LOCAL ECONOMIC IMPACTS OF AIRPORT OPERATIONS: AN ECONOMIC IMPACT ASSESSMENT FOR THE WEST ORANGE AIRPORT AUTHORITY

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL
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To my parents, for all they sacrificed to provide me the opportunity to become a scholar

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LIST OF ABBREVIATIONS

BLS	Bureau of Labor Statistics
FAA	Federal Aviation Administration
FASP	Florida Aviation System Plan
FDOT	Florida Department of Transportation
GDP	Gross Domestic Product
GIS	Geographic Information System
IMPLAN	Impact Analysis for Planning
JIT	Just in Time
LEHD	Longitudinal Employer-Household Dynamics
LQ	Location Quotient
NAICS	North American Industry Classification System
SR	State Road
WOAA	West Orange Airport Authority

Abstract of Thesis Presented to the Graduate School
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Over the last decade, airports and aviation industries have suffered from the perception of an unhealthy and unnecessary industry. This is due to arguments about industry safety and economic sustainability. The goal of this research is to debunk some of the negative perceptions of airports and. to show that airport growth is not only a good thing but public investment in the industry is justified. A case study of airport development plans in Orange County, Florida shows that significant economic benefits can come from public investment in airport development. Analysis shows that airport related operations in Orange County are not only specialized but also hold a comparative advantage over the industry at the state and national level. These results indicate the health of the local industry while the overall national employment suffers.

With the help of a line item budget from a feasibility study, local economic impacts of construction and annual airport operations were quantified. As is the case with any major infrastructure development, the regional economy is positively impacted as construction activities are conducted. Analysis also shows that positive economic effects could be the result of the annual airport operations. To substantiate the

sustainability of airport operations, a cluster analysis was conducted to identify possibilities for industry clusters in the area. Results showed that clustering will only serve to increase the local economic impact of airport operations; further justifying the large public investment.

CHAPTER 1
INTRODUCTION

Problem Statement

In a time when government expenditures are publically scrutinized, more than ever public investment must be justified. The public wants to know that their tax dollars are being put to the highest and best use to serve the greater good. In some cases, Investment in airports often becomes a hot-button issue because of the many concerns of the public.

It would be difficult to imagine modern life without the ability to get on an airplane and travel to a faraway destination in a relatively short amount of time. Despite this, airport growth can often be stifled because of skeptics. Everything from airport noise, aviation safety, and industry economic stability are brought up as arguments against airport growth (Hakfoort, Poot, & Rietveld, 2001; McMillen, 2004). Ever since the terrorist attacks of September 11, 2001, the aviation industry has been scrutinized for its safety. These perceptions hurt the industry as airlines became defunct and others merged to stave off bankruptcy. Concerns about the health of the aviation industry are common. Some think that it is a dying industry because of the unsustainable operational costs. This is especially poignant as oil-based fuel prices have been increasing in recent years.

It is important to remember that despite the negative attributes associated with airport operations (i.e., aircraft noise); air travel has become an integral part of our way of life. To sustain the current standard of living, airports and aviation must be maintained as a prominent method of transporting goods and people over long distances.

Increasingly, airports are being heralded as economic growth engines. No longer are airports simply another transportation hub. Economic activity around some airports is increasing so much that they are themselves being equated to cities. A growing trend is for airport related firms to locate on or very near airport property. The debate raises the question should airport growth be encouraged as their importance is being recognized?

Research Questions and Objectives

State and federal agencies are planning to invest in airport development in west Orange County in Florida. The purpose of this research is to determine the economic impact of airport development in west Orange County. Therefore, the research questions are as follows:

- Is public investment in airport development in Orange County a justified expenditure?
- What will be the economic impacts of this development?
- Are the economic impacts likely to be sustained?

This researcher hypothesizes that not only will the public investment be a justified expenditure, but also that it will be followed by significant and sustained economic benefits.

Method

To answer the research questions, three quantitative analyses are conducted. Economic base analysis is conducted using three different techniques (location quotient, shift-share, and Esteban-Marquillas Extension) to determine whether the airport development project is a worthy investment of taxpayer dollars. An input-output analysis is used to quantify the economic effects of the development. Finally, a cluster

analysis is used to determine the economic sustainability of the impacts. Prior to describing the specifics of how each technique is used in this analysis, pertinent aviation industry background and economic principles are described in the next chapter. Chapter 3 describes the study area for this research. Chapter 4 explains the methodology and analysis results for the economic base analysis. Chapter 5 explains the methodology and results of the input-output analysis. The methodology and results for the cluster analysis is described in Chapter 6. Chapter 7 is the discussion of all the results and conclusions are made in Chapter 8.

CHAPTER 2
LITERATURE REVIEW

Airports, much like other kinds of ports, create a link for interregional trading and travel. The positive benefits from airport development and expansion do not simply include the employment increase but also the effects on demand and supply of the non-transportation sector of the economy (Hakfoort et al., 2001, p. 597). “Airport act not only as a hub for human movement and its immediate ancillaries, but also an industrial focus around which massive conurbations and concomitant support services will be located” (Charles, Barnes, Ryan, & Clayton, 2007, p. 1009-1010).

Barriers and Limitations to Airport Prosperity

Many countries face the debate about the tradeoff between the positive and negative impacts of airport expansions. Some people believe that the current negative impacts from current airport operations provide enough reason to settle the debate about airport development and increased aviation activity. The list of concerns includes aviation noise and concerns about safety (Hakfoort et al., 2001).

The attacks on September 11th, 2001 changed how the United States viewed safety of the airline industry forever. The subsequent negative perception of industry safety combined with the economic slow-down in the mid 2000’s created reason for concern for some invested in the industry. After the industry was able to stabilize, the Federal Aviation Administration (FAA) forecast a steady, 3.3% growth (as measured by number enplanements) for large U.S. air carriers through 2013 and 5.5% growth for regional and commuter airlines during the same time (Vasigh, Fleming, & Tacker, 2008).

A long-standing perception exists that the presence of airports depresses property values because of noise associated with airport operations. However, research, in which the author examined real estate records for study areas in six cities (Chicago; Los Angeles; Denver; Dallas; Newark, New Jersey; and New York City), shows that property values do not appear to be adversely affected by the presence of airports (Walther, 1953). When compared to other areas of a city, real estate in sections of towns near airports have a proportionately lower rate of sale listing. The research also showed proportionally similar sale prices in areas near the airport compared to the rest of the study area (Walther, 1953).

Herman Walther (1953) provides a personal anecdote of when he lived near an airport. He remembers hearing airplanes land the first few nights of living near a runway then eventually to not hearing them at all. He equates this experience to the more commonly referenced anecdote of living near railroad tracks; residents get used to the overwhelming amount of sound even though pictures on the wall shake when a train passes by.

This may not be the same experience with everyone as some people are more sensitive to auditory stimuli. Luckily, airports are becoming significantly quieter over time. Technology has allowed new airplanes to be quieter than older planes. Older aircraft are being retired and the amount of night flights are also being reduced (McMillen, 2004).

The ‘not in my backyard’ sentiment is often a hindrance to development, of all sorts. The sentiment also applies to airport development; “for every business leader who wants to see his or her local airport expand, there is a resident in the flight path of

an airport who wants to see his or her local airport's traffic capped" (Green, 2007, p. 91-92). Another reason that residents may dissent with the idea of expanding airport operations may be the local residents often feel excluded from the planning process when it comes to airport development (McMillen, 2004).

Airport development progresses despite the concerns of the critics. Eighteen of the 31 largest airports in the nation (which account for 70% of all US air passenger traffic) have plans to add runways in the next decade (McMillen, 2004, p. 628). If noise was a discouraging factor as touted by the critics, then development around airports would not exist. However, research provides evidence of residential encroachment on airport properties. Walther (1953) found that there was significant residential construction on vacant land immediately adjacent airport properties. Suffice it to say that the opponent argument of damaging effects of airport noise is debunked. The presence of residences and other developments in the close proximity proves that airport noise and safety concerns are bearable aspect of airport operations. The encroaching development toward airports illustrates that airports are a growth node in their respective localities.

Central place theory describes the situation where a growth node (i.e., airports) attracts smaller firms to a specific location. The smaller firms are drawn to the growth node because they provide goods and/or services that support and are supported by the airport (Blakely & Leigh, 2010). Air-based transportation is the fastest method to transport people and goods around the world so airports certainly provide a very specific and specialized service. Therefore, their presence in the locality is often coveted. Central place theory is usually used to describe urban growth to a downtown

area but, in recent decades, it has also been used to describe the affect airports have on a locality.

The Rise of the Aerotropolis

With the growing interest of the economic advantages of airports and aviation-related developments, academics like John Kasarda are getting more attention for their research. He is one of the most published academics in the area of aviation planning. He is also credited with the coining of the term ‘aerotropolis,’ Which is an urban form whose layout is centered on an airport (Kasarda & Lindsay, 2011).

The aerotropolis concept relies on the assumption that airports will overtake seaports and rail as the primary trading hubs in our cities. Shades of this can be seen with the advent of just-in-time (JIT) logistics. More than transportation by road, rail, and sea, airports are becoming more important assets in the logistics and distribution of goods (Charles et al., 2007).

Air travel is increasingly being used to transport freight nationally and internationally (Başar & Bhat, 2004). The JIT business model is the driving factor the use of air travel as the method of delivery. Aviation provides a level of speed and flexibility that cannot be achieved with any other mode of transportation. When fast delivery is the most important variable, logistics is important to firms and it is not an input that is sacrificed or minimized (Flores-Fillol & Nicolini, 2006). However, it is worth noting that it does not make sense for all goods to be shipped via air. Some goods, like bulky items, are more economically shipped by sea or rail (Charles et al., 2007). In these cases, speed must be sacrificed for the lack of better options.

Physical goods are not the only high valued products that are transported though airports. To an extent, airports also serve as hubs for transporting ‘human capital’ – the

movement of people and their intellectual property or more simply referred to as business-related travel. As aircraft are the fastest form of long-range transportation, business travelers often find this mode of transportation to be most convenient when it comes to interregional and intercontinental travel. From August 2008 to July 2009, 48% of U.S. adult air travelers took trips for business purposes as compared to only 42% traveling for leisure purposes during the same time period. The remaining 10% traveled because of a combination of business and leisure (U.S. Travel Association, 2011).

Some argue that technological advances associated with new methods of communication will eventually render travel non-essential. However, academic research debunks this theory; in fact, the growing ease of communication may be the cause of travel. Research shows that telecommunication advancements have increased demand. The rationale is that air travel creates long distance relationships and opportunities that at some point require travel (Charles et al., 2007).

John Kasarda has developed a theory in which he uses to describe the correlation between internet activity and travel. Telecommunication has provided the opportunity for people to communicate with far-off contacts with whom we would not have otherwise been in contact. This connection serves to peak our curiosity and increases the desire to travel those great distances. For every message that is sent, – whether it is voice or text based – there is a greater chance it will lead to a face-to-face meeting. “Facebook friends drop in and become real ones; stray tweets on Twitter breed followers, contacts, and business trips. The more wired we are the more we fly” (Kasarda & Lindsay, 2011, p. 113).

Empirical evidence supporting this fact can be found in the 83% increase in air travel during the internet years. Researchers claim that this is not a “coincidence but a correlation because technology is only a starting point for long distance relationships; it actually makes us more inclined to fly” (Kasarda & Lindsay, 2011, p. 113). *Time* magazine once estimated that jet powered air-travel had shrunk the world by 40%. Kasarda furthers the reference saying that the world is flat, making most locations easily accessible (Kasarda & Lindsay, 2011).

In the United States, business-related travel accounts for $246 billion in spending and 2.3 million American jobs. Nearly half of the spending and half of the jobs can be directly linked to business meetings and events. **“**For every dollar invested in business travel, businesses experience an average $12.50 in increased revenue and $3.80 in new profits. A 10% increase in business travel spending would increase multi-factor productivity, leading to a U.S. GDP increase between 1.5% and 2.8%” (U.S. Travel Association, 2011). “The wealthier we become, the more we value our time, and the more we value our time, the more likely we are to fly” (Kasarda & Lindsay, 2011, p. 99). Simply put, time equals money.

In a given year, as many as 88 million passengers stream through an airport terminal. Comparatively speaking, only eight to 12 million people peruse though a large mall on an annual basis. When you consider that airline passengers have significantly higher incomes than the average person (three to five times higher than national average) it makes sense that airports now have other commercial attractions besides coffee shops and magazine stands. For example, McCarran international Airport in Las Vegas has a museum and Arlanda Airport in Stockholm has a chapel that served as the

location for 500 weddings in 2007 (Kasarda, 2008, p. 51). The fact that airline passengers are captive audiences in airports also expectedly has an impact the increasing presence of commercial attractions.

Development around the airport reflects the needs of the airport passenger as well as the airport employee. An example of this is childcare services for airport employees (Kasarda, 2008). With all of attractions in airports, people do not want to leave the airport during a trip. This leads to the creation of what Kasarda terms as 'airworld' (Kasarda & Lindsay, 2011). Landside airport development is also occurring. Airports are incorporating a greater diversification of shopping and leisure venues (i.e., conference and exhibition centers; logistics and free trade zones; and facilities for processing time-sensitive goods) (Kasarda, 2008). Researchers argue that it was an easy choice for airports to take advantage of commercial expansion and "reinvent themselves as slick conference centers and convention sites" (Kasarda & Lindsay, 2011, p. 107).

Whether by partnering with third-party real-estate development firms or by doing it in-house, real-estate development has become a way for airports to develop and manage landside property. Even though airports have designated boundaries, many have development occurring 'outside the fence'. This can be analogously compared to urban development and how development does not cease at political boundaries. In some cases, airports are acquiring and operating other airports through special investment management provisions (Kasarda, 2008). The acquisition of excess land around airports creates a physical buffer to airport operations and also may allow for future expansions. These land management practices also allow for the mitigation of the negative externalities associated with abutting non-compatible land uses.

The aerotropolis concept is based on the economic principle of agglomeration economies (Charles et al., 2007, p. 1013). Arthur O' Sullivan (2009) describes agglomeration as the tendency for firms to locate close to one another. Complementary and sometimes competing firms may cluster to share intermediate inputs and labor pools; the result of which lead to increased productivity and economies of scale.
In fact, Kasarda (2008) claims that airports are "more expansive and important for employment growth, business competitiveness and urban form than prior transit center-oriented developments" (p. 50).

Benefits of the Airport in the Community

As Kasarda indicates, the presence of airports in a community is beneficial for the local area. When talking about the economic prosperity of an airport and the local area, concurrently, the 'chicken and egg' principle often applies. Airports create beneficial results for the overall economy and the overall economic prosperity benefits the further growth and helps ensure the continued success of an airport. Kasarda and Lindsay (2011) claim that the efficacy of airports and air travel is a direct indicator of the health and prosperity of the economy. There is a direct correlation between the health of the airline industry and overall economic health. This concept can be eloquently summarized in a few words; "air travel follows the money" (Kasarda & Lindsay, 2011, p. 98). The airline industry – the more specific surrogate of the aviation industry – also generally abides by the aforementioned principle. (Vasigh et al., 2008, p. 20). Since the deregulation of the airline industry in 1978, the national growth domestic product (GDP) has grown at an average rate of 2.6% while the large commercial airline carriers have grown at an average of 4.8%, in terms of revenue. Gross domestic product is "the total

market value of all final goods and services produced in a country in a given year" (Vasigh et al., 2008, p. 19).

Not only can airports be used as a measure of overall economic prosperity, they are seen by policy makers as "strategic assets to the regional and national economy" (Hakfoort et al., 2001, p. 596). Recent conceptualization has brought about the thinking that airports not only serve as a transportation hub but also as a 'growth pole' to spur regional economic activity. The presence of airports in the region creates two way interactions with the local economy (Hakfoort et al., 2001).

Airports are capable of producing large tax revenues for municipalities. They can also be attributed with supporting employment opportunities in a region. A growing number of airports employ upwards of 50,000 daily workers. Using the U.S. Census definition, that makes those airports metropolitan central cities (Kasarda, 2008). In the case of O'Hare International Airport in Chicago, proposed additions and renovations to the airport is projected to create 185,000 service jobs in the region (McMillen, 2004). "Airports are spawning aviation-linked clusters of hotels; convention, trade and exhibition facilities; corporate offices; and retail complexes along with culture entertainment and recreation centers" (Kasarda, 2008, p. 50). In Las Vegas, when the megaresorts opened 20 years ago, the number of patrons doubled in proportional relation with air passengers to the area. Today, Las Vegas is the economic benefactor of to nearly 50 of the nation's largest tradeshows (Kasarda & Lindsay, 2011). "Major airports serve as regional, multi-modal surface-transportation nodes and as magnets for business locations, commercial transactions, information exchanges and leisure activities." (Kasarda, 2008, p. 50).

Air traffic is projected to see continued growth for the foreseeable future. (Hakfoort et al., 2001, p. 596). In 2006, the International Civil Aviation Organization estimated that the aviation industry (and its effects on supporting industries that provide aviation specific inputs or consumer products) was responsible for as much as 4.5% of the global GDP. The total economic contribution of air transport can be measured by looking at the employment and income effects derived from its direct economic activities on the one hand, and from its indirect and induced activities (multiplier effect) on the other hand. Studies show that every "$100 of output produced and every 100 jobs created by air transport trigger additional demand of US $325 and in turn 610 jobs in other industries" (Flores-Fillol & Nicolini, 2006, p. 3-4). Air cargo is also a sector of the air industry that is expected to grow in the coming future. Aerospace industry leaders, Boeing and Airbus, predict an annual 6% growth in global air cargo for the next two decades (Vasigh et al., 2008). Global population growth plays an important role in the predicted growth of air traffic. This is especially the case in developing countries like India and China which has experience a sharp upturn in air travel. It is important to note, however, that this principle is most applicable when population growth is accompanied with income growth (Vasigh et al., 2008, p. 19). Simply put, air travel is the fastest growing mode of transportation in the United States, within the context of intercity travel (Başar & Bhat, 2004, p. 889). One can only assume that growth of the aviation industry will continue to provide beneficial outcomes for the rest of the economy.

The opposite economic relationship between airports and the overall economy (as mentioned earlier) can also be exemplified. Economic growth and prosperity leads to greater employment and economic activity. This leads to increased business related

travel. Business travel is the most important segment of patronage for the airline carriers. The authors of the book *Introduction to Air Transport Economics* claim that international financial centers like London and New York experiences a large amount of air traffic growth. Increased air cargo traffic can also be attributed to overall economic growth. An additional point is that when household income increases during periods of economic activity, more discretionary income is available for families to use for leisurely trips (Vasigh et al., 2008, p. 19). In both cases, it can be stated that the demand for air travel increases with economic growth. Conversely, the prosperity of airports can lead to further economic growth for the locality. Thus, an economically reinforcing relationship exists between airports and the overall economy.

Economic Principles of Air Transportation

The impacts of airport development and operations can be explained via the use of economic principles. Economic impact is a summation of total impact and is divided into three types: direct, indirect and induced impacts. The easiest way to describe direct impact represents economic activities that would not have occurred with the absence of air transportation. These impacts are also referred to as first-tier economic activities. In the air transportation industry, both airlines and airports provide the economy and local communities with a direct economic impact. The employment that is specific to airport operations is an example of direct impact employment. This includes fixed-based operators and other airport personnel (Vasigh et al., 2008).

Indirect impacts are second-tier economic impacts that usually occur off-site. These activities are directly propagated or supported because of air transportation activities. Some examples of indirect economic impacts include services provided by travel agencies, hotels, rental car companies, restaurants, and retail establishments.

These industry sectors are the ones that are most apparent near airports because of the central place theory. They have a strong relationship to the aviation industry and their services or goods are supported by airport activities. Typically, indirect economic impacts are generated by visitors that arrive or depart via air transportation (Vasigh et al., 2008).

For the direct and indirect economic activities to occur, people must be hired by the different firms. The induced economic impact measures this activity. These impacts are the multiplier effects that are associated with the employment and income supported by the direct and indirect economic impacts. So this includes impacts generated from living expenses of employees at the airport, hotel, retail establishments and restaurants. Established multiplier effect coefficients determine the effect based on the reiteration of these economic activities back into the local economy. To entire economic impacts of the local economic activities are described as the total economic impact. The total economic impact is the summation of the direct, indirect, and induced impacts (Vasigh et al., 2008).

Summary

Thanks to John Kasarda and other airport proponents, airports are no longer simple transportation hubs but instead are regarded as local economic drivers. Many different industries rely on aviation activity; whether in the form of air cargo or passenger transportation. The proliferation of internet commerce has created the JIT logistics model that relies on air freight services to transport goods to the buyer. Concurrently, the air passenger has propelled the industry forward as business travel represents nearly half of all air travel.

The presence of an airport in a community is an economic asset because airports offer a specialized service that usually draws users into the community. Airports also make communities more accessible, which further increases the potential for economic impacts. Therefore, the indirect and induced economic impacts of airports are receiving increased focus as they represent a large percentage of the economic impacts when supporting industries agglomerate around airports.

CHAPTER 3
DESCRIPTION OF STUDY AREA

The purpose of this chapter is to describe the study area so that the reader may gain an understanding of the pertinent facts that affect the research.

Orange County Economic Profile

The study area for this research project is Orange County in central Florida. Though other focus areas are discussed and analyzed in this report, Orange County is the primary and consistent point of reference throughout the document. Orange County is bordered by Osceola County (to the south), Lake County (to the west), Seminole County (to the north) and Brevard County (to the east) (Figure 3-1).

Demographics

The total population of the county was 1,145,956 in 2010, making it the fifth most populated county in the state of Florida and accounting for 6.1% of the population. The population is disaggregated into 421,847 households with average size of 2.64 persons. Nearly a half-million housing units in 2010 were located in the county approximately 13.5% of which were vacant compared to 17.5% in the state and 11.4% nationwide (U.S. Census Bureau, 2010a).

In 2010, the median household income was $45,140 in Orange County compared to higher state and national values of $53,093 and $50,046, respectively. In 2010, the Census Bureau estimated that 12.3% of Orange County families had an income that was below the poverty level sometime in the 12 prior months. During the same time, 12% of the families had income levels below the poverty level in the state and 11.3% of fit the same description in the United States. More than 600,000 people in Orange County were in the labor force in 2010 and 12.8% were

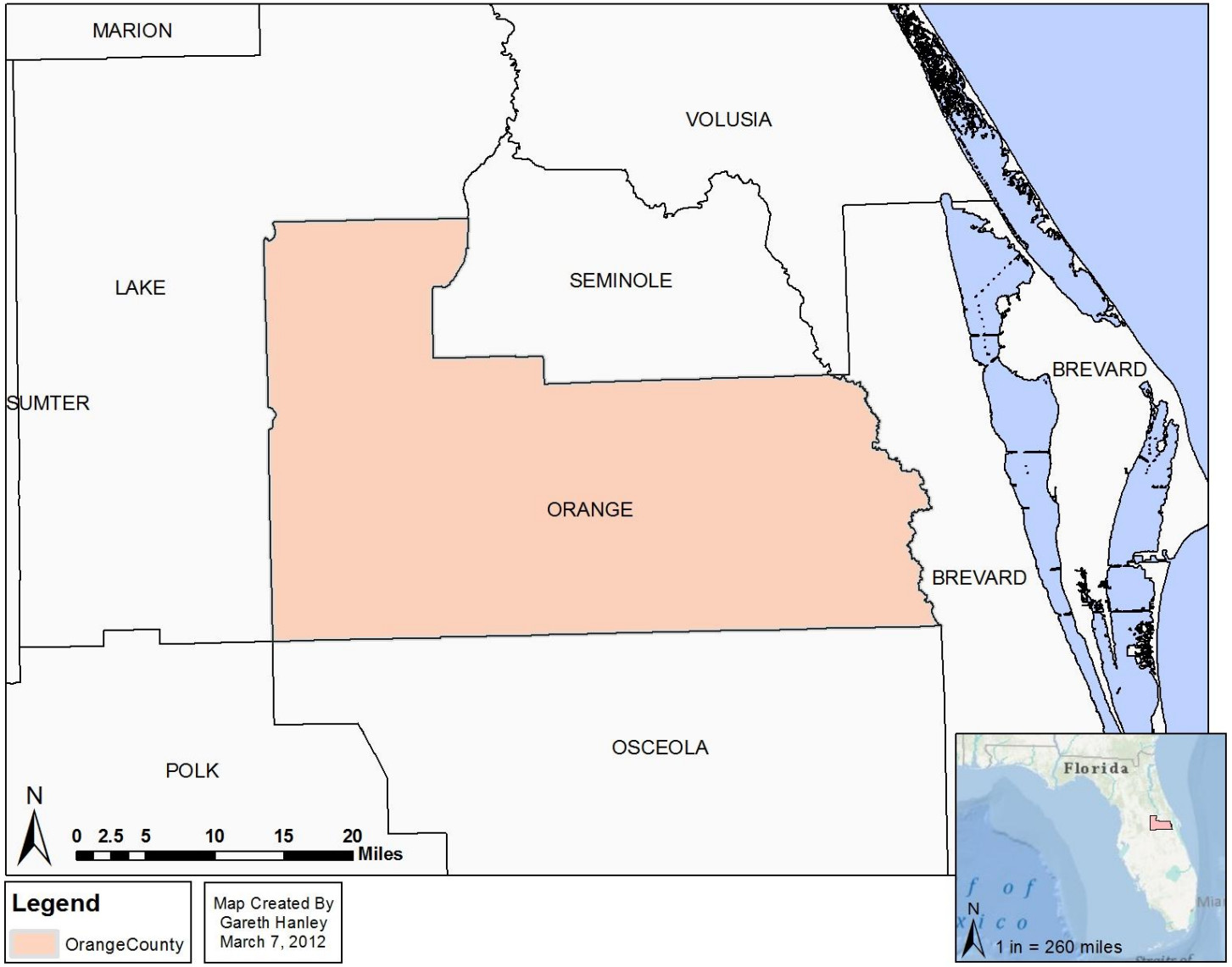

Figure 3-1. Map of Orange County Study Area

unemployed. This is better than the state unemployment figure of 13.3% but worse than the national rate of 10.8% (U.S. Census Bureau, 2010c). Thirty percent of the Orange County residents had earned a bachelor's degree or higher, as of 2010. Compared to the state (25.8%) and nation (28.2%), Orange County has a well educated population (U.S. Census Bureau, 2010b).

The unemployment and vacant property rates show that Florida has been hit especially hard in the recent economic downturn, compared to the nation. Orange County does seem to be faring better than the state but unemployment and vacancy rates are higher than national averages. Despite this higher level of education, median income in Orange County was below the state and national averages. This may be because of the large presence of service and tourism related employers who typically pay less than other industries (Table 3-1). Similarly, a higher percentage of Orange County families earned wages that were below the poverty level. These are indicators that Florida and Orange County could benefit from economic development strategies.

Business Establishments

In 2010, the five largest industry sectors (ranked by employment) in Orange County were as follows: accommodation and food services; retail trade; healthcare and social assistance; arts, entertainment, and recreation; and administrative and waste services (Table 3-1). Each industry sector employed more than 50,000 with the highest employment coming from the accommodation and food services sector – 94,157 jobs in 2010.

Some of the largest private employers include: Walt Disney World, Adventist Health Systems; Universal Orlando; Orlando Health; Busch Entertainment Corporation; Lockheed Martin; and Darden Restaurants (Enterprise Florida, Inc., 2012). Darden

Restaurants – headquartered in Orlando – is Orange County's sole Fortune 500 company with reported revenue of $7.4 million in 2010 (Cable News Network, 2012).

Table 3-1. Top 5 Orange County Industry Sectors, by Employment

Industry	Employment	Percent of Total Employment
NAICS 72 Accommodation and food services	94,157	16.3%
NAICS 44-45 Retail trade	67,900	11.7%
NAICS 62 Health care and social assistance	62,944	10.9%
NAICS 71 Arts, entertainment, and recreation	57,147	9.9%
NAICS 56 Administrative and waste services	56,955	9.8%

Transportation Assets

More than a dozen state and federal highways provide the backbone of the surface-based transportation infrastructure in Orange County (Figure 3-2). Federal Interstate 4 is a primarily east-west corridor that traverses the entire county. Two other federal highways – US-441 and US-17/92 – also pass through the county. Ten state highways crisscross the county and provide increased transportation mobility. Surface transportation is complimented by three railroad operators that transport people and goods through the county – Amtrak, CSX, and Florida Central (Enterprise Florida, Inc., 2012).

Twenty-nine airports (including heliports and seaplane bases) are located within the jurisdictional boundaries of Orange County. This count includes both public and private-use airports. The four public-use airports are Orlando International Airport, Orlando Executive Airport, Orlando Apopka Airport, and Bob White Field. It is important to make special note of Orlando International Airport as it is one of the busiest airports in the country (ranked by enplanements). In 2010, Orlando International Airport ranked thirteenth in the nation and second in the state, by number of enplanements. Only Miami International Airport had more enplanements, by a slim margin, in 2010 than

Orlando International Airport (FAA, 2011). Orlando Apopka Airport and Bob White Field will be discussed in greater detail later in this chapter, as they are the focus of this research.

State Road 429 Extension Corridor

Orange County is the primary study area boundary because of the availability of the data used in this research. The following collection of Zip codes – henceforth referred to as the State Road (SR) 429 Extension Corridor – represents a more specific area within Orange County for which the developmental impact are assessed. The SR 429 Extension Corridor includes three major areas of development. The Wekiva Parkway Interchange Area is a mixed-use development planned for an area bordering the north end of Apopka's city limits. The second area is a regional airport and aviation business park. It is just west of the Apopka city limits and it runs along SR 441. The third site is the Westside Research Park, located at the south end of Apopka, is an agricultural-based business park.

The SR 429 Extension Corridor area is composed of 10 Zip codes (Figure 3-3). The Zip codes are as follows: 32703; 32712; 32757; 32798; 32818; 32830; 34734; 34747; 34761; and 34787. This area was established for use in a different economic evaluation of the proposed extension of Florida State Road 429. The SR 429 Extension Corridor area was also used in this project because of the availability of data from the larger economic assessment.

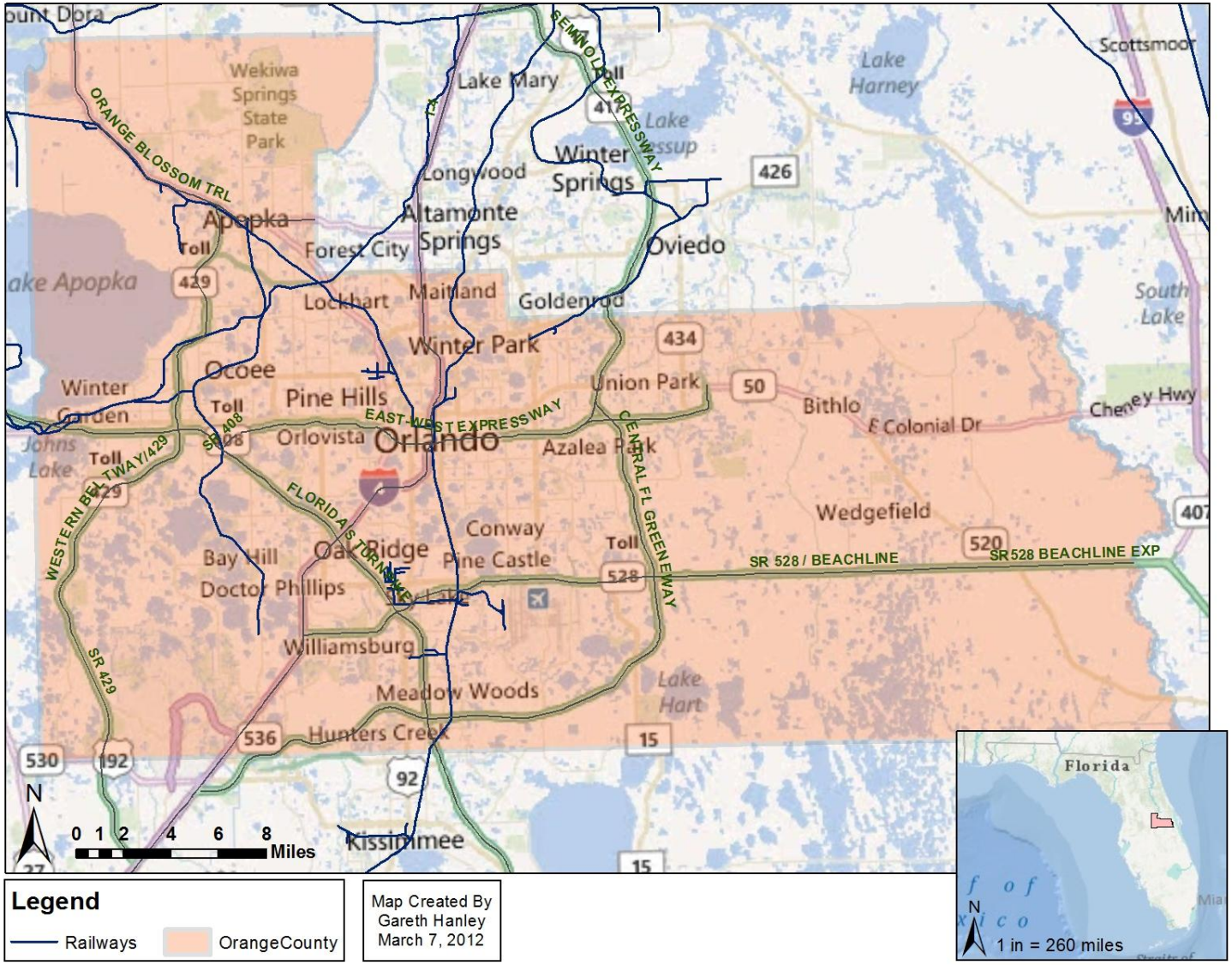

Figure 3-2. Map of Orange County Transportation Infrastructure

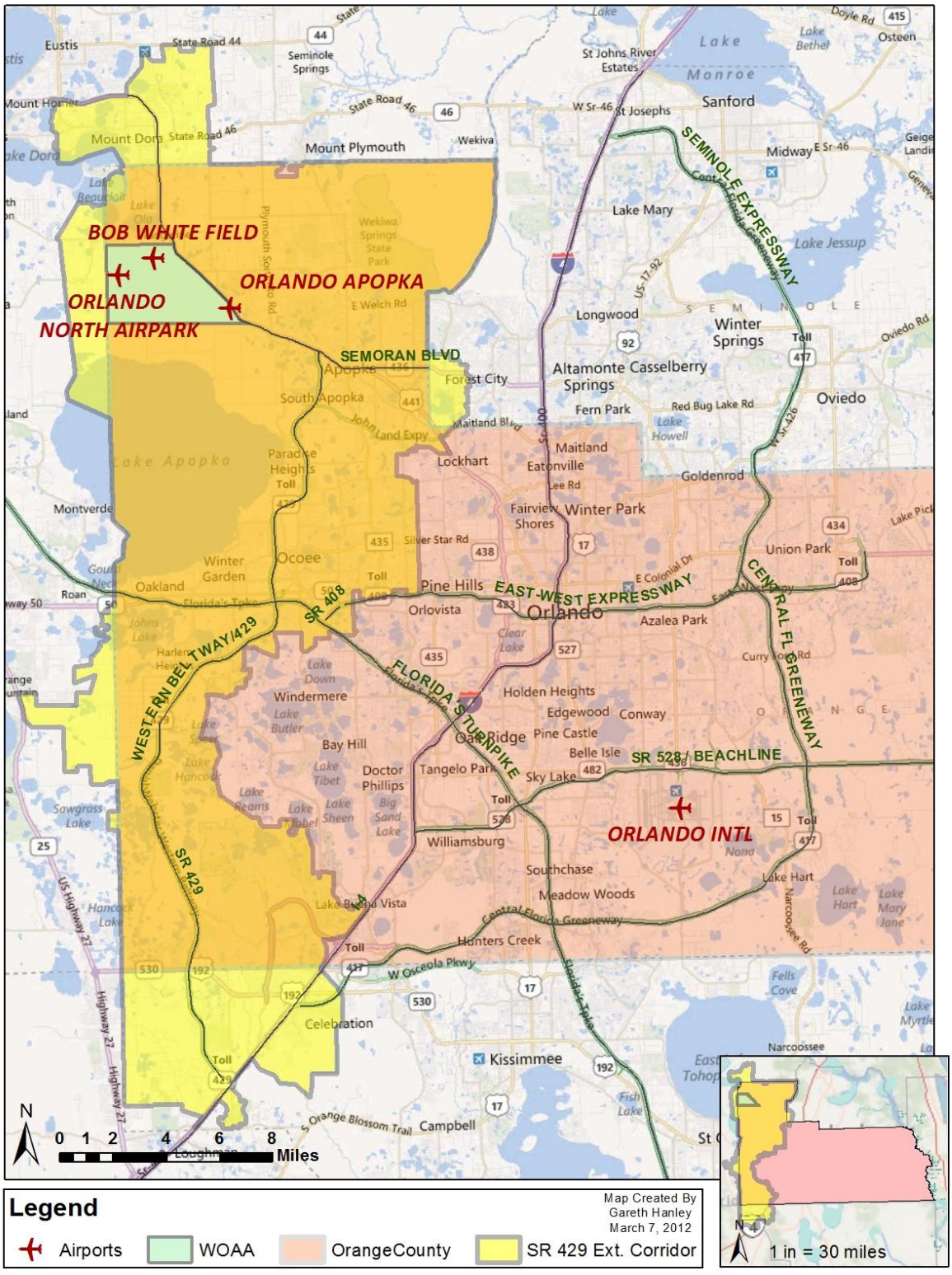

Figure 3-3. Map of SR 429 Extension Corridor Study Area

West Orange Airport Authority

The West Orange Airport Authority (WOAA) is a tri-city committee whose goal is to enhance the aviation accessibility in west Orange County. In 1999, the WOAA become an independent special district by Florida legislative order. In 2007, another legislative order assigned jurisdictional boundaries to this district based on the recommendations of a private feasibility assessment. This area encompasses an area in west Orange County, north of Lake Apopka and west of US-441 (Figure 3-3). It shares similar boundaries with the Central Florida Business and Aviation Center (Orlando Aviation Consultants, 2011). This area includes three airport facilities – Orlando Apopka Airport, Bob White Field, and Orlando North Airpark.

The Florida Aviation System Plan (FASP) is a statewide aviation system plan created in 2005 by the Florida Department of Transportation (FDOT). It combines traditional planning elements with intermodal and strategic planning elements to plan for the state's aviation needs. FASP breaks up Florida into nine regions of differing size. Orange County and WOAA are both completely within the East Central Metropolitan Area region (FDOT, 2012).

Orlando Apopka Airport Profile

The Orlando Apopka Airport is a privately owned, public-use general aviation (private and non-scheduled commercial flights) facility. It is located about 17 miles northwest of the city of Orlando, near the city of Apopka (Figure 3-3) (FDOT, 2010b). The airport operates with a single 3,987 foot long asphalt runway. Due to infrastructure limitations, the airport facilities are only capable of handling smaller aircraft (FDOT, 2010d). In 2008, Orlando Apopka Airport was home to nearly 22,000 general aviation flights, accounting for 1% of general aviation operations in the East Central Metropolitan

Area region of FASP. Airport officials report that nearly 35% of airport activity is related to flight training and an estimated 50% of operations are business related. Tourism-related activity comprises the nearly 15% of remaining airport activity (FDOT, 2009; FDOT, 2010b; FDOT, 2010d).

The airport is located less than two miles from a 10-acre industrial park and is thought to support the transportation needs of the site. Though no FAA or FDOT approved master plan is required for this facility, airport owners have continually attempted to update the existing facilities. Recent modifications include a recently lengthened runway and a newly constructed terminal building. A major barrier to further expansion is the airport's proximity to environmentally sensitive land just west of the property. Despite the barriers of physical growth, owners expect more individuals and corporations will operate out of Orlando Apopka Airport in the coming future as many try to avoid the traffic at the larger airports in the region (FDOT, 2010b).

A 2010 study classified Florida's airports into a categories based on general aviation visitor spending. Orlando Apopka Airport is in a class that includes 21 other airports. These airports averaged 3.1 persons per aircraft operation and had an average of $110 of visitor expenditures per trip. The airport supports more than 230 workers who earn more than $7.5 million annually. This employment represents more than airport employment; it represents the employment of the airport tenants, construction workers, and any other jobs supported by airport activity. The airport's annual direct expenditures are just shy of $10 million and that results in more than $18 million in total annual economic output. The total output is measured by counting employment, annual payroll, and annual economic activity (Wilbur Smith Associates, Inc., 2010; FDOT, 2010d).

Bob White Field Profile

Like the Orlando Apopka Airport, Bob White Field is a privately owned, public-use general aviation airport. It is located about four miles northwest of Orlando Apopka Airport, about one mile west of the community of Zellwood (Figure 3-3). The airfield is equipped with a 3,300 foot grass runway and is served by a 240 square foot terminal building. Due to infrastructure limitations, the airport facilities are only capable of handling small aircraft. In 2008, Bob White Field was home to nearly 20,000 general aviation flights, accounting for less than 1% of regional general aviation operations. The airport is primarily used for sport aviation and recreational purposes. Little to no flight operations serve corporate or business users and the airport owners do not envision much overall growth in the foreseeable future (FDOT, 2010a).

Bob White Field is in a visitor spending tier included 22 other airports. These airports averaged 2.2 persons per flight and $70 of visitor expenditures per trip. The airport supports 18 workers that earn a combined total of $580,000, annually. The airport's annual direct expenditures ring it at $360,000 with a total economic output of $860,000 (Wilbur Smith Associates, Inc., 2010; FDOT, 2010c).

Orlando North Airpark Profile

Orlando North Airpark is a privately owned, private-use airport. It is located about one mile southwest of Bob White Field, straddling the border between Orange and Lake Counties (Figure 3-3). It operates with a 4,000 foot runway that is aligned in an east-west direction. The eastern portion of the runway that is in Orange County is 2,860 feet long and is paved. The remaining 1,140 feet resides in Lake County and is grass (Orlando Aviation Consultants, 2011).

The owner of the airport reported that the airport had 10,000 general aviation operations in 2008 (Orlando Aviation Consultants, 2011). Since this airport is for only for private use this facility is not accepted as part of the FASP. This means that economic and general aviation operation figures are not calculated into regional totals.

Proposed Airport Development

The Central Florida Business and Aviation Center will feature a multimodal business hub comprised of air, road, and rail assets. The goal is to create a new public use airport that will support the growing demand for general aviation in the area. The West Orange Airport Authority hopes that this development will attract businesses and spur economic growth in the area. To qualify for state and federal funds, the new airport would need to meet specific criteria to be accepted into the FASP. At that point, it would be eligible for admittance into the National Plan of Integrated Airport Systems. With existing railroad tracks and spurs bordering the northern and eastern portions of the Central Florida Business and Aviation Center boundary, WOAA has plans for commercial and industrial industry to take advantage of rail accessibility (Orlando Aviation Consultants, 2011). Essentially, WOAA wishes to turn this area into a small-scale industrial aerotropolis.

The purpose of the airport master planning process is to establish specific airport layout, design and jurisdictional judgments. In the meantime, WOAA and the Orlando Aviation Consultants (2011) have generated a few different development scenarios for the purposes of estimating costs for the 20-year outlook of the airport. Orlando Apopka Airport, Bob White Field, and Orlando North Airpark are being considered as possible expansion points for the new WOAA airport.

Conceptual plans

Three main conceptual plans are being discussed for implementation. Each plan adds additional runway infrastructure to an existing airport or creates new facilities entirely. There is no indication that any of the proposed conceptual plans have been identified as more likely to be implemented than any other.

The first concept plan focuses on redevelopment of Orlando Apopka Airport. The existing 3,987 foot runway would be lengthened in the southward to a total length of 6,000 feet. An additional 6,500 foot asphalt runway would also be constructed in the north-south direction, adjacent to the existing runway (Orlando Aviation Consultants, 2011). The 6,000+ foot runways would allow the airport to better handle increased traffic from small business jets (FAA, 2005).

The additional runway would require substantial geotechnical engineering to create a level grade. The proposed location of that runway abuts a steep slope that approaches land owned by the St. Johns River Water Management District (Orlando Aviation Consultants, 2011). Two other runway configurations are also discussed for this plan. One includes the new runway to run perpendicular to the existing runway. The second places the new runway in an east-west orientation, north of the existing runway. The east-west orientation is advantageous because it maximizes wind-based landing opportunities (City of Apopka, 2012).

A number of other developments are planned in the business aviation center in conjunction with the airport. An aviation museum is planned for land adjacent to SR 441, near the Orlando Apopka Airport. A commuter rail station, with accompanying park and ride lot, would be built on the southeast corner of Hermit Smith Road and SR 441. A commercial center is also planned for land near the rail station. Officials hope that its

proximity to the rail station and office developments will help its successful. A trade school with business incubator is also planned for the area near Hermit Smith Road and SR 441. Industrial and warehouse distribution developments would be located around the existing Orlando North Airpark and Bob White Field. Both Orlando North Airpark and Bob White Field will continue to operate in this case. Rail spurs and improved internal roadways would increase local and interregional freight mobility (Orlando Aviation Consultants, 2011).

The second conceptual plan focuses the airport development on the current site of the Orlando North Airpark. The existing runway would be paved and lengthened by 1,000 feet west, across county lines into Lake County. A new, 6,500 foot asphalt runway would also be built parallel to the existing runway. No land grading is required for these runways; however, nearly the entire proposed airport development would be within land currently owned by the St. Johns River Water Management District (Orlando Aviation Consultants, 2011).

The second conceptual plan also calls for the same industrial and business developments as the first concept plan but some would be in different locations. The rail station and trade school would be moved to a location along SR 441, north of the proposed site of the aviation museum (Orlando Aviation Consultants, 2011).

The third conceptual plan focuses the airport development on land adjacent to the existing Bob White Field facilities. The existing grass runway could not be used as a point of expansion for the airport development. It is too near an active rail line and residential properties. Two new asphalt runways (the longest being 6,500 feet) would be built on lands just to the west of the existing airpark. This airport configuration does not

require a notable amount of land grading or encroach on land owned by the St. Johns Water River Management District. This plan also includes the industrial and business amenities with proposed locations similar to the second model (Orlando Aviation Consultants, 2011).

Estimated expenditure outlook

Orlando Aviation Consultants (2011) and WOAA have developed cost and revenue budgets for the proposed airport growth. These budgets were developed to include flexibility to account for slightly different costs that are attributed to each of the conceptual plans. The first budget describes detailed construction cost and the other describes the estimated operational cost and revenues with a 20 year outlook (Appendix A). The current plan is the FAA, FDOT and local authorities to combine to sponsor the airport development.

The construction cost budget describes the amount that will be spent in each of the five phases of the development project. It also specifies how much each agency is expected the commit to each budget item. The total project cost is just shy of $60 million[1] with about $50.8 million coming from the FAA, $4.2 million coming from the FDOT and the remaining $4.6 million coming from local funds. All of these costs are projected in 2010 dollars (Orlando Aviation Consultants, 2011). These costs are universal estimates for all of the concept plans that do not vary despite the different construction tasks required for each plan.

The 20-year operational budget includes estimated cost and revenue details for every year from 2010 to 2030. In 2015, the net operating income is expected to drop to

[1] Projected construction costs total $59,631,044 but nearly $10,000,000 is unaccounted for in the line item budget. This disparity appears to be missing in Phase 2 of the project.

its lowest point of nearly $-132,000 but economic stability is expected to be established soon after (Appendix A). The airport is projected to have a net operating income of $437,000 in 2020 and finish and jump to net operating incomes of $1.1 million and nearly $1.6 million in 2025 and 2030, respectively. These figures were projected based on assumptions that include the airport's operational capabilities and facility use for each year. An example of the assumptions includes recurring utility, administrative, and payroll costs (Orlando Aviation Consultants, 2011).

CHAPTER 4
ECONOMIC BASE ANALYSIS METHODOLOGY AND RESULTS

This is the first of three chapters used to describe the methodologies and results employed to answer the research questions in Chapter 1. The purpose of this chapter is to analyze the public investment in airport development in Orange County. To do this, an economic base analysis is conducted. Economic base analysis includes the location quotient technique (LQ), shift-share analysis, and the Esteban-Marquillas extension.

North American Industry Classification System Overview

All industry activities in the United States are classified and described using the North American Industry Classification System (NAICS). The NAICS industry designation system is the standard by which the Federal government analyzes the business economy (U.S. Census Bureau, 2011b). The 2007 version of the NAICS was used in this study as it was the most recent version of the system available at the time of the analysis. The Bureau of Labor Statistics (BLS), a subsidiary of the U.S. Department of Labor, provides employment data classified into NAICS codes via a website query. Nested, numerical values are used to describe the specific industries; so as more digits are added, the more specific the industry (Blanco, 2010a, slide 27). Four-digit NAICS code data was used in because it provided the necessary level of industry specificity for this analysis. Employment data from 2010 was used because this was the most recent data available from the BLS at the time the data was collected for the research. For the purposes of this study, the 2005 and 2010 employment data was used to calculate LQ, shift-share, and Esteban-Marquillas extension.

Two components of the aviation industry were examined in these analyses. The primary focus was the NAICS 4881 ‘Support Activities for Air Transportation’ industry

sector. This industry sector includes economic activity associated with airport operation, servicing, repairing, maintain and storing aircraft; all things that will be of normal, daily activity at the WOAA airport (U.S. Census Bureau, 2011a). This is primary focus of the research because this industry will have a sustained benefit from the state and federal investment described in Chapter 3.

The secondary focus was the NAICS 4821 'Nonscheduled Air Transportation' industry sector. As the name would indicate, this sector represents economic activity associated with aerial transportation operating on nonscheduled flights. Nonscheduled flights include passenger and cargo movement but these flights are chartered instead of based on a set schedule. These also include recreation and personal use flights. This is difference than the similar sector NAICS 48111 'Scheduled Air Transportation' which represents aerial transportation that occurs via scheduled flights. Scheduled flights generally represent commercial airline (both passenger and cargo) flights. A primary different is that scheduled flights are flown even if maximum capacity of the aircraft is not reached (U.S. Census Bureau, 2011a). Since the WOAA airport is not being designed for or projected to accommodate commercial flights, this researcher deemed it was necessary to specifically focus on nonscheduled flights as a disaggregated form from all air transportation activity.

Though the 'Nonscheduled Air Transportation' sector is not receiving direct investment, it was analyzed because the researcher hypothesizes that this sector will be most affected by secondary spending – indirect impacts – of the investment in airport operations. Analyzing this industry sector, concurrently, may give further justification for

investment in airport operations if it can be proven that there will be substantial multiplier effects.

Construction activities, though it plays a large role in the eventual economic impact of airport development, it is not analyzed in this chapter. This chapter focuses on the justification for public investment; construction activity is simply the means by which the goal is achieved and is not heavily considered as a reason to validate the investment. Its impact, however, will be discussed in later chapters.

Employment Dynamics

Before the analyses were conducted, 2005 and 2010 employment data for the United States, state of Florida and Orange County were examined (Table 4-1). Employment values for the total base economy, the 'Nonscheduled Air Transportation' and 'Support Activities for Air Transportation' are provided in the table.

More than 4.4 million jobs were lost in the United States between 2005 and 2010. Greater than 650,000 jobs and 16,000 jobs were lost in Florida and Orange County, respectively, during the same time period. The 'Nonscheduled Air Transportation' sector experienced job loss at the national and local level but had an increase of 311 jobs in the state industry during the same time. During the tough economic times from 2005 to 2010, the 'Support Activities for Air Transportation' sector fared well, experiencing an employment growth in the nation, state, and county. The United States had an increase of 6,367 jobs while the state added 1,536 jobs. That means that Florida's industry growth represents a 24% of the national job growth in the industry. A local employment increase of 630 represents 41% of the state increase and nearly 10% of the national increase.

There is an intriguing trend that begs the question, why did the 'Support Activities for Air Transportation' experienced such substantial job growth while the base local, state, and national economies were in decline? The following sections of this chapter set out to understand this trend using the results of the economic base analysis tools.

Table 4-1. 2005-2010 Employment

Industry	2005 US Total	2010 US Total	2005 Florida Total	2010 Florida Total	2005 Orange County Total	2010 Orange County Total
Base Industry Total	110,611,016	106,201,232	6,694,864	6,044,806	594,562	578,477
NAICS 4812 Nonscheduled Air Transportation	44,513	40,790	3,350	3,661	378	294
NAICS 4881 Support Activities for Air Transportation	148,201	154,568	14,869	16,405	1,229	1,859

Source: U.S. Bureau of Labor Statistics, 2012

Location Quotient Analysis

Analysis Overview

The location quotient technique is used to "identify the concentration of an industry sector in a local economy relative to a larger reference economy" (Blakely & Leigh, 2010, p. 167). In other words, the location quotient technique compares a specific industry to the entire economy of specific area. In this case, the location quotient was used to compare the industries of Orange County to both economies of the state of Florida and United States in 2010. Therefore, Orange County is henceforth referred to as the 'local' economy while the economies of both Florida and the United States are referred to as 'base' or 'reference' economies. It is important to note that this technique only provides a static assessment of the economy; it does not depict whether an

industry is growing or declining (Blakely & Leigh, 2010, p. 167). Its primary purpose is to measure the relative importance of the different industry sectors in Orange County.

The formula used to calculate the location quotient is as follows:

$$LQ = \left(\frac{e_i}{e}\right) \div \left(\frac{E_i}{E}\right)$$

where

$$LQ = Location\ Quotient$$
$$e_i = local\ employment\ in\ industry\ i$$
$$e_i = total\ local\ employment$$
$$E_i = national\ employment\ in\ industry\ i$$
$$E = total\ national\ employment$$

(Blakely & Leigh, 2010, p. 167-168). The U.S. Bureau of Labor Statistics calculates LQs for different areas throughout the United States. A website interface is used to select data year, study area selected industry. The results can be outputted in tabular form from the website. This method was used to calculate location quotient values.

When looking at the results of the location quotient analysis technique, a number of conclusions can be made. If the location quotient value is less than one, it means that the local industry holds a smaller concentration of the economy relative to the same industry of the larger, reference economy. It suggests that the local economy does not produce enough products or services to meet its need. In this case, the local economy must import products or services to fulfill the need – referred to as an import economy. If the location quotient value is equal to one, then the local industry is just meeting the need for products in the industry and is an indicator that the industry in both the locality and larger economy hold the same percentage of the employment sector. If the location quotient value is greater than one, then it indicates that there is a greater proportion of employment in the local industry when compared to the same industry of the reference economy. It may also suggest that there is an excess of products and services

produced in the locality that can be exported – referred to as an export economy (Blakely & Leigh, 2010). The possible conclusions are summarized and described in Table 4-2.

Table 4-2. Location Quotient Values and Corresponding Conclusions

LQ Value	Conclusion
LQ = 1	The region has the same percentage of employment in that industry as the larger reference area
LQ < 1	The region has a less than proportionate share of employment in that particular industry
LQ > 1	The region has a greater that proportionate concentration of employment in that particular industry
LQ < 0.75	Suggests opportunities exist for import substitution strategies
LQ > 1.25	Suggests export base industries whose further growth will stimulate the overall economy

Source: Blanco, 2010a; Blakely & Leigh, 2010, p. 167

Analysis Results

Table 4-3 lists the industries and corresponding LQ values for the aviation industry sectors. The 'Nonscheduled Air Transportation' industry has LQ values of 0.84 and 1.32 when compared to the state and nation, respectively. These results indicate that the county did not meet its need for the service provided by this industry when compared to the rest of the state. However, when compared to the national economy, the locality did meet its need for the service. In fact such an excess is produced, that it served as an export base industry. This LQ value disparity is an indication that the state had a large proportion of employment in this industry when compared to the entire nation. While the same can be said about the county, when compared to the robust industry in the state, the local industry looks average at best.

When looking at the more specific 'Support Activities for Air Transportation' industry, the LQ values were 1.18 and 2.21 when compared to the state and nation,

respectively. The national LQ value indicates that airport operations had a very high proportionate concentration of employment than the nation. As such, it represented an export base economy because of its excess employment. The lower 1.18 LQ value indicates a higher than proportional employment level in the locality when compared to the state. However, it did not quite meet the minimum requirements to be considered an export base industry.

Table 4-3. Location Quotient Results

Industry	Orange County to Florida	Orange County to United States
NAICS 4812 Nonscheduled Air Transportation	0.84	1.32
NAICS 4881 Support Activities for Air Transportation	1.18	2.21

Shift-Share Analysis

Analysis Overview

The shift-share analysis is a “powerful technique for analyzing changes in the structure of the local economy in reference to the state or nation” (Blakely & Leigh, 2010, p. 181). Unlike location quotient, shift-share is a dynamic economic analytical tool that assesses the changes in the local economy using employment data from two or more points in time. The benefit to using dynamic analyses is that they provide a better understanding of what is changing in the economy and helps analyst plan for anticipated job growth (Blakely & Leigh, 2010). Economic data from 2005 was used as the starting point and data from 2010 was used at the ending point to conduct this analysis. An advantage of shift-share analysis is that local employment trends are normalized based on the trends at the state and national levels. Therefore, results will not be skewed despite overall economic fluctuations during the five year period.

Like the location quotient analysis, the shift-share analysis was conducted by comparing the Orange County economy to the economies of both the state of Florida and United States. The analysis is separated into three parts – economic growth, proportional shift, and differential shift. Each provides a hypothetical local job shift value based on different comparisons. The sum of the total share, mix shift, and competitive shift equals the actual net job shift for the locality

The economic growth portion – also referred to as total share – of the analysis puts the direction of the economy into context and illustrates how local industries are affected as the base economy changes. This portion of the shift-share analysis is used to compare the growth (or decline) of local industries relative to that of the larger economy (Blanco, 2010b). This makes it easy to identify how many jobs were created (or lost) relative to changes in the base economy. A negative economic growth value indicates that the reference economy, as a whole, was in decline during the specific time period. A positive number would indicate that the economy as a whole experienced growth. A value of zero would indicate that the economy experienced a stagnant level of growth during the time period.

Proportional shift – also referred to as mix shift – can inform the researcher of the rate of growth (or decline) of a particular industry in relation to all other industries in the larger economy. It "identifies the industries in the local economy that is contributing to the growth and decline of the economy" (Blanco, 2010b; Blakely & Leigh, 2010, p. 182). A proportional shift value of zero indicates that the local industry is proportional to the overall economy. A negative value indicates that the industry, as a whole, in the reference economy was in decline relative to the entire reference economy during the

specified time. A positive value indicates that the industry, as a whole, in the reference economy if growing relative to the entirety of the reference economy. The actual mix shift coefficient indicates the number of jobs gained or lost at the local level because of dynamism of the industry relative to the entire economy at the base level.

Competitive shift – also referred to as differential shift – compares the health of a specific industry, on the local scale, to that of the same industry on the national scale (Blanco, 2010b). This portion of the shift-share analysis that is most often used by analysts to determine whether local industries are growing or declining relative to the same industry at the state or national level. When an industry in the reference economy is growing, competitive shift identifies the local industries that are growing faster than their national counterparts. Similarly, if an industry in the reference economy is declining, the competitive shift indicates the local industries that are declining less than their national counterparts. Both of these situations are ideal and can be identified by a positive competitive shift value (Blakely & Leigh, 2010).

The formula used to calculate the shift-share is as follows:

$$\overbrace{\Delta e_i = e_i\left[\frac{US^*}{US} - 1\right]}^{\text{Economic Growth}} + \overbrace{e_i\left[\frac{(US_i^*)}{(US_i)} - \left(\frac{US^*}{US}\right)\right]}^{\text{Proportional Shift}} + \overbrace{e_i\left[\frac{(e_i^*)}{(e_i)} - \left(\frac{US_i^*}{US_i}\right)\right]}^{\text{Competitive Shift}}$$

where

$$\Delta e_i = Shift - Share\ Anlysis$$
$$e_i = local\ employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$e_i^* = local\ employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$
$$US = total\ U.S.employment\ at\ the\ beginning\ of\ the\ period$$
$$US^* = total\ U.S.employment\ at\ the\ end\ of\ the\ period$$
$$US_i = U.S.employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$US_i^* = U.S.employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$

(Blanco, 2010b). Either economic or employment data can be used to calculate the shift-share but employment data was used (Blakely & Leigh, 2010). In this study, Orange County's industry employment was compared to both the state and national employment figures.

Analysis Results

Tables 4-4 and 4-5 display the shift-share results for the aviation industry sectors, when compared to Florida and the United States. In general, positive values are preferred instead of negative values but positive values do not always indicate a healthy industry or trend.

Table 4-4. 2005-2010 Shift-Share Results for Orange County to Florida

Industry	Total Share	Mix Shift	Competitive Shift	Actual Net Job Change
NAICS 4812 Nonscheduled Air Transportation	-36.70	71.79	-119.09	-84
NAICS 4881 Support Activities for Air Transportation	-119.33	246.29	503.04	630

Table 4-5. 2005-2010 Shift-Share Results for Orange County to United States

Industry	Total Share	Mix Shift	Competitive Shift	Actual Net Job Change
NAICS 4812 Nonscheduled Air Transportation	-15.07	-16.55	-52.38	-84
NAICS 4881 Support Activities for Air Transportation	-49.00	101.80	577.20	630

Economic growth

The total share values for the aviation industries are both negative when compared to the state and nation. The negative values from all of the industry sectors indicate an overall decline in the reference economies. As was depicted in Table 4-1, the United States and Florida suffered net job losses during the study period. These values represent the proportional loss of employment in the local industry, as a function

of the decline of the larger economy. For example, if the Orange County economy were to follow the same downward trend as the overall state economy, the 'Support Activities for Air Transportation' industry sector would have lost 119 jobs. Similarly, the industry would have suffered 49 job losses if Orange County were to decline as did the United States economy. The same can be said for the 'Nonscheduled Air Transportation' industry sector. This relationship is best described using the analogy of boats on rising and falling seas. As the water rises, so do the boats and vice versa. The boats – which represent the local industries – are affected by the ebb and flow of the overall economy; the local industries are a function of the larger economies.

Mix shift

Each of the aviation industries had a positive mix shift value when the local industry was compared to the state economy. The positive mix shift values indicate that the aviation industries at the state level fared better than the overall state economy. An industry has an advantage when it is growing faster (or declining less) than the economy as a whole. For example, 246 Orange County 'Support Activities for Air Transportation' industry jobs would be gained if the industry trended as did the industry in the state economy.

The mix shift values for the two industries when compared to the nation are split; one is positive and one is negative. The positive mix shift value for the nation is an indication that the national aviation industries have a proportional advantage to the entire national economy. Knowing that there was a decrease in employment in the industry at the national level and the overall state economy (Table 4-1), the positive value indicates that there was less of an employment decrease in the local industry. That is, the 'Support Activities for Air Transportation' industry in Orange County would

have gained 101 jobs if the local industry increased as proportionately as the industry at the national level. Conversely, the negative mix shift value implies that the air transportation industry in Orange County was negatively disproportionate to mix of the industry to the overall economy at the national level. That is, the 'Nonscheduled Air Transportation' industry in Orange County would lose 17 jobs if the local industry was proportionally affected by the industry shift at the national level.

Competitive shift

Positive competitive shift values indicate that the local industry experienced a positive proportional shift in relation to the industry of the reference economy. That is, the industry was growing at a faster rate (or declining at a slower rate) compared to the same industry at the reference economy level. The competitive shift accounted for a growth of 503 Orange County jobs in the 'Support Activities for Air Transportation' sector, when compared to the state and a growth of 577 jobs when compared to the nation. Conversely, 119 jobs were lost in the 'Nonscheduled Air Transportation' sector because of the state competitive shift. The industry also would lose 52 jobs because of the national competitive shift.

Esteban-Marquillas Extension

Analysis Overview

The Esteban-Marquillas extension uses the basis of the shift-share analysis with two modifications; the redefinition of the competitive shift portion and the addition of the allocation effect (Blanco, 2010b). The redefined competitive shift acts similarly to the original competitive shift but is uses a local employment figure that is normalized to a reference economy benchmark. This new employment value is called the homothetic employment. Homothetic employment (formula provided below) is a hypothetical

employment level calculated based on industry proportionality, at the state or national level. Therefore, the competitive shift value calculates a hypothetical local industry employment value based on the normalized employment value – homothetic employment value. The allocation effect is broken into two parts – the specialization effect and the comparative advantage; both tell a slightly different bit of information. The specialization effect informs the researcher if the locality has a specialized industry and the comparative advantage tells if the locality has a comparative advantage compared to the reference economy (Blanco, 2010b).

The formulas used for the homothetic employment and entire Esteban-Marquillas extension are as follows:

$$e_i' = e\left(\frac{US_i}{US}\right)$$

$$\Delta e_i = \overbrace{e_i\left[\frac{US^*}{US} - 1\right]}^{\text{Economic Growth}} + \overbrace{e_i\left[\frac{(US_i^*)}{(US_i)} - \left(\frac{US^*}{US}\right)\right]}^{\text{Proportional Shift}} + \overbrace{e_i'\left[\frac{(e_i^*)}{(e_i)} - \left(\frac{US_i^*}{US_i}\right)\right]}^{\text{Redefined Competitive Shift}}$$

$$+ \underbrace{(e_i - e_i')\left[\left(\frac{e_i^*}{e_i}\right) - \left(\frac{US_i^*}{US_i}\right)\right]}_{\text{Allocation Effect}}$$

where

$$e_i' = local\ homothetic\ employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$\Delta e_i = Esteban - Marquillas\ extension$$
$$e = total\ employment\ at\ the\ beginning\ of\ the\ period$$
$$e_i = local\ employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$e_i^* = local\ employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$
$$US = total\ U.S.employment\ at\ the\ beginning\ of\ the\ period$$
$$US^* = total\ U.S.employment\ at\ the\ end\ of\ the\ period$$
$$US_i = U.S.employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$

$$US_i^* = U.S. employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$

(Blanco, 2010b). The equations for the specialization effect and comparative advantage are extracted from the allocation effect and listed as follows:

$$a_i = \underbrace{(e_i - e_i')}_{\text{Specialization Effect}} \underbrace{\left[\left(\frac{e_i^*}{e_i}\right) - \left(\frac{US_i^*}{US_i}\right)\right]}_{\text{Comparative Advantage}}$$

where

$$a_i = Allocation\ Effect$$
$$e_i = local\ employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$e_i^* = local\ employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$
$$e_i' = local\ homothetic\ employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$US_i = U.S. employment\ in\ industry\ i\ at\ the\ beginning\ of\ the\ period$$
$$US_i^* = U.S. employment\ in\ industry\ i\ at\ the\ end\ of\ the\ period$$

(Blanco, 2010b). If the specialization effect value is greater than zero, the locality is considered to be specialized. The specialization effect value is less than zero, the locality is not specialized. If the comparative advantage value is greater than zero, the locality has a comparative advantage and if the value is less than zero, the locality does not have a comparative advantage. If the industry is specialized but there is no competitive advantage, then intervention may be effective. If the industry is not specialized but there is a comparative advantage, intervention may be effective (Blanco, 2010b).

Analysis Results

Tables 4-6 and 4-7 describe the Esteban Marquillas Extension results when compared to Florida and the United States, respectively. The state benchmarked homothetic employment for the ‘Support Activities for Air Transportation’ industry sector

is larger than the actual employment, which creates a negative specialization effect. Despite the negative specialization effect, a positive value of 540.49 was established for the redefined competitive shift. When compared to the nation, the smaller homothetic employment produces a positive specialization effect. This, again, results in a positive redefined competitive shift. The positive redefined competitive shift values signify the amount of jobs created based on industry trends, when the homothetic employment shift is applied.

Table 4-6. Esteban Marquillas Extension 2005-2010 Orange County to Florida

Industry	Homothetic Employment	Redefined Competitive Shift	Specialization Effect	Comparative Advantage
NAICS 4812 Nonscheduled air transportation	297.51	-93.73	80.49	-0.32
NAICS 4881 Support activities for air transportation	1320.50	540.49	-91.50	0.41

Table 4-7. Esteban Marquillas Extension 2005-2010 Orange County to United States

Industry	Homothetic Employment	Redefined Competitive Shift	Specialization Effect	Comparative Advantage
NAICS 4812 Nonscheduled air transportation	239.27	-33.16	138.73	-0.14
NAICS 4881 Support activities for air transportation	796.62	374.13	432.38	0.47

The ‘Nonscheduled Air Transportation’ industry sector has homothetic employment values less than the actual industry employment values, when compared to both the state and nation. When the homothetic employment values (297.51 for the state and 239.27 for the nation) are subtracted from the actual employment (378), the two positive specialization effect values are the result. The resulting values indicate that the ‘Nonscheduled Air Transportation’ industry sector had 80.49 and 138.73 more jobs in the local industry than was the amount that would be hypothesized based on the

structure of the industry in the state and nation, respectively. Both redefined competitive shift values for the industry are negative. Assuming that the local industry employment was established based on the benchmark; the values indicate the hypothetical number of jobs that declined because of the industry trends at the state and national level.

Summary

The results presented in this Chapter are analyzed and discussed in Chapter 7. It is important to remember that the results of these economic base analyses are not taken out of context. Though conclusions are made about the health of local industries, they are only made in reference to state and national employment proportions. These methodologies rely on the assumption that the national and/or state economies, themselves, are well proportioned.

CHAPTER 5
INPUT-OUTPUT ANALYSIS METHODOLOGY AND RESULTS

This chapter describes the methodology and results of the input-output analysis. It is the second of three chapters that describes the methodology and results of the analyses used to answer the research questions. The purpose of this chapter is to quantify the economic impact of airport development.

Analysis Overview

The input-output analysis was created to measure the economic impact of monetary transactions between different sectors of the economy in a given year. In normal economic transactions, firms purchase goods and services from multiple agencies to produce its goods and/or services. The resulting goods and services are used by other firms and consumers to conduct their business. The cycle repeats itself in a healthy economy. This multiplier effect is the basis of economic development analysis for the input-output technique. Multipliers are represented by coefficient values that usually range from 1.5 to 1.75. It allows for the examination of linkages between industry sectors (Blakely & Leigh, 2010; Blanco, 2010c).

The input-output analysis has been used to measure the economic impact of airports for more than 20 years. Researchers were polled in a 2008 study and the consensus was that input-output models are the most useful analysis for measuring an airport's economic significance (Transportation Research Board, 2008).

Three outputs are produced by this methodology – the direct impacts, indirect impacts, and induced impacts. As was mentioned in Chapter 2, these three impact types measure different layers of transactions. Multiplier coefficients, employment

impacts, and monetary impacts are produced as results for each transaction level (Blakely & Leigh, 2010).

IMPLAN Software

For the purposes of this research project, the input-output analysis was conducted using the computer software package called IMPLAN® Version 3.0. The name IMPLAN is an acronym that stands for impact analysis for planning. Multiple software packages can be used to perform this analysis but according to researchers, IMPLAN is one of the best programs. It is the industry leader and is in widespread use by economic development professionals (Blakely & Leigh, 2010).

An IMPLAN model is basically a session in which analysis settings (study area included) are set. Multiple scenarios (referred to as activities) can be created and analyzed in each model. An activity is described as a group of related spending events that represents some sort of industry change (MIG, Inc., 2012). To illustrate the components necessary to create an activity, consider the following example. An activity may be the development of a new retail store. This activity would be comprised of multiple events that represent the different economic transactions necessary to develop the store (i.e., architectural, construction, and advertising services). A sector designation would be assigned to each event and dollar amount would be entered to represent the amount that would be spent in each industry. IMPLAN uses its own set codes for the different industry sectors (MIG, Inc., 2011a). They are not the same as the NAICS codes but can easily be cross-referenced with a sector search query built into the software.

Two models were created for this analysis and each of the airport scenarios listed below was run in each model. The first was focused on the economic impacts for the

entirety of Orange County. The SR 429 Extension Corridor was the study area for the second model, with a slight modification. Two of the 10 ZIP code jurisdictions (32757 and 34747) cross into Lake County and were omitted from the study area of this portion of the analysis. This is because the IMPLAN dataset only represented Orange County; data was not available for the two ZIP codes that crossed the county border.

Construction Costs

Several IMPLAN scenarios were created to represent the different scenarios that were examined for this project. The first was to look at the economic impacts of the five phases of airport construction. Table A-1 described detailed construction expenses for each phase of the project. The model was created to take into account, each listed construction expenditure. NAICS sector codes were attributed to each budget line in the table, based on the expenditure title. These sector codes were then cross-referenced with the corresponding IMPLAN sector code. The IMPLAN software fails to include specific sector codes for the different types of construction events but rather groups them under one generic sector code. Therefore, the majority of the budget items were eventually assigned to that generic construction sector code. Lastly, each activity event was assigned an industry sales value equivalent to and these figures were calculated in 2010 dollars. The five phases of construction were combined and analyzed as a single scenario.

Operational Costs

Data from the 20-year budget outlook was used for this portion of the analysis. For this, data from Table A-1 was used. Four separate activities were created, one for each of the following budget years (2015, 2020, 2025, and 2030). A single event – with a sector to represent airport operations – was used for each of the activities. When this

sector was applied, the IMPLAN software assigned default employment values to the event; however, employment figures were used in the analysis instead of the assigned default values. Using case specific employment numbers rather than software defaults creates more accurate results. The total operating expenses sums from the table was used in the model as the industry expenditure values. It is important to note that each activity was run with the appropriate modifiers to simulate costs in the particular years. For example, the 2015 expenditure totals were entered and the model was run to simulate impacts in 2015 as opposed to the default setting of 2011.

Analysis Results

The IMPLAN software produced economic impact summary tables for each of the scenarios. The direct, indirect, and induced effects are summarized for the projected employment, labor income, value added, and output figures. The employment figures do not discriminate from full-time or part-time jobs. They are not full-time equivalents so it is possible for workers to work multiple jobs in the model. The labor income measure is calculated by adding the total wages of the workers and sole-proprietor incomes. It is important to note that this figure also includes employee benefits like insurance or retirement packages and not simply the take home pay. The value added measure is the sum of the labor income measure, as well as costs like property income and indirect business taxes. The total output is the total value of economic production. It is the sum of the value added measure and the cost of making the goods needed to produce the end product or service (MIG, Inc., 2012).

Multiplier Coefficients

IMPLAN, and all other input-output analysis tools, use multiplier coefficients. The power of input-output software packages reside with their isolation of local multiplier

coefficients. These coefficients are unique to the study area and are established based on the presence of firms from different industry sectors. At the national level, every firm in the United States is taken into account and the presence of a greater number and diversity of firms would create higher multiplier effects. Therefore, regional multipliers would never supersede national multiplier values because the less diverse industry presence at the regional level yields a smaller multiplier coefficient.

The industry sectors described in Table 5-1 include 'Nonscheduled Air Transportation', 'Support Activities for Air Transportation', and the four sectors directly affected by the construction investments. Of the sectors in Table 5-1, the 'Nonscheduled Air Transportation' sector has the lowest multiplier with a value of 1.32 for the SR 429 Extension Corridor and 1.43 for Orange County. This means that if one dollar was invested in this sector, there would be $1.32 of total economic impact in the SR 429 Extension Corridor or $1.43 in the entire Orange County.

Table 5-1. Study Area Multiplier Coefficients

Industry	SR 429 Ext. Multiplier	Orange County Multiplier
NAICS 23 Construction	1.40	1.63
NAICS 4812 Nonscheduled Air Transportation	1.32	1.43
NAICS 4881 Support Activities for Air Transportation	1.45	1.70
NAICS 5413 Architectural, Engineering, and Related Services	1.48	1.76
NAICS 5416 Management, Scientific, and Technical Consulting Services	1.49	1.76
NAICS 5629 Remediation and Other Waste Management Services	1.40	1.60

Construction Scenarios

IMPLAN uses the study area multipliers and predefined industry linkages to create impact estimates for a number of performance measurements (i.e., employment, labor income, total value added, and output) for each industry sector. Tables 5-2 and 5-3 describe summarized economic impact for the five phased construction project for the study area. Airport construction is expected to support 546 jobs in the SR 429 Corridor and will earn nearly $30 million dollars. With a direct investment of nearly $50 million, officials can expect more than $70 million of total economic activity in the SR 429 Extension Corridor. Airport construction is expected to support 652 jobs Orange County jobs. Total worker compensation will exceed $35 million. A direct investment of almost $50 million will spur more than $82 million of economic activity in Orange County. The total effect is greater for Orange County than it is for SR 429 Extension Corridor because a larger study area allows a greater opportunity for impacts. This is the result of larger multiplier effects for Orange County when compared to SR 429 Extension Corridor.

2015 Airport Operations Scenarios

Tables 5-4 and 5-5 describe the economic impact of airport operations in 2015 for both the SR 429 Extension Corridor and the entire county. The $2.7 million airport expenditure is expected to support 44 jobs in the SR 429 Extension Corridor and an additional five jobs in the county. Workers will earn more than $2.2 million in the SR 429 Extension Corridor and nearly than $2.5 million in the county. Officials can expect nearly $4 million of total economic activity in the SR 429 Extension Corridor and more than $4.6 million in the entire county.

Table 5-2. Construction Scenario Impact Summary for SR 429 Ext. Corridor

Impact Type	Employment	Labor Income (in 2010 dollars)	Value Added (in 2010 dollars)	Output (in 2010 dollars)
Direct Effect	372.2	$22,362,318	$25,255,235	$49,700,044
Indirect Effect	70.7	$3,409,615	$5,203,177	$8,558,475
Induced Effect	103.4	$4,166,919	$7,683,594	$11,937,569
Total Effect	546.2	$29,938,852	$38,142,006	$70,196,088

Table 5-3. Construction Scenario Impact Summary for Orange County

Impact Type	Employment	Labor Income (in 2010 dollars)	Value Added (in 2010 dollars)	Output (in 2010 dollars)
Direct Effect	386.7	$22,759,733	$25,691,527	$49,700,044
Indirect Effect	122.1	$6,466,133	$9,502,520	$15,550,142
Induced Effect	143.7	$6,128,985	$10,794,631	$17,272,252
Total Effect	652.5	$35,354,851	$45,988,678	$82,522,439

Table 5-4. 2015 Airport Operations Scenario Impact Summary for SR 429 Ext. Corridor

Impact Type	Employment	Labor Income (in 2015 dollars)	Value Added (in 2015 dollars)	Output (in 2015 dollars)
Direct Effect	34	$1,740,095	$1,829,098	$2,721,308
Indirect Effect	2.9	$154,314	$216,488	$366,299
Induced Effect	7.1	$313,867	$579,385	$881,820
Total Effect	44	$2,208,276	$2,624,971	$3,969,427

Table 5-5. 2015 Airport Operations Scenario Impact Summary for Orange County

Impact Type	Employment	Labor Income (in 2015 dollars)	Value Added (in 2015 dollars)	Output (in 2015 dollars)
Direct Effect	34	$1,740,095	$1,826,047	$2,721,308
Indirect Effect	5.8	$295,727	$424,063	$716,954
Induced Effect	9.3	$439,578	$774,846	$1,235,647
Total Effect	49.2	$2,475,399	$3,024,957	$4,673,909

2020 Airport Operations Scenarios

Table 5-6 and 5-7 describe the economic impacts of the proposed 2020 airport expenditures in the SR 429 Extension Corridor and Orange County. The airport is expected to support 64 employees in 2020. An additional 22 employees will be supported in the SR 429 Extension Corridor and more than 35 additional jobs will be

supported in the county. The increased employment from 2015 is based on the assumption that the airport will operate at an increasing level every year through 2030. The workers in the SR 429 Extension Corridor will earn more than $4.8 million and nearly $5.6 million in the county. With a direct investment of $8.7 million, total economic impact will exceed $11.8 million in the SR 429 Extension Corridor and $13.9 million in the county.

2025 Airport Operations Scenarios

Tables 5-8 and 5-9 describe the economic impact of the 2025 airport operation scenarios for the SR 429 Extension Corridor and Orange County. In 2025, it is expected that the airport will directly employ 94 workers. A total of 129 workers will be supported in the SR 429 Extension Corridor and will earn nearly than $8.2 million. The total economic impact of airport operations will be nearly than $21.9 million in the SR 429 Extension Corridor. Looking at the entire county, 150 workers will be supported and will earn about $9.5 million. The total economic impact will be about $25.9 million in the county in 2025.

Table 5-6. 2020 Airport Operations Scenario Impact Summary for SR 429 Ext. Corridor

Impact Type	Employment	Labor Income (in 2020 dollars)	Value Added (in 2020 dollars)	Output (in 2020 dollars)
Direct Effect	64	$3,660,762	$3,946,511	$8,736,882
Indirect Effect	8.2	$474,295	$665,390	$1,154,856
Induced Effect	14.3	$703,063	$1,299,284	$1,960,038
Total Effect	86.5	$4,838,120	$5,911,185	$11,851,776

2030 Airport Operations Scenarios

Tables 5-10 and 5-11 summarize the economic impacts of 2030 airport operations in both the SR 429 Extension Corridor and the County. The airport is projected to employ 124 workers in 2030. Employment totals will reach 175 if just looking at the SR

429 Extension Corridor or 206 in the entire county. With a direct investment of about $28 million, the SR 429 Extension Corridor would experience an economic impact of about $36.9 million. A $43.9 million impact would be felt in the entire county off of the same investment.

Table 5-7. 2020 Airport Operations Scenario Impact Summary for Orange County

Impact Type	Employment	Labor Income (in 2020 dollars)	Value Added (in 2020 dollars)	Output (in 2020 dollars)
Direct Effect	64	$3,660,762	$3,924,942	$8,736,882
Indirect Effect	16.2	$908,937	$1,303,389	$2,318,888
Induced Effect	19.5	$1,015,650	$1,791,723	$2,888,631
Total Effect	99.7	$5,585,349	$7,020,055	$13,944,402

Table 5-8. 2025 Airport Operations Scenario Impact Summary for SR 429 Ext. Corridor

Impact Type	Employment	Labor Income (in 2025 dollars)	Value Added (in 2025 dollars)	Output (in 2025 dollars)
Direct Effect	94	$6,124,345	$6,660,881	$16,404,816
Indirect Effect	13.3	$852,565	$1,196,067	$2,138,273
Induced Effect	22.1	$1,196,821	$2,212,599	$3,346,410
Total Effect	129.4	$8,173,730	$10,069,548	$21,889,499

Table 5-9. 2025 Airport Operations Scenario Impact Summary for Orange County

Impact Type	Employment	Labor Income (in 2025 dollars)	Value Added (in 2025 dollars)	Output (in 2025 dollars)
Direct Effect	94	$6,124,345	$6,599,220	$16,404,816
Indirect Effect	26.3	$1,633,854	$2,342,898	$4,411,854
Induced Effect	30.3	$1,741,266	$3,072,607	$5,071,137
Total Effect	150.6	$9,499,465	$12,014,725	$25,887,808

Table 5-10. 2030 Airport Operations Scenario Impact Summary for SR 429 Ext. Corridor

Impact Type	Employment	Labor Income (in 2030 dollars)	Value Added (in 2030 dollars)	Output (in 2030 dollars)
Direct Effect	124	$9,489,795	$10,403,787	$27,945,684
Indirect Effect	19.6	$1,390,385	$1,950,577	$3,605,826
Induced Effect	31.4	$1,881,354	$3,479,291	$5,328,217
Total Effect	175	$12,761,534	$15,833,655	$36,879,727

Table 5-11. 2030 Airport Operations Scenario Impact Summary for Orange County

Impact Type	Employment	Labor Income (in 2030 dollars)	Value Added (in 2030 dollars)	Output (in 2030 dollars)
Direct Effect	124	$9,489,795	$10,264,234	$27,945,684
Indirect Effect	38.8	$2,664,531	$3,820,858	$7,655,259
Induced Effect	43.3	$2,751,990	$4,857,256	$8,294,580
Total Effect	206.1	$14,906,316	$18,942,348	$43,895,522

Top 10 Affected Industries

Tables 5-12 and 5-13 describe the top 10 affected industries by the airport operations investment for each of the analyzed years. The tables display the total output figures and are ranked by the output results of the 2030 scenario; surprisingly, the rankings do differ slightly between scenario years.

Not surprisingly, 'Support Activities for Air Transportation' represents the highest output in each of the scenarios because it is the industry that receives the direct funding investments. A notable industry sector ranked among the top 10 is the 'Imputed Rental Activity for Owner-occupied Dwellings.' It is not a NAICS industry sector but rather one created by IMPLAN to help describe their results. The sector describes economic activity associated with owning a home, which include repair and maintenance on the home. No employment is associated with the industry and the only output by the industry is home ownership so its further contribution to the economy is naturally limited (MIG, Inc., 2011b).

Summary

A $50 million investment in construction yields $70.2 million of economic impacts in the SR 429 Extension Corridor and $82.5 million of economic impacts in Orange County. A total of 546 and 652 jobs would be supported in the SR 429 Extension Corridor and Orange County respectively. The 2030 airport operations budget of $28

million would yield an economic impact of $37 million in the SR 429 Extension Corridor and $44 million in Orange County. Airport operations activities would support 175 annual jobs in the SR 429 Extension Corridor and 206 jobs in Orange County. The results presented in this Chapter are analyzed and discussed in Chapter 7.

Table 5-12. Top 10 Affected Industries for Airport Operations by Output in SR 429 Ext. Corridor

NAICS Sector	2015	2020	2025	2030
4881 Support Activities for Air Transportation	2,438,368.6	6,777,093.6	11,016,365.9	16,246,603.3
Imputed Rental Activity for Owner-occupied Dwellings	142,555.1	291,701.7	450,567.6	642,430.8
531 Real Estate	83,374.7	188,058.3	295,281.0	425,356.4
622 Hospitals	74,869.6	150,818.7	231,734.5	328,866.4
6211-3 Offices of Physicians, Dentists, and Other Health Practitioners	70,884.9	143,016.0	219,862.2	312,166.4
722 Food Services and Drinking Places	62,334.0	129,558.9	200,481.5	286,030.9
42 Wholesale Trade	59,532.3	127,261.3	197,840.2	283,054.9
491 Postal Service	33,358.6	91,388.9	148,249.3	218,343.0
5613 Employment Services	27,705.4	74,410.0	120,352.1	176,915.1
336412 Aircraft Engine and Engine Parts Manufacturing	26,375.5	73,267.3	119,088.9	175,619.9

Table 5-13. Top 10 Affected Industries for Airport Operations by Output in Orange County

NAICS Sector	2015	2020	2025	2030
4881 Support Activities for Air Transportation	2,468,768.9	6,860,690.8	11,152,054.3	16,446,525.1
Imputed Rental Activity for Owner-occupied Dwellings	147,573.5	311,143.8	483,832.2	693,333.6
492 Couriers and Messengers	100,185.9	276,623.5	449,242.0	662,135.0
531 Real Estate	101,320.4	233,049.6	367,433.7	530,932.5
622 Hospitals	91,991.1	191,146.5	295,804.3	422,076.3
5241 Insurance Carriers	66,834.4	156,005.0	246,926.5	357,971.1
6211-3 Offices of Physicians, Dentists, and Other Health Practitioners	72,957.5	151,797.2	235,013.6	335,467.3
42 Wholesale Trade	64,562.8	142,352.0	222,752.0	320,241.8
722 Food Services and Drinking Places	66,668.4	143,142.0	223,070.4	319,933.3
491 Postal Service	46,857.5	128,230.1	207,987.1	306,306.6

CHAPTER 6
CLUSTER ANALYSIS METHODOLOGY AND RESULTS

This chapter describes the methodology and results of the cluster analysis. It is the third and final chapter that describes the analyses used to answer the research questions. The purpose of this chapter is to identify possible industry clusters that contribute to the economic impact.

Analysis Overview

A cluster is a "network of interrelated firms that buy and sell from the same suppliers, share markets, and are supported by a common specialized infrastructure" (Blakely & Leigh, 2010, p. 191). A cluster of firms may have an increased potential for job creation and contribution to the success of the local economy. Airport operation is the long-term and regular economic activity that will occur because of the initial construction expenditure. Therefore, the purpose of the analysis is to identify possible clusters of supporting industries in the area that may promote the continued success of airport operations.

Clusters are generally defined by four characteristics: geographic concentration; competitive advantage; supplier and buyer advantages; and advantageous infrastructure (Blakely & Leigh, 2010; Blanco, 2010c). LQ, input-output and geographic information system (GIS) data was used to help identify these possible clusters. The top 10 affected industry sectors of Orange County (Table 5-13) were used as a starting point in identifying possible clusters. The industry sectors in those are most affected by airport operations and therefore indicate specialized industry linkages necessary for a cluster. Using this industry list, LQ data was acquired for each sector to verify its competitive advantage (Table 6-1). As was mentioned in the previous chapter, the

‘Imputed Rental Activity for Owner-occupied Dwellings’ industry sector does not have a corresponding NAICS code so this sector was not used in this analysis. GIS analysis then was used to confirm both geographic concentration and physical proximity to advantageous infrastructure. Not only must the firms be clustered near one another but they also must be near advantageous infrastructure. For this analysis, the WOAA airport was the advantageous infrastructure.

GIS data was acquired from the U.S. Census Bureau in the form of Longitudinal Employer-Household Dynamics (LEHD) data. LEHD data provides employment figures by census bock for each major industry sector. This data is available in tabular form and was integrated with spatial data so that it may be analyzed using GIS processes.

Analysis Results

Table 6-1. LQ Values for Industries Most Affected by Airport Operations

Industry	Orange County to Florida	Orange County to US
NAICS 42 Wholesale Trade	0.81	0.8
NAICS 491 Postal Service	2.40	1.54
NAICS 492 Couriers and Messengers	1.34	1.26
NAICS 524 Insurance Carriers and Related Activities	0.67	0.71
NAICS 531 Real Estate	1.27	1.85
NAICS 621 Ambulatory Health Care Services	0.68	0.77
NAICS 622 Hospitals	0.92	0.89
NAICS 722 Food Services and Drinking Places	0.96	1.05

Table 6-1 describes the LQ values for each of the most affected industries of Orange County (except the ‘Support Activities for Air Transportation’ sector which is in Table 4-3). Note the varying specificity of the industry sectors; this, as closely as possible, represents the industry sector that is correlated to the IMPLAN sector. With the goal of identifying industries that were specialized in the locality, industry sectors

with LQ values greater than one (when compared to the state or nation) were selected to be part of the GIS analysis. These sectors include: ‘Support Activities for Air Transportation’; ‘Postal Service’; ‘Couriers and Messengers’; ‘Real Estate’; and ‘Food Services and Drinking Places’.

Since the LEHD data was organized by census blocks, that unit was used as areas of specialization. Note that LEHD industry data is limited to two NAICS codes of specificity. For example, NAICS sector 72 ‘Accommodation and Food Services’ was used to represent NAICS 722 ‘Food Services and Drinking Places’. All census blocks with at least 10% of the total employment of each of the industry sectors was selected. A total of six areas fit this criteria; one being within the SR 429 Extension Corridor (Figure 6-1).

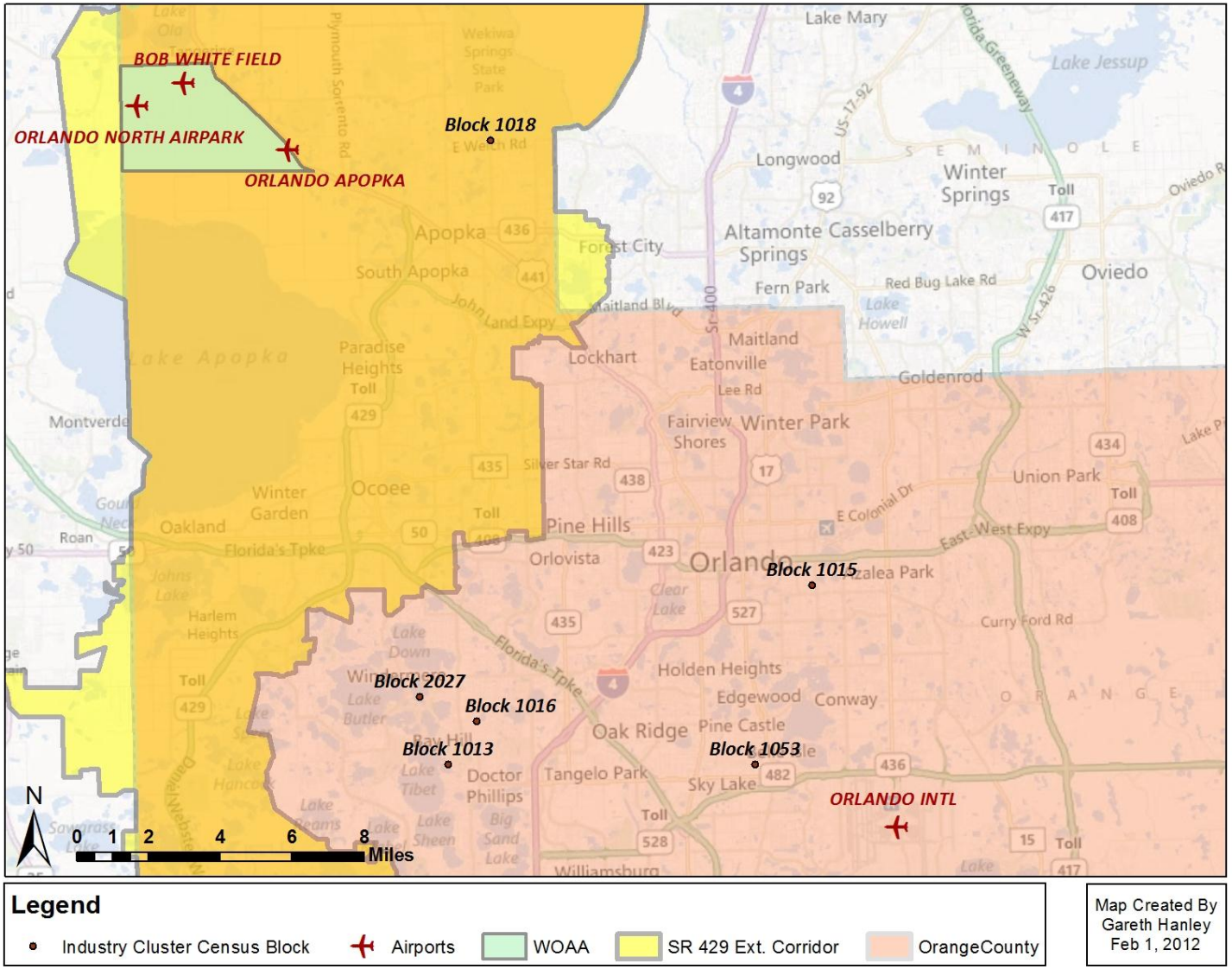

Figure 6-1. Location of Potential Industry Clusters

CHAPTER 7
DISCUSSION OF RESULTS

This chapter integrates the qualitative and quantitative results of the methodologies of Chapters 4, 5 and 6. This is a holistic discussion of the available findings to make conclusions that satisfy the research questions set forth in Chapter 1.

Support Activities for Air Transportation Sector

A healthy industry shows efficient economic linkages and the impressive employment growth figures described in Table 4-1 gives the first indication that investment in the 'Support Activities for Air Transportation' sector is justified. The LQ values help substantiate this claim. Both values are greater than 1.0 so that indicates healthy and possibly specialized local industries. The high 2.21 LQ value (when compared to the nation) is an indicator of a strong, export base industry. That is, the state and national 'Support Activities for Air Transportation' was strong enough to grow in spite of major job losses in the state and national economies.

Despite these positives indications of a successful local industry, it's necessary to analyze the dynamism of the industry with the shift-share and Esteban-Marquillas Extension analysis.

As was mentioned in Chapter 4, the negative total share values of the shift-share analysis are expected and do not reflect negatively on the local industry. In fact, positive mix shift values were complimented by the negative total share values. These values indicate that the 'Support Activities for Air Transportation' industry sector at the reference economy level experienced an employment growth while the overall economies were in decline. It is a good sign that the national and state 'Support Activities for Transportation' sectors are growing because it dispels a possible

reservation in investing in a local industry that is failing at the higher levels. The positive competitive shift values provide indications of a healthy local industry, especially since the mix shift values were also positive. In summary, the shift share values (when compared to the nation) suggest that though the overall national economy was in decline from 2005 to 2010, the national 'Support Activities for Air Transportation' industry was growing. More importantly, the Orange County 'Support Activities for Air Transportation' industry sector was growing at a faster rate that the increasing national industry sector. The same can also be said about the shift share values when compared to the state: the local 'Support Activities for Air Transportation' industry sector was growing faster at the local level when compared to the state industry, also growing in a declining overall state economy.

The Esteban-Marquillas Extension analysis is where the indications of industry health presented by the results of the LQ and shift-share are confirmed. The high LQ value (when compared to the nation) insinuated that the local industry was specialized and indeed it is. The positive specialization value of the Esteban-Marquillas Extension did indicate that the local industry is specialized, when compared to the nation. The LQ value for the state comparison (1.18) was not as high as the national comparison (2.21) but it did not rule out the possibility of the local industry being specialized when compared to the state. However, the negative specialization measure when the local industry is compared to the state reveals that the local industry is not specialized.

Though the local industry appears to be specialized when compared to the United States and not specialized when compared to Florida, the comparative advantage values both tell the same story. Whether compared to the state or nation, the 'Support

Activities for Air Transportation' sector in Orange County is positive and indicates a comparative advantage. The positive competitive shift values of the shift-share analysis also alluded to this conclusion. Therefore, the magnitude of the comparative advantage and specialization effect values indicate that the local industry markets were functioning normally when compared to the nation but not functioning normally when compared to the state. This means that the local industry is healthy and intervention is unnecessary when compared to the nation but local industry may require public intervention to better its health.

In summary, the overall results of the LQ, shift-share, and Esteban-Marquillas analyses signify that the 'Support Activities for Air Transportation' industry sector is healthy, in relation to state and national standards. This conclusion is made despite the fact that the LQ does not meet the requirements for an export base industry or the requirements to be considered specialized, by state standards. It is important to note that the LQ was positive and near the point where it could be declared an export base industry. So it is not to say that the state compared LQ value does not indicate that there would be positive economic impacts. Also, the state shift-share analysis provided similarly positive results to the national comparison. The relatively subpar, state compared specialization effect is most likely a result of the state's industry specialization in relation to the national economy. A LQ calculation on the industry at the state level compared to the national level proves this (LQ = 1.86). So it is not to say that the local industry seemed unhealthy or uncompetitive by state standards. Furthermore, the conclusions that can be made by national comparisons supersede any disparities between state and local comparisons. The state of Florida and its economy is, after all,

a part of the United States and the national economy. Therefore, public investment in this local industry is justified because further growth would benefit the overall local economy.

Nonscheduled Air Transportation Sector

After concluding there is justification for public investment in the local 'Support Activities for Air Transportation', it is important to analyze the economics of what this researcher believes will be the most affected industry. As was mentioned in Chapter 4, the two LQ values provide seemingly contradicting conclusions. When compared to the nation it seems like the local industry is not only healthy but also an export industry. In contrast, when compared to the state the local industry is does not meet the need of the locality. This large disparity is best explained by with the same rationale used in the previous section. The 'Nonscheduled Air Transportation' industry at the state level has a proportionally higher employment than the nation. The calculation of the LQ for this industry at the state level compared to the national proves this (LQ = 1.58). Therefore, when the local industry is compared to the state, it seems like the local industry is not healthy. Therefore, the overall conclusion is that the local industry is healthy and does represent an export industry, but it is subpar within the overachieving state economy.

The values of the shift-share analysis indicate that the 'Nonscheduled Air Transportation' industry was relatively unhealthy at the national and local level from 2005 to 2010. The national industry sector was riveted with steep employment decline and the local industry sector experienced even steeper decline when compared to the nation. At the state level, however, the state industry sector showed signs of growth but the local industry sector (when compared to the state) showed the same declining trend as it did when compared to the nation.

The Esteban-Marquillas results confirm the conclusions of the LQ and shift-share analysis. Both (compared to the state and nation) the state and nationally compared specialization effects were positive, indicating a specialized local industry sector. As was suggested by the shift-share analysis, the negative comparative advantage values confirm that the local industry sector does not have an advantage over the state or national economies. This endorses the conclusion that indirect investment in the local 'Nonscheduled Air Transportation' sector may have substantial positive impacts but does not confirm this effect.

A relative conclusion can be made by looking at Table 5-1. With the 'Nonscheduled Air Transportation' industry sector sporting the lowest multiplier coefficients in the table, it can be concluded that the sector will have a relatively minimal economic impact. That said, the IMPLAN models determines that neither 'Nonscheduled Air Transportation' nor any air transportation related sectors were among in the top 10 most affected industries by investment in airport operations. This is likely the case because many of the most affected industries are those that provide inputs necessary to operate an airport; especially personnel related costs and the induced impacts.

Economic Impacts

The construction related activities will be the recipient of the $10's of millions of direct government investment so this investment will clearly have more profound impacts than those of the airport operation activities. With a direct investment of $49.7 million, the IMPLAN software estimates that more than $70.2 million would be circulated throughout the SR 429 Extension Corridor. The effects would reach an estimated $82.5 million in Orange County. With the larger study area, the absolute effects are greater as

there are more opportunities for the ripples of the economic investment to ripple through the area.

The construction effort would directly support 372 jobs. An additional 174 local jobs will be supported, if the impact growth were limited to the SR 429 Extension Corridor. These employment figures would be slightly larger when Orange County is used as the study area. An estimated 386 direct jobs and an additional 265 local jobs would be supported in Orange County. These are positive figures for a state that has the highest rate of long-term unemployment in the nation (Luhby, 2012). It is important to note that these employment figures do not represent annual employment but rather a temporary boost. The direct investment in airport construction is a one-time expenditure. Therefore the project would not sustain these jobs once the construction is complete.

Skeptics may say that a $50 million investment is not worth the 651 jobs but it is important to remember that this is an investment in transportation infrastructure. Transportation infrastructure is usually very capital intensive but the impacts cannot simply be measured in the number of jobs created but the immeasurable impact of the increased accessibility and mobility. Increased mobility and accessibility allow for the more efficient movement of people and goods and this impact is very difficult to measure.

Sustained employment opportunities would be expected from the continued operation the airport, unlike employment related to construction activities. Estimates provided on Figure A-1 indicate that the airport is expected in increase its annual employment by 30 people every five years; with 34 in 2015 and 124 in 2030. This represents an annual 18% increase in direct effect jobs from 2015 to 2030. In the SR

429 Extension Corridor, total jobs are expected to climb from 44 in 2015 to 175 in 2030; representing an annual growth of 20%. In Orange County, an annual job increase of 21% is expected.

From 2015 to 2030, direct airport expenditures are expected to increase by an average annual rate of 62%. With direct airport expenditures in the SR 429 Extension Corridor being increased 1.45 times, the total economic output is expected to grow from nearly four million dollars in 2015 to $36.9 million in 2030. This results in a total growth of 829% (55% annually) of total output. In Orange County, the total output growth average will be 839% (56% annually) as total output increases from $4.8 million in 2015 to $43.9 million in 2030. The initial public investment of $49.7 million will establish a firm in Orange County that will create $43.9 million of annual economic impact by 2030.

Most Affected Industries

As was mentioned earlier, it is surprising that none of the air transportation industry sectors are not represented in the top 10 most affected industries by airport operations. The ‘Postal Service’, ‘Employment Service’ and ‘Aircraft Engine Parts Manufacturing’ are most affected by indirect effects, when the SR 429 Extension Corridor is the study area. With the presence of the aerospace giant, Lockheed Martin, in Orange County perhaps this is adds to reason that ‘Aircraft Engine Parts Manufacturing’ is among the most industries most affected by airport operations in Orange County.

Two of the industry sectors in Orange County are particularly specialized in indirect effects – ‘Support Activities for Air Transportation’ sector – ‘Postal Service’ and ‘Couriers and Messengers’. These sectors all have higher indirect impact values than induced impact vales. This indicates that they are primarily affected by the products and

services that they will sell to support the ‘Support Activities for Air Transportation’ sector. When the induced impact values are greater than the induced impact values, this indicates that these industry sectors are mostly supported by the economic activity of personal spending. This is true for the remaining industries on the list; none of which was much of a surprise. The effect on the ‘Real Estate Establishments’ sector was nearly evenly split between indirect and induced industry sectors for all scenarios. This perhaps indicates that the aerotropolis or airport city concept would be in effect in the area – airports are increasingly getting into the business of land acquisition and development.

Clustered Industries

Applying the concept of cluster analysis helped justify investment in airport development. If firms from each of the most affected industry sectors are located near one another, then they are more likely to have profound and continued economic effects on airport operations. They allow the efficient exchange of goods and services of interrelated industries, essentially forming symbiotic relationships. Clustered industries benefit one another and also the locality as sustained economic success is often an outcome.

The presence of clusters may support the success of the WOAA airport. Potential supporting industry clusters were identified if they met the qualifications. Six resulting census blocks met the criteria of the cluster analysis; however, one census block in particular seemed especially apt to host supporting industry clusters. This is because of its location within the SR429 Extension Corridor and proximity to the WOAA site. Census Block 1018 was the only potential cluster than was located within the SR 429 Extension Corridor and it is located about five miles east of the WOAA area which

makes it the closest. Its proximity to the proposed airport makes it an attractive site for supporting industry clustering, therefore increasing the potential of that this cluster will further the economic impact.

Summary

In this chapter, a discussion of the results justified the public investment in the WOAA airport. The 'Support Activities for Air Transportation' industry is healthy and further growth will create a ripple effect in the local economy, creating further economic growth. As was indicated by the economic base analyses, substantial impacts will be the result of the construction and annual operation of the airport. For every dollar spent during the construction phase, $1.63 of economic impact would be felt in Orange County. Even better, for every one dollar spent in operating the airport $1.70 will be circulated throughout the county. Development and operation of the expanded airport does serve the greater good because of the economic impacts. Impacts will be felt throughout the county in a number of different industry sectors. Though this is a facility that will only directly be used by a small portion of the population, it is an investment in transportation infrastructure that increases the capacity for aviation activity in Orange County. As was discussed in Chapter 2, airport efficiency is important because aviation activity is an integral aspect of modern economic activity.

Despite the research hypothesis, 'Nonscheduled Air Transportation' was not among one of the most affected industries. Luckily, a cluster analysis of the most affected industry shows that there are six potential sites of industry clustering in Orange County. Clustering will only serve to increase the local economic impact of airport operations; further justifying the large public investment.

CHAPTER 8
CONCLUSION

Recommendations

Looking at the proposed airport development concepts, this researcher recommends that the first implementation concept is chosen for implementation. There are more positives with this concept than the other concept plans; namely the location of the airport. Orlando Apopka Airport is the largest of the three airports in the WOAA study area. It also has the most comprehensive existing infrastructure which should lower cost of development. Its adjacency to US 441 is another plus that the other two facilities lack. The proximity to this major arterial would provide greater access, allowing it to become the multimodal hub that officials hope for. Furthermore, it is the closest in proximity to the potential industry cluster identified in Census Block 1018. However, it may be more expensive to develop because of specific site conditions that would increase the cost of development.

This researcher would also like to recommend that the economic incentives and be provided for clustered industries. The presence of clustered industries creates further economic prosperity and helps to maintain economic sustainability in a region. Six potential sites of clustered industries were identified in Chapter 6. So this, perhaps, provides a good starting point for that recommendation.

Limitations

A number of data limitations presented themselves during the course of this research. Most notably was the lack of availability of more recent employment data. The BLS only provided data from 2010 as the most recently available data. Newer data would allow for more accurate economic base analyses. As it stands, the data was

nearly two years old at time of analysis. Another source of data limitations is with the IMPLAN data. The exorbitant cost of data and release date inconveniences resulted in the use of 2009 IMPLAN data. It is not clear if much would have changed in the data if the more up-to-date 2010 was used but 2009 was deemed to be acceptable due to the limitations.

It is important to remember that the economic base analysis used in this research do not describe the economic trends of particular firms in Orange County. That is, it does not report the trends of any particular airport but rather the industry as a whole in Orange County. The presence of Orlando International Airport in Orange County is likely to significantly impact on the results of the economic base analysis. This is not to say that the results are inaccurate but rather should not be misinterpreted as the employment trends of any airport in particular. This is a limitation of the economic base analysis.

Opportunities for Future Research

Though this research is a comprehensive analysis, opportunities exist to take what was started here and expand it to include more scenarios and possibilities. The research questions presented in Chapter 1 focused only on the specific economic activity of airport operations. WOAA plans for a multimodal hub with a number of other commercial and industrial activities occurring on the site. The incorporation of these supporting activities will only serve to make the WOAA airport more successful and prosperous. Future research may account for these additional activities and estimate their local economic impacts.

Due to cost of the input-output data, the study area for these analyses was limited to Orange County. With additional input-output data, the study area could be expended

to include other counties in the region or even the state. This research project looked at the economic impact on a finite scale. But in reality, effects of economic activity do not stop at county lines and other jurisdictions. It would be worth analyzing the impacts at larger scales.

Final Thoughts

It is important to remember that the economic base analysis illustrates industry trends for Orange County. While this is a good analysis to understand the economic trends when compared to the base economies, there is an unmeasured dynamism within Orange County. There are 29 airport facilities within the county and it is safe to assume that the expansion of a WOAA airport will shift aviation activity within the county. Also the results of the economic base analysis may be overstated because of the presence of Orlando International Airport. As mentioned earlier, Orlando International Airport is one of the busiest airports in the nation.

Competition from Orlando International Airport should not pose much negative impact on the WOAA airport. Orlando International Airport serves primarily as a commercial airport while the WOAA airport serves as a general aviation airport. Though general aviation activities are permitted and do occur at Orlando International Airport, it will not be a direct competitor to the WOAA airport. The improved WOAA airport infrastructure will make it a more attractive destination than Orlando International Airport for general aviation activities. The new and improved runways increases accessibility as it will be able to accommodate a wider variety of aircraft. The WOAA will also be less congested than Orlando International Airport. A less congested airport makes landings and takeoffs more time efficient, which also makes it a more attractive option. This

researcher believes that the WOAA airport will be the benefactor of a shift of general aviation activities from some of the larger and busier airports in the county.

APPENDIX A
PROJECTED AIRPORT CONSTRUCTION AND OPERATIONAL BUDGETS

The following tables are part of the WOAA feasibility plan. They depict the budgetary cost assumptions for development and annual operation from through 2030.

Table A-1. Preliminary Cost Estimate of Total Project and Phasing

Project Phasing and Costs Phase Project		Percentages			Amounts		
	2010 Cost	FAA	FDOT	Local	FAA	FDOT	Local
1EA	252,000	95.0%	2.5%	2.5%	239,400	6,300	6,300
1 DR I/ADA	630,000	95.0%	2.5%	2.5%	598,500	15,750	15,750
1 Airport Master Plan	220,500	95.0%	2.5%	2.5%	209,475	5,513	5,513
1 Master Drainage Plan and Master Permitting	289,800	95.0%	2.5%	2.5%	273,310	7,245	7,245
Phase 1 Total	**1,392,300**				**1,322,685**	**34,958**	**34,958**
2 Environmental Mitigation	3,400,000	95.0%	2.5%	2.5%	3,230,000	85,000	85,000
2 Land Acquisition	7,700,000	95.0%	2.5%	2.5%	7,315,000	192,500	192,500
2 Construct R/W	6,930,000	95.0%	2.5%	2.5%	6,583,500	173,250	173,250
2 Construct R/W Safety Areas	630,000	95.0%	2.5%	2.5%	598,500	15,750	15,750
2 Construct Apron	1,638,000	95.0%	2.5%	2.5%	1,556,100	40,950	40,950
2 Construct Connector T/W	252,000	95.0%	2.5%	2.5%	239,400	6,300	6,300
2 Drainage System and Retention Ponds	1,890,000	95.0%	2.5%	2.5%	1,795,500	47,250	47,250
2 Terminal Building	945,000	0.0%	50.0%	50.0%	-	472,500	472,500
2 Automobile Parking 40	252,000	0.0%	50.0%	50.0%	-	126,000	126,000
2 FBO Hangar	630,000	0.0%	50.0%	50.0%	-	315,000	315,000
2 Lighting MIRLS	441,000	95.0%	2.5%	2.5%	418,950	11,025	11,025
2 Lighting MITLS	252,000	95.0%	2.5%	2.5%	239,400	6,300	6,300
2 Lighting Apron	189,000	95.0%	2.5%	2.5%	179,550	4,725	4,725
2 Lighting Auto Parking	94,500	95.0%	2.5%	2.5%	89,775	2,363	2,363
2 Electrical Vault	189,000	95.0%	2.5%	2.5%	179,550	4,725	4,725
2 Sewer and Water	315,000	0.0%	50.0%	50.0%	-	157,500	157,500
2 Electrical Service Lines	126,000	0.0%	50.0%	50.0%	-	63,000	63,000
2 Access Road	504,000	0.0%	50.0%	50.0%	-	252,000	252,000
2 Engineering (1)	2,283,750	80.0%	10.0%	10.0%	1,827,000	228,375	228,375
2 Contingency (2)	4,026,125	85.0%	7.5%	7.5%	3,422,206	301,959	301,959
Phase 2 Total	**42,627,375**				**37,117,431**	**2,754,972**	**2,754,972**

Source: Orlando Aviation Consultants, 2011

(1) Engineering is assumed to be 10% of total excluding land acquisition
(2) Contingency is assumed to be 10% of total including engineering cost

Table A-1. Preliminary Cost Estimate of Total Project and Phasing (continued)

Project Phasing and Costs Phase Project	2010 Cost	Percentages FAA	FDOT	Local	Amounts FAA	FDOT	Local
3 Construct Parallel T/W	2,646,000	95.0%	2.5%	2.5%	2,513,700	66,150	66,150
3 Drainage System and Retention Ponds	1,890,000	95.0%	2.5%	2.5%	1,795,500	47,250	47,250
3 T-Hangars 30	378,000	0.0%	50.0%	50.0%	-	189,000	189,000
3 Sewer and Water	126,000	0.0%	50.0%	50.0%	-	63,000	63,000
3 Electrical Service Lines	50,400	0.0%	50.0%	50.0%	-	25,200	25,200
3 Industrial Park Roads	252,000	0.0%	50.0%	50.0%		126,000	126,000
3 Engineering (1)	534,240	76.4%	12.0%	12.0%	406,022	64,108	64,108
3 Contingency (2)	587,664	76.4%	12.0%	12.0%	446,625	70,519	70,519
Phase 3 Total	**6,464,304**				**5,161,847**	**651,227**	**651,227**
4 T-Hangars 30	378,000	0.0%	50.0%	50.0%	-	189,000	189,000
4 Sewer and Water	31,500	0.0%	50.0%	50.0%	-	15,750	15,750
4 Electrical Service Lines	12,600	0.0%	50.0%	50.0%	-	6,300	6,300
4 Engineering (1)	42,210	0.0%	50.0%	50.0%	-	21,105	21,105
4 Contingency (2)	46,431	0.0%	50.0%	50.0%	-	23,216	23,216
Phase 4 Total	**510,741**					**255,371**	**255,371**
5 T-Hangars 30	378,000	0.0%	50.0%	50.0%		189,000	189,000
5 Land Acquisition for R/W extension	3,307,500	95.0%	2.5%	2.5%	3,142,125	82,687	82,687
5 RW ext	1,638,000	95.0%	2.5%	2.5%	1,556,100	40,950	40,950
5 Construction R/W Safety Area	315,000	95.0%	2.5%	2.5%	299,250	7,875	7,875
5 Parallel TW ext	630,000	95.0%	2.5%	2.5%	598,500	15,750	15,750
5 LPV approach	500,000	95.0%	2.5%	2.5%	475,000	12,500	12,500
5 Sewer and Water	63,000	0.0%	50.0%	50.0%	-	31,500	31,500
5 Electrical Service Lines	25,200	0.0%	50.0%	50.0%	-	12,600	12,600
5 Industrial Park Roads	252,000	0.0%	0.0%	100.0%	-	-	252,000
5 Industrial Park Utilities (electrical and water)	88,200	0.0%	0.0%	100.0%	-	-	88,200
5 Engineering (1)	527,940	76.3%	12.0%	12.0%	401,234	63,352	63,352
5 Contingency (2)	911,484	80.0%	10.0%	10.0%	729,187	91,148	91,148
Phase 5 Total	**8,636,324**				**7,201,396**	**547,364**	**887,564**
Project Total - All Phases	**59,631,044**				**50,803,359**	**4,273,893**	**4,584,092**

Source: Orlando Aviation Consultants, 2011

Table A-2. Abridged Near Term and Long Term Operation Revenue/Cost Estimates With Assumptions

	2015	2020	2025	2030
REVENUE				
Tie Down Fees	261,966	459,602	704,655	1,006,176
Fuel	49,075	79,037	127,289	205,000
Lease Income				
Aviation Use	2,579,611	5,798,793	8,146,677	9,217,217
Professional Office Space	182,500	1,301,119	2,208,146	2,498,314
Retail	150,000	848,556	960,063	1,086,224
Industrial Space	400,000	5,430,759	14,848,981	32,441,879
Miscellaneous Income	638	814	1,039	1,327
TOTAL REVENUE	**3,613,791**	**13,918,671**	**26,996,851**	**46,456,137**
OPERATING EXPENSES				
Advertising (2% of Revenue)	72,276	278,373	539,937	929,123
Bank Charges	200	300	400	500
Contract Labor	7,730	12,450	20,051	32,292
Depreciation (S/L for 29.5 yrs)	896,324	5,100,275	10,443,660	18,888,078
Dues & Subscriptions	460	560	660	760
Employee Benefits	55,769	102,012	161,571	237,515
Insurance (2.7% of Revenue)	97,572	375,804	728,915	1,254,316
Office Expense	5,100	6,600	8,100	9,600
Outside Services	22,973	29,320	37,421	47,759
Payroll-Administration & Operations	1,394,215	2,550,300	4,039,284	5,937,884
Payroll Taxes	121,994	223,151	353,437	519,565
Permits & Fees	1,700	2,200	2,700	3,200
Postage & Delivery	580	640	707	780
Professional Services	22,973	29,320	37,421	47,759
Repairs & Maintenance	3,063	3,909	4,989	6,368
Supplies	1,532	1,955	2,495	3,184
Telephone	10,433	12,095	14,022	16,255
Utilities	6,414	7,617	9,047	10,745
TOTAL OPERATING EXPENSES	**2,721,308**	**8,736,882**	**16,404,816**	**27,945,684**
OPERATING INCOME	**892,483**	**5,181,789**	**10,592,034**	**18,510,454**
OTHER EXPENSES				
Interest on Acquisition & Build out	1,024,247	4,744,743	9,473,640	16,946,949
NET OPERATING INCOME	**-131,764**	**437,045**	**1,118,395**	**1,563,505**

Source: Orlando Aviation Consultants, 2011

APPENDIX B
NAICS INDUSTRY SECTOR DEFINITIONS

4812 Nonscheduled Air Transportation

48121 Nonscheduled Air Transportation
This industry comprises establishments primarily engaged in (1) providing air transportation of passengers and/or cargo with no regular routes and regular schedules or (2) providing specialty flying services with no regular routes and regular schedules using general purpose aircraft. These establishments have more flexibility with respect to choice of airports, hours of operation, load factors, and similar operational characteristics.
Illustrative Examples:
Air taxi services
Nonscheduled air freight transportation services
Aircraft charter services
Nonscheduled air passenger transportation services

481211 Nonscheduled Chartered Passenger Air Transportation US
This U.S. industry comprises establishments primarily engaged in providing air transportation of passengers or passengers and cargo with no regular routes and regular schedules.

481212 Nonscheduled Chartered Freight Air Transportation US
This U.S. industry comprises establishments primarily engaged in providing air transportation of cargo without transporting passengers with no regular routes and regular schedules.

481219 Other Nonscheduled Air Transportation US
This U.S. industry comprises establishments primarily engaged in providing air transportation with no regular routes and regular schedules (except nonscheduled chartered passenger and/or cargo air transportation). These establishments provide a variety of specialty air transportation or flying services based on individual customer needs using general purpose aircraft.
Illustrative Examples:
Aircraft charter services (i.e., general purpose aircraft used for a variety of specialty air and flying services)
Aviation clubs providing a variety of air transportation activities to the general public

4881 Support Activities for Air Transportation
This industry group comprises establishments primarily engaged in providing services to the air transportation industry. These services include airport operation, servicing, repairing (except factory conversion and overhaul of aircraft), maintaining and storing aircraft, and ferrying aircraft.

48811 Airport Operations

This industry comprises establishments primarily engaged in (1) operating international, national, or civil airports or public flying fields or (2) supporting airport operations (except special food services contractors), such as rental of hangar space, air traffic control services, baggage handling services, and cargo handling services.

488111 Air Traffic Control
This U.S. industry comprises establishments primarily engaged in providing air traffic control services to regulate the flow of air traffic.

488119 Other Airport Operations CAN
This U.S. industry comprises establishments primarily engaged in (1) operating international, national, or civil airports, or public flying fields or (2) supporting airport operations, such as rental of hangar space, and providing baggage handling and/or cargo handling services.

48819 Other Support Activities for Air Transportation
See industry description for 488190 below.

488190 Other Support Activities for Air Transportation
This industry comprises establishments primarily engaged in providing specialized services for air transportation (except air traffic control and other airport operations).
Illustrative Examples:
Aircraft maintenance and repair services (except factory conversions, overhauls, rebuilding)
Aircraft testing services

Source: U.S. Census Bureau, 2011a

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BIOGRAPHICAL SKETCH

Gareth Reece Hanley was born on the small island of St. Kitts in the Caribbean. When he was five, his family immigrated to the United States so that he and his two siblings would have greater educational opportunities. After earning a Bachelor of Science degree in geography from the University of Florida, he decided to pursue a Master of Arts in Urban and Regional Planning. Already with an interest in transportation planning, he discovered he was also interested in the role economics plays in planning. He selected a thesis topic by integrating his long-time passion for aviation with his interests in transportation and economics planning.