sources of competitive advantage of LCCs such as Southwest, Ryanair, and easyJet are identified. Many have looked to these carriers' operational efficiency as their source of advantage, but the choice of business model with point-to-point service provides the strategic advantage and the operational effectiveness complements this choice. The vertical relationships between processes are based on the simplicity of service. This leads to simplicity of processes and simplicity of organization. These points are illustrated with a discussion of Southwest and how it organizes its "turns" for flights. The team organization and the simplicity of information flows result in greater relational coordination. This contrasts with airlines such as Ryanair that seek lower costs through lower prices. The paper argues that the Southwest model is not generic and duplication is difficult because of system coordination, whereas the Ryanair model can be more easily duplicated. This results in first mover advantages for carriers such as Ryanair and their willingness to engage

in long-term contracting for key assets, such as airport access. These differences in achieving operational efficiency have different implications for airports, which include bargaining power and risk exposure. An airport with a dominant single LCC is subject to more risk and low bargaining power.

Gözen, B.; Chandra, B. (2004). A parameterized consideration set model for airport choice: an application to the San Francisco Bay Area. *Transportation Research Part B: Methodological,* 38 (10), 889–904.

Abstract: Airport choice is an important air-travel-related decision in multiple-airport regions. This paper proposes the use of a probabilistic choice set multinomial logit (PCMNL) model for airport choice that generalizes the multinomial logit model used in all earlier airport choice studies. The paper discusses the properties of the PCMNL model, and applies it to examine airport choice of business travelers residing in the San Francisco Bay area. Substantive policy implications of the results are discussed. Overall, the results indicate that it is important to analyze the choice (consideration) set formation of travelers. Failure to recognize consideration effects of air travelers can lead to biased model parameters, misleading evaluation of the effects of policy action, and a diminished data fit.

Gupta, S., et al. (2008). Air passenger preferences for choice of airport and ground access mode in the New York City metropolitan region. *Transportation Research Record 2042: Journal of the Transportation Research Board,* 3–11.

Abstract: In current practice, regional models are limited in their capability to analyze policies involving changes and improvements to airports (and their services) and ground access transportation. Typically, airports are treated only as employment centers or as special generators. Important and distinct features of air passenger travel affecting trip distribution and mode choice are rarely modeled explicitly. This paper presents the development of a joint airport and ground access mode choice model for the New York City metropolitan region based on an extensive survey of airport users. Unlike travel to and from most U.S. cities, air passengers flying to and from the New York region face a nontrivial choice of airports and ground access modes (including premium transit options). A nested logit model was formulated with airport choice at the upper level and ground access mode choice at the second level; however, a multinomial logit model was found to be statistically preferable. Results indicate that air passenger travel behavior is significantly different for business and nonbusiness travelers. Overall, willingness to pay for trips to and from the airport is much higher than for regular intra-city trips. Average yield, access time, and access cost are the most important determinants of air passenger's choice; demographics and trip characteristics are also significant. The developed tool was used for a comprehensive study of airport development alternatives in the New York region and is seen as the platform for additional data development and model extensions for future studies of air passenger service planning in the New York mega region.

Hess, S. (2010). Evidence of passenger preferences for specific types of airports. *Journal of Air Transport Management,* 16 (4), 191–195.

Abstract: Studies of air travel choice behavior increasingly make use of data collected through stated choice surveys. This paper puts forward the hypothesis that when making their choices in such surveys, respondents may complement the information presented to them by additional attributes. Specifically, the paper looks at characteristics linked to airport size and breadth of service, as well as the proximity to a respondent's home. The findings in a discrete choice analysis suggest that, all else being equal, respondents prefer larger to smaller airports while having a preference for the airport closest to their home. This could suggest that even though respondents associate a higher likelihood of delay and other inconveniences with larger airports, there is a perception that if things go wrong (e.g., flight cancellations), the backup options at larger airports (e.g., replacement aircraft) are superior to those at small or regional ones.

Hess, S. (2004). An analysis of airport-choice behaviour using the Mixed Multinomial Logit model. *ERSA conference papers.* European Regional Science Association.

Abstract: This paper describes part of an ongoing study of airport choice for passengers departing from the San Francisco Bay area. The aim of the present paper is to test for the prevalence of taste heterogeneity across travelers, using the mixed multinomial logit (MMNL) model. Our results indicate the presence of significant levels of heterogeneity in tastes, especially with respect to the sensitivity to access time, characterized by significant (deterministic) variation between groups of travelers (business/leisure, residents/visitors) as well as random variation within groups of travelers. Our analysis reinforces earlier findings showing that business

travelers are far less sensitive to fare increases than leisure travelers, and are willing to pay a higher price for decreases in access time (and generally also increases in frequency) than is the case for leisure travelers. Finally, the results show that the random variation between business travelers in terms of sensitivity to access time is more pronounced than that between leisure travelers, as is the case for visitors when compared to residents.

Hess, S.; Polak, J. W. (2006). Airport, airline and access mode choice in the San Francisco Bay area. *Papers in Regional Science,* 85 (4), 543–567.

Abstract: This article presents an analysis of air travel choice behavior in the San Francisco Bay Area. The analysis extends existing work by considering the simultaneous choice by passengers of a departure airport, airline, and access mode. The analysis shows that several factors, most notably flight frequency and in-vehicle access time, have a significant overall impact on the attractiveness of an airport, airline, and access mode combination, while factors such as fare and aircraft size have a significant effect only in some of the population subgroups. The analysis highlights the need to use separate models for resident and non-resident travelers, and to segment the population by journey purpose. The analysis also shows that important gains can be made through the inclusion of airport-inertia variables, and through using a non-linear specification for the marginal returns of increases in flight frequency. In terms of model structure, the results suggest that the use of the different possible two-level nested logit models leads to modest, yet significant, gains in model fit over the corresponding multinomial logit models, which already exhibit very high levels of prediction performance.

Hess, S.; Polak, J. W. (2006). Exploring the potential for cross-nesting structures in airport-choice analysis: A case study of the Greater London Area. *Transportation Research Part E: Logistics and Transportation Review,* 42 (2), 63–81.

Abstract: The analysis of air passengers' choices of departure airport in multi-airport regions is a crucial component of transportation planning in many large metropolitan areas, and has been the topic of an increasing number of studies over recent years. This paper advances the state of the art of modeling in this area of research by making use of a cross-nested logit (CNL) structure that allows for the joint representation of inter-alternative correlation along the three choice dimensions of airport, airline, and access mode. The analysis uses data collected in the Greater London Area, which arguably has the highest levels of inter-airport competition of any multi-airport region; the authors of this paper are not aware of any previous effort to jointly analyze the choice of airport, airline, and access mode in this area. The results of the analysis reveal significant influences on passenger behavior by access time, access cost, flight frequency, and flight time. A structural comparison of the different models shows that the cross-nested structure offers significant improvements over simple nested logit (NL) models, which in turn outperform the multinomial logit (MNL) model used as the base model.

Hess, S.; Polak J. W. (2005). Accounting for random taste heterogeneity in airport choice modeling. *Transportation Research Record 1915: Journal of the Transportation Research Board,* 36–43.

Abstract: The findings from a disaggregate analysis of the choice of airport, airline, and access mode for business travelers living in the San Francisco Bay Area, California, are presented. Aside from formulation of the multidimensional choice process, the main objective is to explore random taste heterogeneity among decisionmakers in their evaluation of the attractiveness of the different alternatives. The results indicate that this heterogeneity is present in tastes relating to in-vehicle access time, access cost, and flight frequency. Accounting for this heterogeneity leads to gains in model fit but, more important, leads to important insights into the differences in behavior across decisionmakers and avoids the bias introduced into trade-offs when fixed coefficients are used in the presence of significant levels of heterogeneity. In terms of substantive results, the models also reveal a significant impact of changes in out-of-vehicle access time, indicate a preference for service on jet over turboprop flights, and show that experience plays an important role in air travel choice behavior.

Hess, S., Polak J. W. (2005). Mixed logit modelling of airport choice in multi-airport regions. *Journal of Air Transport Management,* 11 (2), 59–68.

Abstract: This paper presents an analysis of the choice of airport by air travelers departing from the San Francisco Bay area. The analysis uses the mixed multinomial logit model, which allows for a random distribution of tastes across decisionmakers. To our knowledge, this is the first application using this model form in the analysis of airport choice. The results indicate that there is significant heterogeneity in tastes, especially with respect

to the sensitivity to access time, characterized by deterministic variations between groups of travelers (business/leisure, residents/visitors) as well as random variations within groups of travelers. The analysis reinforces earlier findings showing that business travelers are far less sensitive to fare increases than leisure travelers, and are willing to pay a higher price for decreases in access time (and generally also increases in frequency) than is the case for leisure travelers. Finally, the results show that the random variation between business travelers in terms of sensitivity to access time is more pronounced than that between leisure travelers, as is the case for visitors when compared to residents.

Hess, S., et al. (2007). Modelling airport and airline choice behaviour with the use of stated-preference survey data. *Transportation Research Part E: Logistics and Transportation Review,* 43 (3), 221–233.

Abstract: The majority of studies of air travel choice behavior make use of revealed preference (RP) data, generally in the form of survey data collected from departing passengers. While the use of RP data has certain methodological advantages over the use of stated-preference (SP) data, major issues arise because of the often low quality of the data relating to the unchosen alternatives, in terms of explanatory variables as well as availability. As such, studies using RP survey data often fail to recover a meaningful fare coefficient, and are generally not able to offer a treatment of the effects of airline allegiance. In this paper, we make use of SP data for airport and airline choice collected in the United States in 2001. The analysis retrieves significant effects relating to factors such as airfare, access time, flight time, and airline and airport allegiance, illustrating the advantages of SP data in this context. Additionally, the analysis explores the use of non-linear transforms of the explanatory variables, as well as the treatment of continuous variations in choice behavior across respondents.

Ishii, J., et al. (2009). Air travel choices in multi-airport markets. *Journal of Urban Economics,* 65 (2), 216–227.

Abstract: Study of how air travel consumers departing from a multi-airport region trade-off across airport and airline supply characteristics. Researchers empirically investigate this trade-off by estimating a weighted conditional logit model of airport–airline choice, using survey data on travels departing from one of three San Francisco Bay Area airports and arriving at one of four airports in greater Los Angeles in October 1995. Nonprice characteristics like airport access time, airport delay, flight frequency, the availability of particular airport–airline combinations, and early arrival times are found to strongly affect choice probabilities. The study calculates marginal effects and counterfactual scenarios to compare the values of these characteristics among each other and across traveler type. To examine the robustness of the conditional logit model, the researchers estimate a mixed logit model and find that the results are similar. The researchers attribute the similarity to our strictly defined travel market and to our distinction between leisure and business travelers, thus controlling for two important sources of consumer heterogeneity. The paper considers the implications of empirical findings on vertical integration between airlines and airports, on the effectiveness of "airport dominance," and on the competitive effect of entry by LCCs.

Jiang-tao, L. (2008). Airport choice in multi-airport regions: An empirical study for Chinese Metropolitan Area. *International Conference on Intelligent Computation Technology and Automation,* 2, 329–332.

Abstract: In this paper, a multinomial logit (MNL) model is constructed to predict airport choice in a multiple-airport region and estimated using passenger data from a Chinese metropolitan area. Four explanatory variables were investigated, namely, access time to the airports of choice, airline service (mainly flight frequencies) at the regional airports, airfare, and a passenger's experience with an airport. In agreement with previous work, it was found that flight frequency is one of the significant predictors of airport choice. However, estimation results indicate that not access time but airfare is another important predictor in the competition between airports in a developing country's region. Travelers in developing countries have higher airfare elasticity than those in developed countries, while travelers in developed countries have higher access time elasticity than those in developing countries. In addition, a passenger's experience is significant in the airport choice behavior in both developed and developing countries. This would indicate that passengers who have used an airport will tend to continue to use the same airport, all other factors being equal.

Lian, J. I.; Ronnevik, J. (2011). Airport competition—Regional airports losing ground to main airports. *Journal of Transport Geography,* 19 (1), 85–92.

Abstract: Regional airports in Norway are losing market shares to nearby main airports on flights to the national capital, Oslo, and on international travel via Oslo. Travelers are willing to spend several hours extra

driving to a larger airport in order to take advantage of lower fares and more convenient airline services. Traffic leakage from regional airports is high when the service from the regional airport is indirect and fare differences are large. Public service obligation (PSO) tenders set maximum fares on the regional legs, but do not cover through travel from regional airports that involve commercial legs. Traffic leakage is particularly evident in the leisure segment. Leakage levels tend to increase as competition is intensified at main airports, but the evidence is rather mixed. Logistic curves of airport market shares have proven to be useful when comparing spatial variations in leakage levels.

Loo, B. P. Y. (2008). Passengers' airport choice within multi-airport regions (MARs): some insights from a stated-preference survey at Hong Kong International Airport. *Journal of Transport Geography,* 16 (2), 117–125.

Abstract: Passengers' airport choice in multi-airport regions (MARs) is of great interest to transport researchers, local governments, airport authorities, and airline companies. This paper analyzes the airport choice of passengers departing from Hong Kong International Airport (HKIA) to 15 destinations in different parts of the world. The results, based on stated-preference (SP) data, show that airfare, access time, flight frequency and the number of airlines were the most important airport level of service (LOS) attributes. In contrast, the number of airport access modes, access cost, airport shopping area, and queue time at check-in counters were not statistically significant. The segmentation analyses reveal important subtle variations in airport preferences among different market segments. The findings provide valuable insights on a less well-researched MAR—the Hong Kong-Pearl River Delta (HK-PRD) MAR.

Luken, B. L.; Garrow, L. A. (2011). Multiairport choice models for the New York Metropolitan Area : Application based on ticketing data. *Transportation Research Record 2206: Journal of the Transportation Research Board,* 24–31.

Abstract: This study examines the potential to use online ticketing data to model airport choice for domestic flights originating in one of the three major airports located in the New York City area. Results indicate that airport accessibility and LOS influence airport choice. Results also suggest that capacity constraints—reflected in sold-out flights and higher fares—may lead to more switching across airports as the flight departure dates approach. This underscores the importance of incorporating the actual flights available and the actual prices seen by consumers at the time that they ticket into multi-airport choice models.

Marcucci, E.; Gatta, V. (2011). Regional airport choice: Consumer behaviour and policy implications. *Journal of Transport Geography,* 19 (1), 70–84.

Abstract: The analysis of origin airports in multi-airport regions has a well-established tradition in transportation and regional economics. The main goal of the paper is to estimate the importance of the different attributes that determine origin airport choice. In this paper, a stated-preference approach was adopted to study this problem and evaluate the effects of possible policy interventions. A detailed segmentation of the sample studied according to the socioeconomic variables that prove statistically relevant when interacted with the attributes used to characterize airport choice was performed. Moreover, in order to test for the presence of heterogeneity in agents' preferences the researchers estimate several mixed logit models with different specifications, including heteroscedasticity and error component. With respect to previous studies the researchers developed and extended the traditional SP approach by also analyzing the role and relevance of attribute cut-offs in this research field. The policy simulations produced are based on the estimation of airport-specific attributes. The study concentrates on a multi-airport region in central Italy where four competing airports are located.

Matisziw, T. C.; Grubesic, T. H. (2010). Evaluating locational accessibility to the US air transportation system. *Transportation Research Part A: Policy and Practice,* 44 (9), 710–722.

Abstract: Although there are hundreds of airports that support commercial air passenger traffic in the United States, not all areas are equivalently served by the commercial air transportation system. Locations in the United States differ with respect to their level of access to the commercial air network and their overall accessibility within the system. Given the complexity of the domestic commercial air passenger network and supporting infrastructure, past research has only been able to provide a limited assessment of locational accessibility within the United States. To address these complexities, this paper proposes a new metric that incorporates measures of access to air transport as well as accessibility within air transportation networks. Using a comprehensive dataset on scheduled airline service, the developed approach is then applied to the U.S. domestic commercial passenger air transportation network to

explore geographic differentials in accessibility. Results suggest marked differences between core-based statistical areas throughout the United States.

Nicole, H. (2004). The upside of using an inconvenient airport. *The Wall Street Journal - Eastern Edition,* 244 (5), D1–D4.

Abstract: Reports that flyers are using smaller, less convenient airports to save time and money. Describes advantages of using non-major airports (such as cheaper tickets and avoiding long security delays) statistics on passenger volume at major airports, effect of discount airlines on the popularity of smaller airports, and challenges of utilizing smaller airports.

Pathomsiri, S.; Haghani, A. (2005). Taste variations in airport choice models. *Transportation Research Record 1915: Journal of the Transportation Research Board,* 27–35.

Abstract: A mixed multinomial logit model for analyzing choice of departure airport in a multiple-airport system (MAS) is presented. The model aims to capture random taste variations across passengers in response to airport LOS through a set of random coefficients. A case study is carried out for the Baltimore, Maryland-Washington, D.C., MAS. The 1998 Air Passenger Survey database is used to estimate the model. The results indicate significant taste variations in response to flight frequency and airline fare even within smaller segments by both trip purpose and residency status. Analyses of the model provide several insightful results, such as distribution of perceived LOS and time value. In addition, the model is used to simulate the impact of interesting scenarios on market share. Substantial policy implications for airport management are also provided.

Pels, E., et al. (2009). Low-cost airlines and airport competition. *Transportation Research Part E: Logistics and Transportation Review,* 45 (2), 335–344.

Abstract: An important question from the viewpoint of competition analysis in the air transport industry is the extent to which low-cost airlines operating from a secondary airport compete with full-service airlines serving a main airport in a multiple-airport region. This paper addresses the issue of the competition between full-service and low-cost airlines serving adjacent airports in Greater London using econometric estimation of demand structure (own- and cross-price elasticities). The analysis follows the method in (Pels, E., Nijkamp, P., Rietveld, P., 2000. Airport and airline competition for passengers departing from a large metropolitan area, *Journal of Urban Economics,* 48 (1), 29–45; Pels, E., Nijkamp, P., Rietveld, P., 2003. Access to and competition between airports: A case study for the San Francisco Bay area, *Transportation Research Part A: Policy and Practice,* 37 (1), 71–83). It is based on the nested logit model we use to capture three key dimensions of passenger choice: airfare, surface-access costs, and frequency. The researchers obtained estimates of the own- and cross-price elasticities, which was the focus of the researchers' interest. On the basis of understanding of the industry dynamics the paper found these estimates, especially of the cross-price elasticities, to be on the low side.

Pels, E., et al. (2001). Airport and airline choice in a multiple airport region: An empirical analysis for the San Francisco Bay Area. *Taylor and Francis Journals,* 35 (2), 1–9.

Abstract: In this paper a nested logit model is used to describe passenger preferences concerning airports and airlines. A statistical model for the passengers' sequential choice of airport and airline is calibrated. It appears the nested multinomial logit model, with airports as the common elements in the nests, is statistically preferable to the standard multinomial logit model. Frequency and access time to the airport are all significant. Separate models are estimated for business and leisure travelers, but there appear to be only small divergences.

Pels, E., et al. (1999). Airport and airline competition for passengers departing from a large metropolitan area. *Journal of Urban Economics,* 48 (1), 29–45.

Abstract: In this paper, an airport and airline choice model, based on a nested multinomial logit model, is developed to investigate both airport competition and airline competition in a metropolitan area with multiple departure airports. The model can be used to analyze the effects of an improvement in accessibility of a specific airport in a metropolitan area. It is shown analytically that if the frequency elasticity of demand is smaller than 1, unique airfare-frequency and passenger-charge equilibria exist. Next, symmetric equilibria are derived analytically; their properties are also examined. Finally, asymmetric equilibria are derived numerically, while their properties are discussed as well.

Redondi, R., et al. (2011). Hub competition and travel times in the world-wide airport network. *Journal of Transport Geography,* 19 (6), 1260–1271.

Abstract: The aim of this work is to measure the competition between airport hubs based on an analysis of

travel times in the world-wide airport network. By considering the minimum travel time required to connect each pair of airports, it is possible to create new measures of hub competition, separating the effects of hub position and temporal coordination. This analysis was carried out at the global level, considering all 232 airports with more than 3 million seats yearly offered in departure flights in 2008, and also in relevant geographic markets. The results show a high level of competition among the most important world airports, but the major airports of Europe have a geographical advantage in relation to world markets over the major American and Asian airports. Also shown is that airports located on different continents often compete for the same origin–destination markets. Geographical position appears to be the most important variable explaining hub performance. Secondary hubs show a higher degree of specialization toward specific markets.

Ricondo & Associates Inc. (2011). Official Statement—City of San Jose Airport Revenue Bonds 2011A. *Report of the Independent Airport Consultant,* City of San Jose.

Abstract: Uses regional survey data from 2009 study of Bay Area residents conducted for the Regional Airport Planning Committee of the Association of Bay Area Governments to capture airport activity market share. Results indicate that passenger demand is influenced by flight availability, airfares, proximity to residence, airport accessibility, and airport reliability.

Suzuki, Y. (2007). Modeling and testing the "two-step" decision process of travelers in airport and airline choices. *Transportation Research Part E: Logistics and Transportation Review,* 43 (1), 1–20.

Abstract: This paper develops and estimates a nested logit model of airport–airline choice that incorporates the "two-step" decision process of air travelers. The model assumes that a traveler first eliminates certain choice alternatives that do not satisfy his/her minimum acceptable standards (first step), and then chooses the utility-maximizing alternative from the set of screened choice alternatives (second step). The model is calibrated by using the survey data collected in the U.S. (Central Iowa). The results imply that the "two-step" choice model may fit the observed data significantly better than the conventional "one-step" choice models.

Suzuki, Y., et al. (2003). Airport choice, leakage, and experience in single-airport regions. *Journal of Transportation Engineering,* 129 (2), 212–218.

Abstract: Airport leakage refers to the phenomenon where travelers in small, single-airport regions avoid using their local (nearest) airports and prefer to use the more distant but larger metropolitan airports. Past studies of airport choice did not consider airport leakage tendencies of air travelers in single-airport regions, nor considered how the choice probabilities of individual travelers are affected by the goodness or badness of the travelers' experiences with one or more of the candidate airports. This paper extends the research on airport choice by considering the airport leakage tendencies of travelers in single-airport regions, and by incorporating variables that capture the individuals' heterogeneity of airport experience. The results indicate that single-airport area travelers are more likely to leak to larger metropolitan airports when their trip purpose is leisure than when it is business, and that travelers are more likely to choose the airports in which they gained good experiences than those which they have never used or had bad experiences.

Tam, M. L., et al. (2011). The impact of travel time reliability and perceived service quality on airport ground access mode choice. *Journal of Choice Modelling,* 4 (2), 49–69.

Abstract: This study makes two contributions to existing airport ground access mode choice models. The first is an assessment of travel time reliability on air passenger airport ground access mode choice decisions. Revealed preference questions were asked to determine the safety margin allowed for ground access journey to airports. The larger the safety margin allowances, the less reliable the passenger perceived the mode to be. Stated-preference questions were also used to determine the impact of travel time reliability on mode choice decisions. The second contribution of this research is the incorporation of air passenger perceived service quality in the calibration of the airport ground access mode choice model. With the use of the survey data, the effects of safety margin allowances, travel time reliability, and perceived service quality on ground access mode choices to Hong Kong International Airport are quantified by a multinomial logit-type mode choice model. For strategic planning, the calibrated model can be used by the airport authority and various transport operators for evaluating the changes in the service attributes on modal split pattern in international airports, hence improving the access mode services.

Tierney, S.; Kuby, M. (2008). Airline and airport choice by passengers in multi-airport regions: The effect of Southwest Airlines. *Professional Geographer,* 60 (1), 15–32.

Abstract: The business strategy of Southwest Airlines (SWA) features low fares and direct flights between major cities. To minimize aircraft turnaround times, SWA favors smaller, urban-fringe airports over larger, more congested airports. The researchers surveyed passengers flying to the multi-airport regions of Boston-Providence and Baltimore-Washington to assess how many and what types of passengers choose their less convenient airport and why. Maps of final destinations illustrate a reverse traffic shadow favoring smaller airports served by SWA. Motives for choosing less convenient airports include cheaper fares, fewer delays, and easier ground transport. Logit analysis confirms that leisure travel, traveling with family, and frequent flyer membership, significantly affect the choice of a less convenient airport.

Tsamboulas, D. A.; Nikoleris, A. (2008). Passengers' willingness to pay for airport ground access time savings. *Transportation Research Part A: Policy and Practice,* 42 (10), 1274–1282.

Abstract: There are cases when passengers are willing to pay a premium to reduce travel time, in particular when the trip has to be made. This paper aims to provide insight into factors that determine passengers' willingness to pay to reduce travel time for their ground access to an airport. A method is developed that comprises two steps: the identification of the passengers with zero willingness to pay and, from the rest, the estimation of the additional price they are willing to pay to reduce their travel time. For the first step, a probit model was formulated, and for the second, a linear regression model. To this purpose, data have been collected employing stated preference from passengers at the Athens International Airport. It has been found that a high percentage of passengers have zero willingness to pay, and of the remaining ones those using public transport have a significant willingness to pay to reduce access travel time. The method and the models are structured in such a way that their transferability to any airport environment is possible, thus providing a useful tool for decisions relating to airport ground access measures.

Warburg, V., et al. (2006). Modeling demographic and unobserved heterogeneity in air passengers' sensitivity to service attributes in itinerary choice. *Transportation Research Record 1951: Journal of the Transportation Research Board,* 7–16.

Abstract: Modeling passengers' flight choice behavior is valuable to understanding the increasingly competitive airline market and predicting air travel demand. Standard and mixed-multinomial logit models of itinerary choice for business travel are estimated on the basis of a stated-preference survey conducted in 2001. The results suggest that observed demographic- and trip-related differences are incorrectly manifested as unobserved heterogeneity in a random-coefficient mixed logit model that ignores the demographic- and trip-related characteristics of travelers. Among demographics, gender and income level have the most noticeable effects on sensitivity to service attributes in itinerary choice behavior, but membership in a frequent flyer program, employment status, travel frequency, and group travel also emerge as important determinants. However, residual heterogeneity is significant because of unobserved factors, even after accommodating sensitivity variations due to demographic- and trip-related factors. Consequently, substitution rates for each service attribute show substantial variations in the willingness to pay among observationally identical business passengers.

Warnock-Smith, D.; Potter, A. (2005). An exploratory study into airport choice factors for European low-cost airlines. *Journal of Air Transport Management,* 11 (6), 388–392.

Abstract: LCCs are an increasingly important part of the European aviation industry. Airport choice is a crucial factor in determining their success or failure. While research has been conducted into airport choice factors, their relative rankings have not previously been investigated. This paper addresses this through an exploratory survey of eight European low-cost airlines. The paper finds that demand for low-cost services is the most important choice factor, with aeronautical charges ranked fourth. Further analysis reveals different requirements depending on airline characteristics. This implies that airport managers need to tailor their service offering to individual low-cost airlines rather than treating the sector uniformly.

Wei, W.; Hansen, M. (2006). An aggregate demand model for air passenger traffic in the hub-and-spoke network. *Transportation Research Part A: Policy and Practice,* 40 (10), 841–851.

Abstract: This paper builds an aggregate demand model for air passenger traffic in a hub-and-spoke network. This model considers the roles of airline service variables such as service frequency, aircraft size, ticket price, flight distance, and number of spokes in the network. It also takes into account the influence of local passengers and social-economic and demographic conditions in

the spoke-and-hub metropolitan areas. The hub airport capacity, which has a significant impact on service quality in the hub airport and in the whole hub-and-spoke network, is also taken into consideration.

The study's demand model reveals that airlines can attract more connecting passengers in a hub-and-spoke network by increasing service frequency than by increasing aircraft size in the same percentage. This research confirms the importance of local service to connecting passengers, and finds that, interestingly, airlines' services in the first flight leg are more important to attract passengers than those in the second flight segment. Based on data in this study, it also was found that a 1% reduction of ticket price will bring about 0.9% more connecting passengers, and a 1% increase of airport acceptance rate can bring about 0.35% more connecting passengers in the network, with all else equal. These findings are helpful for airlines to understand the effects of changing their services, and also useful for quantifying the benefits of hub airport expansion projects.

This paper concludes with an example as an application to demonstrate how the developed demand model could be used to valuate passengers' direct benefit from airport capacity expansion.

Wilken, D., et al. (2007). Airport choice in Germany: New empirical evidence of the 2003 German air traveller survey. *Journal of Airport Management* 1 (2), 165–179.

Abstract: The paper deals with the quantitative relationship between the number of air travelers in a region and the airports chosen in Germany in 2003. The paper presents results of an analysis of airport choice behavior of total air passenger demand in Germany, based on data from the German air traveler survey conducted at 17 international and 5 regional airports. Approximately 210,000 passengers were interviewed about their trip origin, destination, choice of travel mode to the airport, purpose of their journey, and further related journey and personal attributes. As a result of analyzing these data, the distribution of airports chosen by passengers coming from different regions in Germany can be shown in relation to the journey purpose and destination. Based on these data, logit models have been calibrated for each market segment to forecast airport choice in relation to the accessibility and attractiveness of airports. The research in the present paper is intended to describe the formulation, estimation, and application of an airport choice model by market segment for use in a subsequent paper.

Windle, R.; Dresner, M. (1995). Airport choice in multiple-airport regions. *Journal of Transportation Engineering,* 121 (4), 121–132.

Abstract: A logistic model is constructed to predict airport choice in a multiple-airport region and estimated using passenger data from the Washington, D.C./Baltimore area. In agreement with previous work, it was found that airport access time and flight frequencies were significant predictors of airport choice, although, as might be expected, decreased access time and additional flight frequencies were more important to the business traveler than to the nonbusiness traveler. Additional estimations indicated that when only those passengers within reasonable proximity of more than one airport were included in the estimation, the significance of access time decreased and that of flight frequencies increased. Additional variables for a passenger's experience with an airport were then included in the model and were significant. This would indicate that passengers who have used an airport will tend to continue to use the same airport, all other factors being equal.

Wooi, L. O., et al. (2010). Note on the determinants of airline choice: The case of Air Asia and Malaysia Airlines. *Journal of Air Transport Management,* 16 (4), 209–212.

Abstract: Logit analysis is employed on primary data from departing air passengers at the Penang International Airport, Malaysia, to examine the determinants of airline choice between incumbent Malaysia Airlines and low-cost Air Asia. With the exception of educational level and ethnicity, other socio-demographic characteristics do not play a statistically significant role in determining airline choice. Instead, behavioral factors such as concerns over schedules and fares, routes, booking methods, and purpose of journey are found to be predictors of airline carrier choice.

Zhang, Y.; Xie, Y. (2005). Small community airport choice behavior analysis: A case study of GTR. *Journal of Air Transport Management,* 11 (6), 442–447.

Abstract: The issue of airport selection attracts considerable attention. However, most studies focus on using advanced discrete choice models to analyze airport choice behavior in metropolitan areas with several closely located, competing airports. This paper addresses passengers' choice behavior in selecting between local small community airports and a more distant major commercial airport. It looks at factors affecting air travelers' airport choice behavior in cities

with small community air service. Data relating to the Golden Triangle Regional Airport in Mississippi is used in logistic regressions to identify the key factors that influence air travelers' airport choices. Ticket price, experience with Golden Triangle Regional Airport, and flight schedule were found to be the strongest effects.

Zhang, A., et al. (2010). Revenue sharing with multiple airlines and airports. *Transportation Research Part B: Methodological,* 44 (8–9), 944–959.

Abstract: This paper investigates the effects of concession revenue sharing between an airport and its airlines. It is found that the degree of revenue sharing will be affected by how airlines' services are related to each other (complements, independent, or substitutes). In particular, when carriers provide strongly substitutable services to each other, the airport has incentive to charge airlines, rather than to pay airlines, a share of concession revenue. In these situations, while revenue sharing improves profit, it reduces social welfare. It is further found that airport competition results in a higher degree of revenue sharing than would be had in the case of single airports. The airport–airline chains may nevertheless derive lower profits through the revenue-sharing rivalry, and the situation is similar to a Prisoners' Dilemma. As the chains move further away from their joint profit maximum, welfare rises beyond the level achievable by single airports. The (equilibrium) revenue-sharing proportion at an airport is also shown to decrease in the number of its carriers, and to increase in the number of carriers at competing airports. Finally, the effects of a "pure" sharing contract are compared to those of the two-part sharing contract. It is found that whether an airport is subject to competition is critical to the welfare consequences of alternative revenue-sharing arrangements.

APPENDIX C

Case Study Selection

The case studies were selected through a rigorous process designed to match the characteristics of each candidate region under consideration with the need to understand the key drivers of passenger and airline choice. Ultimately, the case studies selected provide insight regarding how and why passengers and airlines make their choices among multiple airports in a region.

An essential first step in the process was to determine a standard basis for including or excluding markets from consideration. The following series of considerations ("filters") were applied to an assumed initial universe of the 100 largest U.S. population centers.

Filter 1: Demographic Size of Market Regions

Demographic size is among the significant differentiators among market regions. The initial analysis focused on the largest population centers, thus ensuring that the largest concentrations of population (e.g., air travelers) would be taken into consideration in the selection of case studies.

The top 100 population centers in the United States (Metropolitan Statistical Areas or MSAs) were identified and ranked. These MSAs constituted the initial universe of market regions to be considered. The 100 MSAs represent a population of 201 million, or 64% of the total U.S. population.

Filter 2: Initial Scope of Market Region Geography

The scope of each of the regions involving the top 100 MSAs was initially defined, based on a 100-mile radius from the center of the largest city of each MSA. The 100-mile radius was used to establish an initial approximation of a 2-hour drive time assumption from anywhere in the region to anywhere else in the area. However, in view of the different drive times that are likely to result in each of the different regions, the 100-mile radius was reviewed and adjusted as appropriate to reflect likely drive time differentials. (Further refinement of drive times was subsequently undertaken for each of the case studies.)

Filter 3: Region Overlaps

The 100 regions were reviewed to understand their geographic relationship to each other, and to identify the extent of overlaps. Such overlaps were noted for consideration later regarding consolidation and/or reconstitution of regions.

Filter 4: Airports Serving the Largest Market Areas

The commercial service airports located within each of the 100 regions were identified. The air travel passenger traffic and air travel passenger revenue related to airline activity at the airports in each of the regions was quantified and reviewed.

Filter 5: Single-Airport Regions

A review of the top 100 regions was performed to identify those that have only one commercial service airport, or that have minimal air service at airports in the market region other than the one major airport. This review resulted in the identification of 25 of the largest 100 MSAs as single-airport regions, which were subsequently excluded from case study consideration.

Filter 6: Region Consolidations and Reconstitutions

The previously identified overlapping regions were evaluated to determine whether they were candidates for potential consolidation or redefinition. This review examined situations where MSAs and airports were located in more than one of the defined regions. Such situations suggest the integration

of markets and air services, and could make it appropriate to consolidate or reconstitute market areas.

Filter 7: Integration of Smaller MSAs into Major Regions

To more fully reflect the true market sizes of the regions under consideration, the MSAs that are smaller than the top 100 were identified and, where appropriate, integrated into the market regions.

Filter 8: Additional Regions of Interest

A review of regions not included in the initial consideration through Filter 7 was performed to identify regions that should be considered as case study candidates due their potentially instructive situation. These markets were reviewed to determine if their inclusion in the study would potentially provide insight into choice factors in markets that have substantially different characteristics than those in the top 100 MSAs (i.e., smaller population base, longer drive time characteristics, subsidized air service, etc.).

This review resulted in the identification of 15 additional market regions of interest for inclusion in the list of case study candidates. The airports located in each of the additional market regions were also identified.

Filter 9: Consideration of Results of the Literature Review

The results of Task 1 of the study—literature review—were reviewed to determine if the findings provided guidance regarding the inclusion, exclusion, or redefinition of regions as potential candidates for case studies.

Filter 10: Grouping of Market Regions for Sample Diversity

The preceding reviews and analyses resulted in the identification of 59 regions for consideration as potential case study candidates. These regions were sorted into five groups based on the following criteria:

- **Group 1:** Regions with more than three large/medium hub airports, plus two or more small/non-hub airports;
- **Group 2:** Regions with two large/medium airports plus two or more small/non-hub airports;
- **Group 3:** Regions with one large/medium airport or two or more small/non-hub airports;
- **Group 4:** Regions with one large/medium airport and one small/non-hub airport; and
- **Group 5:** Regions served only by small/non-hub airports.

The size classifications are based on the FAA Airport Hub Classification System:

- Large = Large Hub (1% or more of annual passenger boardings in the United States),
- Medium = Medium Hub (.25% to less than 1% of annual passenger boardings in the United States), and
- Small = Small Hub (.05% to less than .25% of annual passenger boardings in the United States) and Non-Hub (less than .05% of annual passenger boardings in the United States).

Filter 11: Relevancy to Study Objectives

The regions were further reviewed with the objective of identifying those that would yield case studies that would be most relevant to understanding passenger and airline choice. This review required several steps.

Timeframe of Review

To be relevant, the selected case studies must address events and trends that occurred in the recent past, and that, although analyzed historically, are instructive in the context of the current and near-term future aviation industry and economic environment. For the purposes of the study, it was decided that events and trends that occurred since 2001 would constitute "recent past." Thus, the study period was established as 4Q2002 through 2Q2011. This timeframe encompasses many of the fundamental changes that have occurred in the aviation industry that are still impacting the current environment, including traffic demand trend changes, airline industry consolidation, aviation security impacts on air travel volume, aviation fuel pricing, hub restructuring and elimination, evolving and new airline business models, among others.

Review and Identification of Traffic Trends

The 59 regions were reviewed, with the objective of identifying trends in traffic that suggest that passengers and/or airlines made significant choices in the market region during the study period. This review enabled the research team to reduce the number of potential case study candidates for subsequent review and analysis.

The research team considered various approaches for the use of metrics that would indicate trends in both air travel demand and airline capacity supply in the regions and at the airports in the regions. It was decided that the metric that would be most instructive initially is onboard traffic (US DOT T-100 data series), reflecting the total number of passengers utilizing the

seat capacity being offered by airlines at each airport. Onboard traffic included passengers traveling in the local city-pair market, passengers connecting from one flight to another, and passengers on through-plane itineraries. This metric, used in time-series analysis, captures both airline decisions regarding changes in levels of capacity (supply) being offered at an airport, and changes in passenger traffic (demand) that occur at an airport. Trends that are indicated at major hub airports will need to take into consideration the connecting and through traffic elements, but this need not be done until the case studies are performed.

The research team performed time-series analyses of passenger traffic trends at each of the airports in each of the 59 regions. Each analysis reviewed trends in onboard passengers at each airport in each region, compared to U.S. total average passenger trends, and the trend relationships among the individual airport traffic trends in the region.

The research team reviewed the time-series analyses to identify the following:

- Significant changes in onboard traffic at an airport (indications of increase or decrease in demand and/or seat capacity); and
- Changes in market share relationships between/among airports in the region.

Exclusion or Inclusion of Potential Case Study Candidates

The review of onboard traffic trends provided the basis for the decision of whether to exclude or include a region as a candidate for a case study.

Exclusion of a candidate was based on

- No or minimal difference between U.S. traffic trends and airport traffic trends for the study period, and
- No or minimal difference in traffic trends over time among the airports in the region for the study period.

Inclusion of a candidate was based on

- Significant difference between U.S. traffic trends and airport traffic trends,
- Significant difference in traffic trends over time among the airports in the region, and
- Instructive diversity regarding market size and region location in the selected list of case study candidates.

This review and analysis generated a list of 21 potential case study candidates, for which the research team prepared individual profiles, as described below.

Profiles of Case Study Candidate Regions

Profiles provide an efficient means of evaluating, at a macro level, the geographic, traffic/service, pricing, competition, and other defining characteristics of each of the 21 candidate regions. The research team, through this evaluation, identified those regions that would likely provide the most instructive, relevant, and diverse case studies. The case studies recommended and selected as a result of the review of regional profiles reflected the diversity of the market regions, while seeking to provide instructive results to as many users of the study report as possible.

The research team established a standard template for the development of the 21 regional profiles. The standard template incorporated the following key information:

Location—A map is provided indicating the location and general parameters of the region. This was intended to indicate the cities and airports that are included in the scope of the regional profile, and was not intended to provide a definition of the catchment area(s) of the airport(s) in the region.

Region Overview—Description of the region in the context of the location map.

MSAs in the Region—Identification of the Metropolitan Statistical Areas (MSAs) included in the regional profile.

Airports in the Region—Identification of the airports included in the regional profile, and information regarding their traffic levels, relationship to each other and their respective market positions.

Geographic and/or Surface Access Issues—General description of geographic and/or surface access issues that impact passenger choice of alternative airports.

Summary of Observations—Observations are made based on the research team's development, review, and discussion of each regional profile. These observations focus on several key areas that provide guidance regarding trends in the region, and resulting suitability of the region as a case study. Specifically

- Air service environment,
- Airline market involvement,
- Traffic/capacity trends,
- Airfares, and
- Domestic Air Service Data Summary.

Key data were developed for each airport in the region, and the region as a whole, for the following metrics:

- Passenger traffic, based on onboard traffic for the most recent 12 months of the study period (Year End 2nd Quarter 2011)(Source: U.S. DOT T-100)

- Scheduled flights for October 2011 (Source: OAG)
- Scheduled seats for October 2011 (Source: OAG)
- Average seats per flight for October 2011 (Source: OAG)
- Average airfare for October 2011 (Source: U.S. DOT O&D Survey)
- Total traffic growth from YEQ4 2002 through YEQ2 2011 (Source: U.S. DOT T-100)
- Passenger traffic, average fare, and total traffic growth were also provided for the United States for comparison with airport or regional data
- Onboard traffic for domestic services at each airport in the region was plotted on line graphs for each quarter of the study period. This enabled a review of trends at each airport, major changes at a particular airport, and/or the potential relationship between/among trends or changes (Source: U.S. DOT T-100).
- Onboard traffic for international services at each airport in the region (if the region has significant international service) was plotted on a line graph for each quarter of the study period. This enabled a review of trends at each airport, major changes at a particular airport and/or the potential relationship between/among trends or changes (Source: U.S. DOT T-100).
- Average fares for domestic itineraries for travelers at each airport in the region were plotted on a line graph for each quarter of the study period. This enabled a review of trends at each airport, major changes at a particular airport and/or the potential relationship between/among trends or changes (Source: U.S. DOT O&D Survey).
- Average fares for international itineraries for travelers at each airport in the region (if the region has significant international service) were plotted on a line graph for each quarter of the study period. This enabled a review of trends at each airport, major changes at a particular airport and/or the potential relationship between/among trends or changes. (Source: U.S. DOT O&D Survey).
- The percentage of market shares for domestic traffic of each airline at each airport in the region was established. This enabled a review of the market position of each airline at each airport for the most recent period of the study period. (Source: U.S. DOT T-100).
- The percentage of market shares for international traffic of each airline at each airport in the region (if the region has significant international services) was established. This enabled a review of the market position of each airline at each airport for the most recent period of the study period (Source: U.S. DOT T-100).

Profiles were prepared for each of the following 21 market regions and provided to the panel for review and comments:

- Metro New York City,
- Los Angeles Basin,
- Metro Chicago/Milwaukee,
- South Florida,
- San Francisco Bay,
- Southern Arizona,
- Metro San Diego,
- Southern Gulf Florida,
- Greater San Antonio,
- Central Florida,
- Southwest Ohio/Northern Kentucky/Indiana,
- Greater Cleveland,
- Western Carolina,
- West Central Virginia,
- New Orleans,
- Coastal Carolina,
- Northern Gulf Coast,
- Central Montana,
- Rio Grande Valley,
- Interior Southern Michigan, and
- Central Northern Wisconsin.

APPENDIX D

Industry Contacts

The following individuals provided perspective and insight regarding the development of this report, especially with regard to the regional case studies. The research team appreciates the assistance they provided in helping to understand trends and events in their regions and in the airline industry.

- Kevin Baker, Executive Director, Piedmont-Triad International Airport (GSO)
- Joseph Brauer, Airport Director, Rhinelander/Oneida County Airport (RHI)
- Patrick Carreno, Airport Director, Stockton Metropolitan Airport (SCK)
- Melinda C. Crawford, A.A.E., Airport Director, Pensacola International Airport (PNS)
- Lynne Douglas, Air Service Development/Customer Service Manager, Columbia Metropolitan Airport (CAE)
- David N. Edwards, President/CEO, Greenville-Spartanburg International Airport (GSP)
- Dan Feger, Executive Director, Bob Hope Airport (BUR)
- Victor Gill, Director of Public Relations and Government Affairs, Bob Hope Airport (BUR)
- Olgierd Hinz, Manager, Network Planning, Virgin America Airlines
- Hazel Johns, Assistant Airport Director, Santa Barbara Airport (SBA)
- Mark Kiehl, Deputy Director—Development, Palm Springs International Airport (PSP)
- Tina Kinsey, Director of Marketing, Public Relations and Air Service, Asheville Regional Airport (AVL)
- Marty Lenss, Airport Director, Outagamie County Regional Airport (ATW)
- John L. Martin, Airport Director, San Francisco International Airport (SFO)
- Thomas Miller, Airport Director, Austin Straubble International Airport (GRB)
- Ed Nelson, Director of Air Service Development, Mineta San Jose International Airport (SJC)
- Mario Rodriguez, Airport Director, Long Beach Airport (LGB)
- Charity Speich, Airport Manager, Chippewa Valley Regional Airport (EAU)
- Jon Stout, Airport Manager, Sonoma County Airport (STS)
- Colin Wheeler, Manager, Route Planning, American Airlines
- Courtney Wiercoch, Deputy Airport Director—Public Affairs, John Wayne Airport (SNA)
- Tony Yaron, Airport Administrator, Central Wisconsin Airport (CWA)

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation