



Projected Demand for Air Travel in the San Diego Region: 10 to 20 Year Timeframe

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Executive Summary

This report provides an analysis of the factors affecting demand for air travel in the San Diego region, with a particular focus on how these factors affect demand at San Diego International Airport (SDIA). Additionally, this report provides projections of air travel demand at SDIA in the 10 to 20 year timeframe, and beyond. These projections are provided in terms of forecasted enplanements and total passengers at SDIA.

The air travel demand drivers studied in this report include population growth, airfare pricing, gross regional product, per capita income, and growth of industries in the region. All demand drivers studied indicate moderate to very strong correlation to enplanements at SDIA.

Population is a major factor affecting air travel demand. San Diego County has demonstrated significant population growth rates over the last five decades, and is projected to reach nearly 3.7 million by 2030. From 1993 to 2012, San Diego County population and enplanements at SDIA were found to have a moderately strong linear relationship. Based on estimates of San Diego County population, projected enplanements at SDIA would reach 10.5 million in 2020 and nearly 12 million in 2030.

When comparing price of airfare to enplanements at SDIA, a moderately strong correlation was found. This relationship is not always inversely related: as airfare costs increase, enplanements often increase as well. The analysis suggests that demand is more closely tied to economic conditions rather than airfare price changes.

Over the last 20 years, GRP in the San Diego region shows a very strong correlation with enplanements at SDIA, indicating that when the region's economy is growing, there is a corresponding increase in enplanements at the airport. Over the last five years, San Diego County Gross Regional Product (GRP) has averaged 1.8% annual growth. This growth is consistent with the rest of California, but below the national rate of 2.7%.

Similar to GRP, a strong correlation also exists between San Diego's per capita income and the number of enplanements at SDIA. Since 1993, per capita income in San Diego had an average growth rate of 4.4%, compared to a 2% growth rate in number of enplanements at SDIA. Conversely, when per capita income in the region decreased, a corresponding decrease in enplanements was observed.

Four major industries (healthcare, biotechnology, military, and tourism) show significant contribution to the San Diego regional economy. All industries studied show significant growth and play a major role in the region's GRP and per capita income statistics. In aggregate, these industries and the businesses supporting them, contribute to demand for air travel demand at SDIA.

All factors driving current and future demand in the San Diego region, and specifically at SDIA, were analyzed to create projections for future air travel demand. This report projects that by 2040, total enplanements at SDIA will be between 13.5 to 16.7 million; total passengers at SDIA are projected to reach 29.3 to 33.4 million. The team's research suggests SDIA will reach an operational capacity constrained level by 2030, and a maximum utilization by 2037.

Chapter I. INTRODUCTION

Background

The demand for air travel in the San Diego region and the potential need for a new or expanded airport has been a subject of research and debate for decades. Prior airport studies have concluded that SDIA was already at near maximum capacity, and unable to support the growing demand of the greater San Diego area.

With more than three million residents throughout the greater San Diego region, it is important to determine the accuracy and relevancy of prior studies in present day conditions. It is the team's opinion that the future growth of San Diego's economy depends on the airport's ability to meet the demand of its residents and businesses for air transportation.

There are numerous factors affecting air travel demand. The purpose of this report is to identify and analyze these factors, and provide air travel demand projections for the next 10 to 20 years in consideration of an alternative airport site in the San Diego region.

Methodology

In order to properly forecast area demand for air travel, it is imperative to analyze multiple demand drivers. The demand drivers analyzed in this study include: population growth, airport infrastructure-related variables, quantities and types flights to and from SDIA, local economic and industry trends, airline-specific issues, and new transportation and communication technologies, which may be alternatives to air travel. The team applied a data-driven analytical approach with the purpose of properly substantiating the findings and turning this study into a tool that can facilitate the decision making process. The study also provides the reasoning behind researching and analyzing these specific demand drivers.

Empirically, population growth has a direct impact on air travel demand. In order to fully correlate this variable to demand for air travel, the population growth rate of the entire greater San Diego metropolitan area was examined. Additionally, the team compared SDIA to airports of cities with similar metropolitan area populations and air passenger traffic. The objective of this analysis was to discover any similarities or differences between these facilities and SDIA in terms of ability to meet current and future demand. Airport-related variables analyzed include location, size, number of flights, and number of runways.

Another major factor of air travel demand in San Diego is the destination of flights leaving SDIA. The research provides information on passenger destinations, both domestic and internationally, to determine if SDIA will have the ability to meet future demand.

The impact of local industry growth on demand for air travel at SDIA was also investigated. This line of research focused on four major industries located in the San Diego region: Tourism, Military & Defense, Biotechnology, and Healthcare.

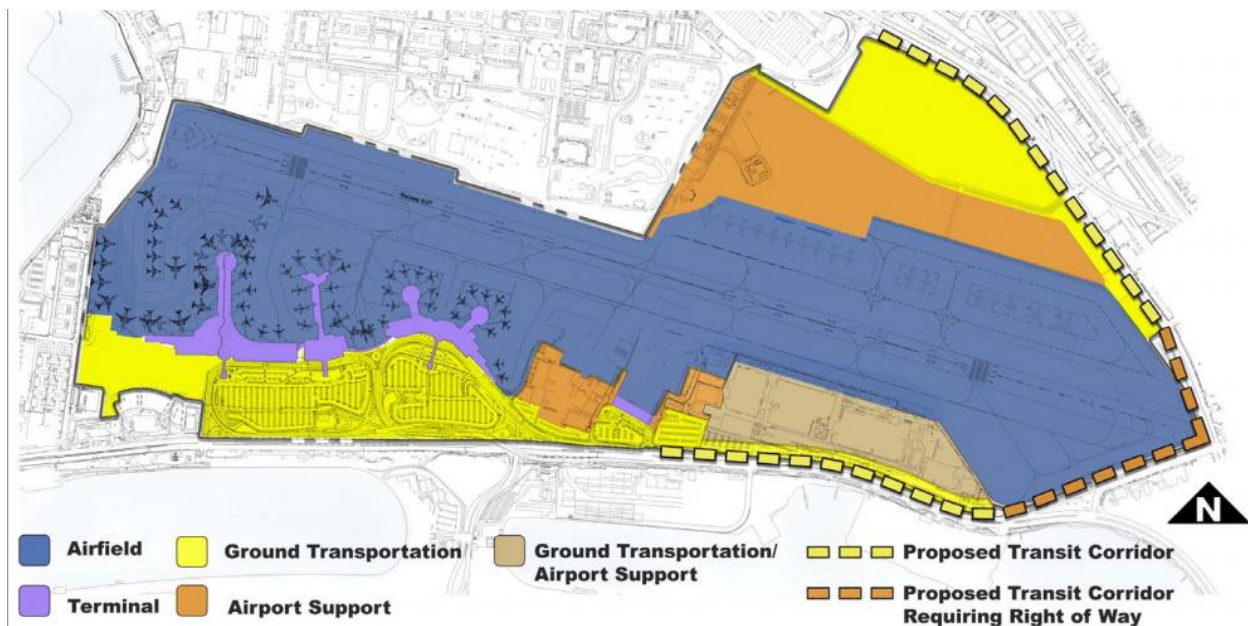
Local economic conditions were also analyzed to examine their effect on the airlines currently conducting business in San Diego. In addition, the costs associated with inputs were also explored to determine if they are significantly impacting the decision of airlines to operate at SDIA.

Lastly, the advancement of communication technologies provides a potential alternative to air travel that may affect future demand. Alternative transportation options such as high-speed rail were also considered, as they have the potential to impact air travel demand in the next 20 to 30 years.

Chapter II. SDIA – CURRENT OPERATIONS

SDIA is the busiest single-runway commercial airport in the United States, and second-busiest in the world. The airport operations include approximately 500 flights and 50,000 passengers per day (SDCRAA, 2011). As of 2013, there are 22 passenger airlines and five cargo airlines operating at SDIA. Two large terminals with 51 gates and a commuter terminal with 4 gates service commercial passengers. There is also a cargo terminal on the north side of the airport serving the cargo airlines, and a small area for general aviation (Figure 2-1).

Figure 2-1: SDIA Airport Use Map



(Source: san.org)

Takeoffs and landings are usually from east to west, and are hindered by local topographic conditions. The approach from the east is steeper than most commercial airports due to hilly terrain and the Interstate 5 freeway. The airport has further restrictions due to its relatively small size (661 acres), so that the runway also lacks the standard 1,000 ft. safety areas at each end and has a displaced landing threshold of 1,810 ft. The flight path is further complicated due to the adjacency of downtown San Diego and its many skyscrapers along the south, San Diego Bay, and the hills and tall trees of Balboa Park along the north. The flight path occasionally reverses from west to east during certain wind and fog conditions, and is also restricted by the hilly terrain of Point Loma to the west. There is also a noise curfew that only allows departures from 6:30 am to 11:30 pm.

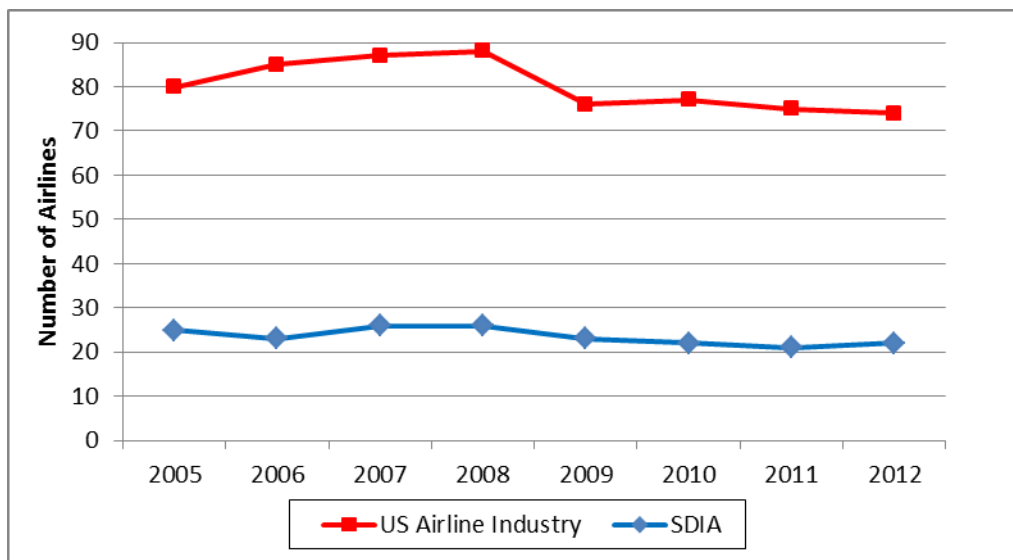
Air traffic in San Diego must also coordinate with nearby airports, most notably the military bases at North Island, Miramar, Imperial Beach, and Camp Pendleton. Other large aircraft commercial airports operating in the region include the Tijuana International Airport, Palomar-McClelland Airport in Carlsbad, and several local municipal airports throughout the county.

Number of Carriers

This section examines the effects of passenger demand in relation to the number of carriers in the industry, and in particular those operating at San Diego International Airport (SDIA). In prosperous economic conditions, demand is high and airlines compete among each other and new entrants to capture market share by expanding routes to different cities or through acquisitions of other carriers. Downturns in the economy have the opposite effect, forcing airlines to look for ways to minimize costs and retain profits, sometimes by reducing flights, services, fleet size, and personnel.

In economic downturns, the industry's thin margins often force companies into bankruptcy or undesirable mergers. Most notable are the recent United/Continental merger in 2009-10, and the pending American/US Airways unification. While these are seen as strategic moves by large operatives to consolidate assets and leverage their market share, many small and regional airlines were not able to withstand the effects of the 2008 financial crisis. The U.S. airline industry has decreased from a high of 88 commercial airlines in 2008 to 74 in 2012 due to the effects of a deep economic recession and slowed recovery. Likewise, the number of commercial carriers at SDIA has decreased in the same time span from 26 to 22 (Figure 2-2).

Figure 2-2: Commercial Airlines Operating at SDIA

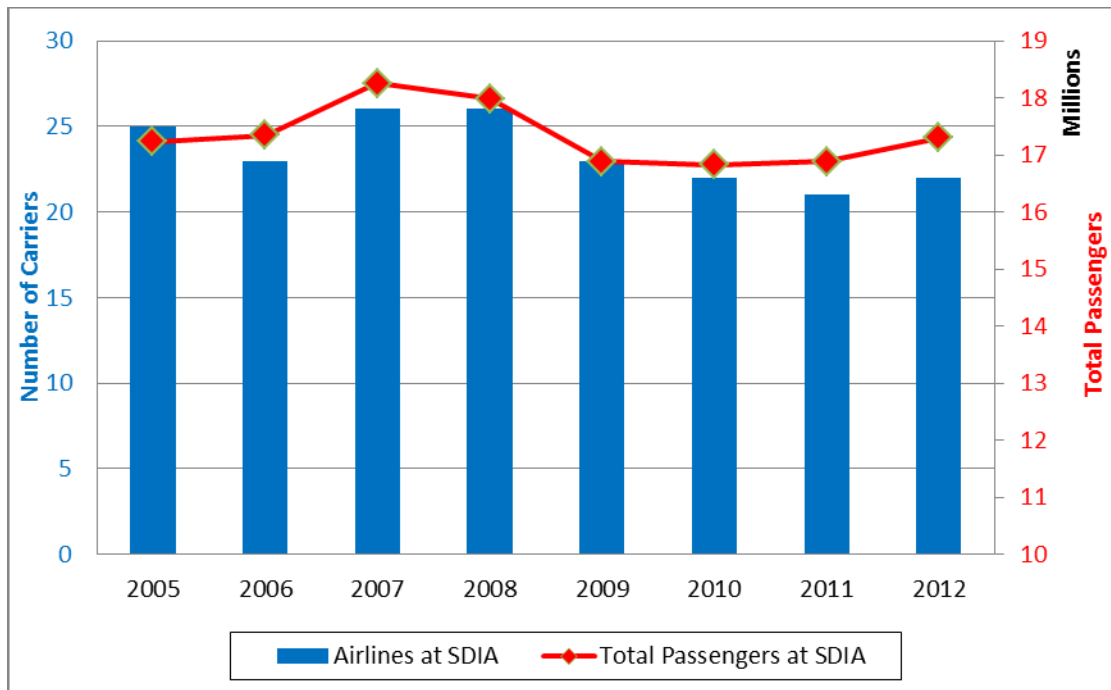


(Source: Bureau of Transportation Statistics (BTS))

The airline industry is closely tied to the overall U.S. economy. Passengers tend to fly more for business and pleasure when discretionary spending is high, and less when it is low. Industry margins are very thin due to price competition among airlines. Smaller carriers do not always have the resources or capital to withstand such a drastic drop in passenger demand.

Coinciding with the recession, Figure 2-3 demonstrates a significant drop-off in passenger enplanements from 2008 to 2009 at SDIA (right axis), along with the number of airlines operating at the airport during this timeframe (left axis). SDIA enplanements decreased by 6.5% from 2008 to 2009, corresponding to a nationwide decrease of 5.3% (DOT, 2010). The U.S. economy has been slowly improving since 2009, but total passengers are still below levels from 2006-07.

Figure 2-3: Number of Airline Carriers to Total Passengers at SDIA



(Source: Bureau of Transportation Statistics (RITA))

While it is important to note recent economic conditions, this study focuses on forecasting long-term demand, specifically through the year 2030. The 2011 FAA Aerospace Forecast projects average annual growth rates of 3.8% per year through 2031 for U.S. airlines (FAA, 2011). This projection is consistent with the average of 4% growth seen from 1980 through 2012, which estimates total annual passengers at SDIA at 34 million by 2030. This estimate is nearly double the total passengers in 2012 (Jacobs Consultancy, 2009). A low end forecast of 2% growth increases passenger demand to 25 million per year by 2030, an approximate 50% increase from 2012.

Airline Destinations

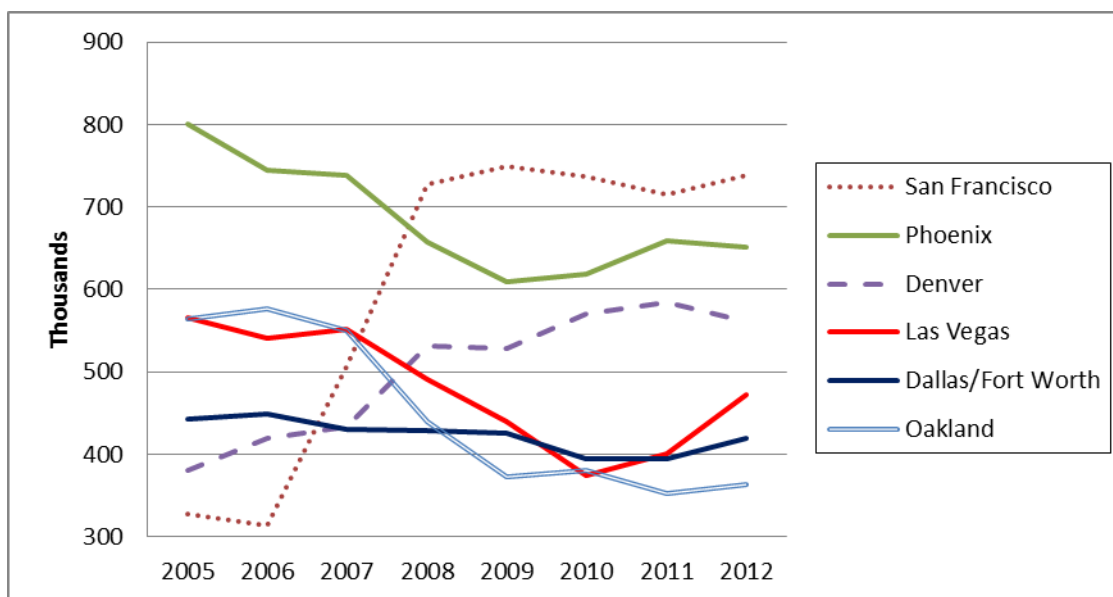
Geography plays a key role in determining flight routes to and from San Diego. Located in the extreme southwest point of the contiguous United States, SDIA services residents of San Diego County and is almost exclusively an end destination point for business and casual travelers. The airport is not utilized as a “hub” location for any major or minor airlines, though it is an attractive market due to a large metropolitan population size. The region is served by domestic commercial airlines that connect to larger airport hubs in other states, with a majority

of passengers connecting to another city, while 45% fly direct to their end destination (RITA, 2013).

Similar to most U.S. markets, the main air travel demand drivers for San Diego County are population growth, per capita income, Gross Regional Product (GRP), and airfare cost. However, for airline carriers to consider adding routes there are additional variables to consider such as load factor and local industry. San Diego is a desirable market due to its large metropolitan area population, high per capita income, strong local economy, tourism sector, and industries related to the several military bases in the region. Each of these factors contributes to the demand for en route passengers.

Additional factors to consider are the destinations passengers are traveling to, as well as where they are coming from. San Diego connects to all the major airlines hub cities, which account for 55% of outgoing enplanements (RITA, 2013). These flights are usually scheduled multiple times per day to service customer commutes throughout the country. Many of these hub airports account for the most popular flight routes out of San Diego. Figure 2-4 shows the most popular destinations from 2005-12.

Figure 2-4: Passengers Enplaned by Most Popular Destinations



(Source: Bureau of Transportation Statistics (RITA))

Each of these airports is within 2 ½ hours flight time from SDIA. These are either hubs for major airlines or short flights to nearby destinations. The hubs include San Francisco (United Airlines), Phoenix (US Airways), Denver (United Airlines), and Dallas/Fort Worth (American Airlines). San Francisco, Las Vegas, and Oakland are popular nonstop destinations with multiple flights per day through Southwest Airlines.

The most frequent departures out of SDIA are to cities in the western United States. Southwest Airlines offers the most routes out of San Diego, which include most of the top destinations listed in Table 2-1.

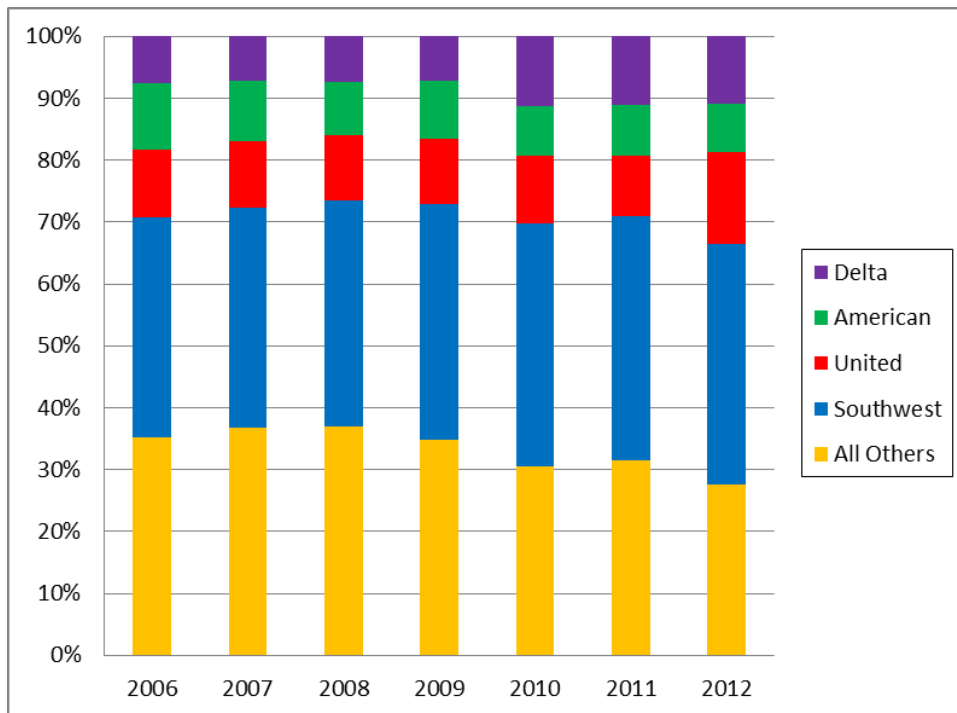
Table 2-1: Most Frequent SDIA Departure Destinations

| City | Enplanements 2005-2012 |
|-------------------|------------------------|
| Phoenix | 5,480,000 |
| San Francisco | 4,816,000 |
| Denver | 4,010,000 |
| Las Vegas | 3,838,000 |
| Oakland | 3,597,000 |
| Dallas/Fort Worth | 3,384,000 |
| Chicago | 3,246,000 |
| Atlanta | 3,105,000 |
| Sacramento | 3,103,000 |
| San Jose | 2,971,000 |
| Seattle | 2,691,000 |
| Los Angeles | 2,659,000 |

(Source: Bureau of Transportation Statistics (RITA))

Most Southwest flights departing from SDIA are less than 90 minutes in length, and typically cost less than connecting routes through other cities. Southwest has been the most popular carrier at SDIA from 2006-12 (Figure 2-5).

Figure 2-5: Share of SDIA Scheduled Flights

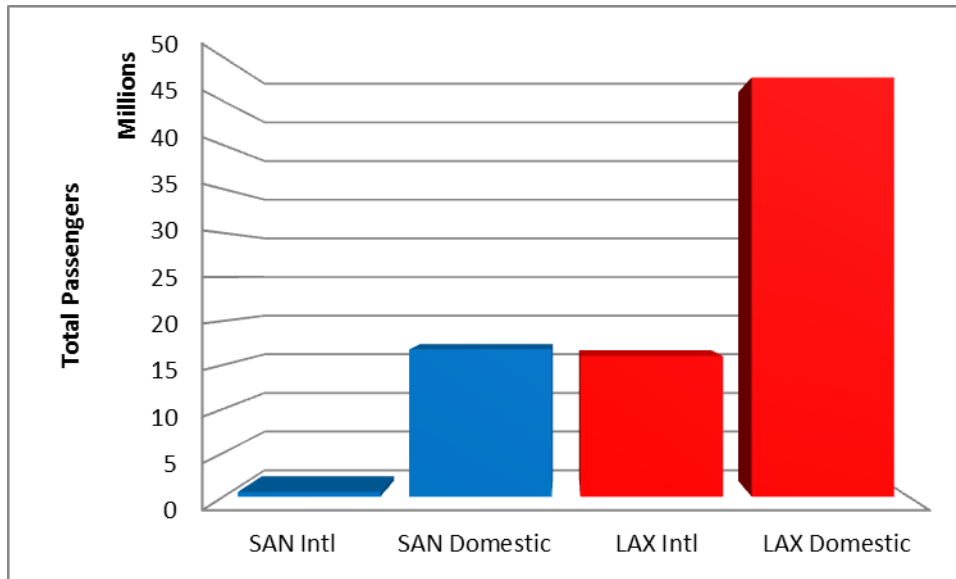


(Source: Bureau of Transportation Statistics (RITA))

International Flights

Los Angeles International Airport (LAX), located 125 miles to the north of San Diego, is the 3rd busiest international airport in the country. Due to its relatively close proximity, longer runways, additional gates and terminals, and established infrastructure, LAX accommodates the majority of southern California's international passengers (Figure 2-6). LAX had 16 million international passengers in 2012, compared to approximately half a million at SDIA (RITA, 2013).

Figure 2-6: Total 2012 Passengers – International & Domestic – SAN/LAX



(Source: Bureau of Transportation Statistics (RITA))

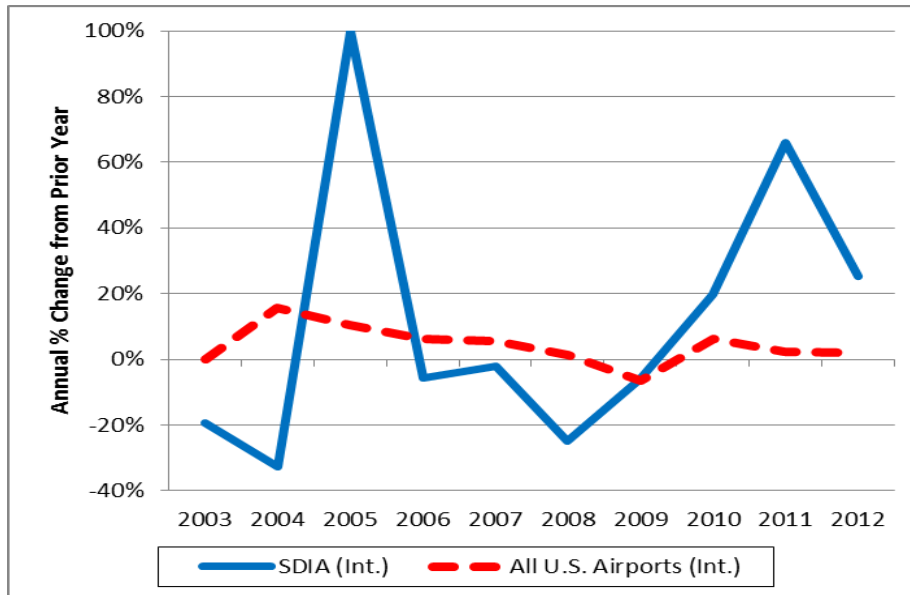
Most aircraft used for international routes are larger and require longer runways. The short length of San Diego's single runway (9400 feet), along with steep takeoff and landing logistics, further limits the type of aircraft that can fly in and out of SDIA. Most international flights departing from San Diego are to Mexico and Canada, with the exception of a small quantity of intercontinental flights to Europe and Asia. The majority of international flights departing from San Diego are accessed through additional legs at points such as LAX, San Francisco, Chicago, Newark, New York, Houston, and Miami.

SDIA's relatively short runway limits the use of larger commercial aircraft which are often used in international flight. Larger aircraft such as the Boeing 747 and 787, and Airbus 350 and 380 models, require a longer runway because of their weight and dimensions. The current runway length makes it more difficult for airlines to add long, continental flights out of SDIA (Boeing, 2012). International flights at SDIA increased to 2.8% of total flights in 2012. This is insignificant when compared to airports such as LAX, where international flights make up 25% of all direct air travel (RITA, 2013). The current configuration of SDIA is preventative for significant growth in direct international flights.

Though SDIA is primarily a domestic flight airport, international passenger growth has experienced a notable increase over the past decade. SDIA has grown an average of 12% annually, while all U.S. airports have averaged annual growth at a 4% rate during the same

period. The annual fluctuation in the number of international passengers at SDIA is provided in Figure 2-7.

Figure 2-7: *International Passengers Percentage Change*



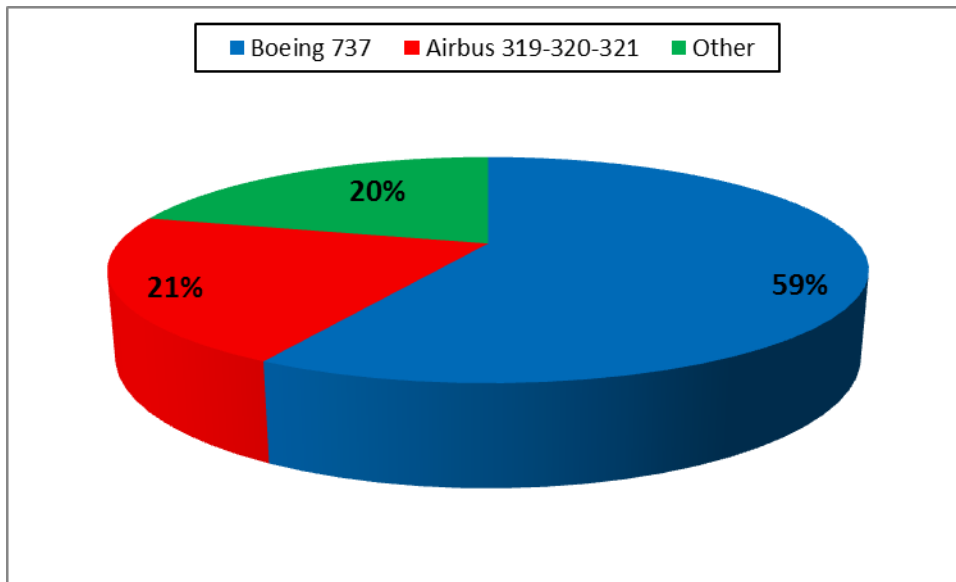
(Source: Bureau of Transportation Statistics (RITA))

International passengers accounted for approximately 2% of SDIA's total passengers from 2001 through 2012. U.S. airports averaged 11% international passengers for the same period.

Aircraft Operating at SDIA

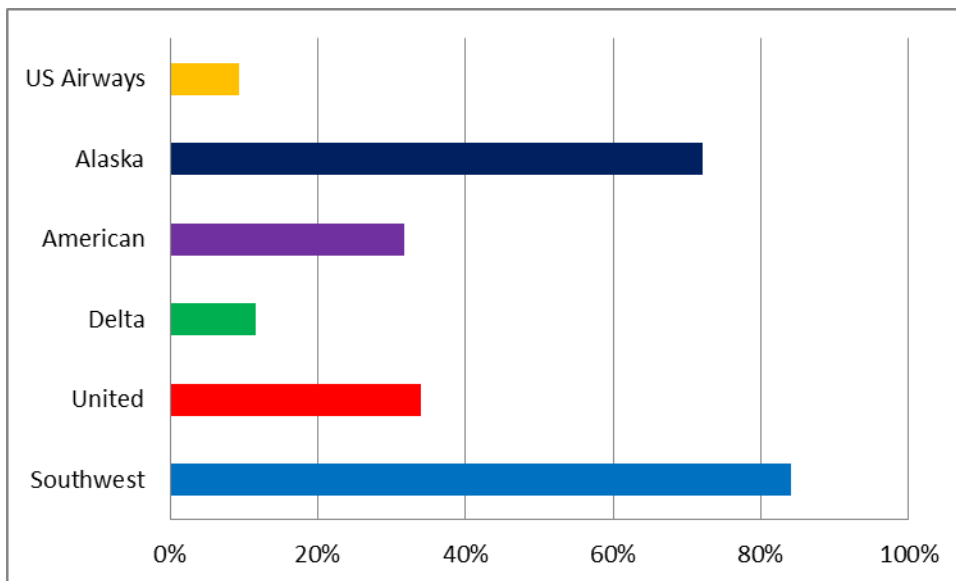
Over the past decade the most popular aircraft utilized at SDIA is the Boeing 737, an efficient single-aisle model with capacity of less than 150 passengers (Boeing, 2013). This aircraft is ideal for SDIA's unique location which requires a steep takeoff and landing on a mid-length runway. The Boeing 737 is utilized by most of the major carriers operating at SDIA, including Southwest Airlines, who almost exclusively uses this model. In 2012, 59% of all SDIA flights were Boeing 737 models, followed by the similar sized models of the Airbus 319, 320, and 321 (Figures 2-8 & 2-9).

Figure 2-8: Aircraft Type at SDIA (2012)



(Source: U.S. Department of Transportation)

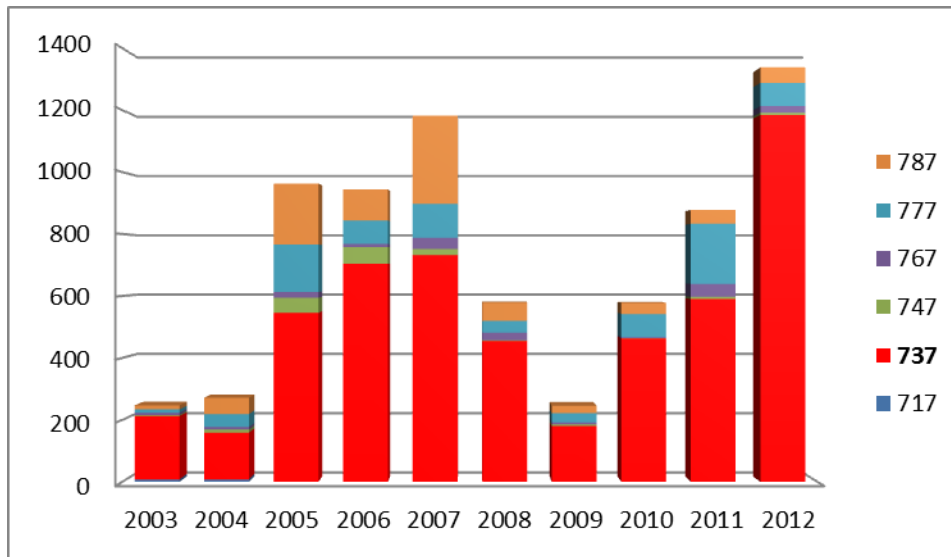
Figure 2-9: Boeing 737 – Percentage of Flights by Major Carriers – SDIA (2012)



(Sources: Company websites for US Airways, Alaska Airlines, American Airlines, Delta Airlines, United Airlines, & Southwest Airlines)

Sales and order fulfillment data from Boeing and Airbus, the two leading aircraft manufacturers in the U.S., indicate that single-aisle, mid-sized planes are the most common models being ordered by U.S. airlines. Of Boeing's six classes of aircraft, the 737 has been the most purchased over the last 10 years (Figure 2-10) (BOEING, 2013). Due to the limited runway and infrastructure at SDIA it is reasonable to assume most airlines utilizing the 737 will continue to operate there for decades to come.

Figure 2-10: Boeing Sales by Aircraft Model (2003-2012)



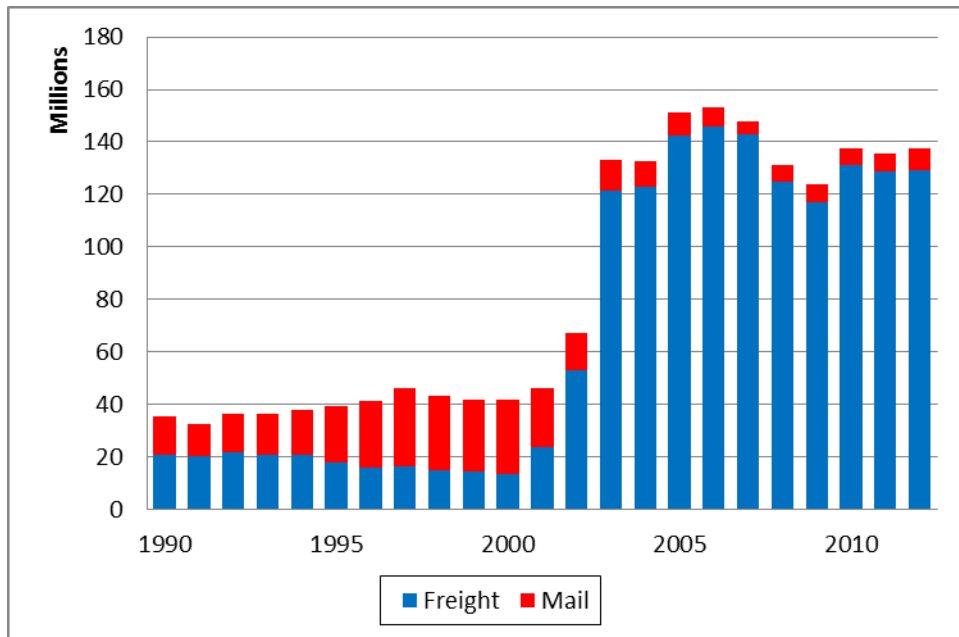
(Source: Boeing, Inc.)

Air Cargo

Having an airport that can serve the needs of both passengers and cargo is relevant; therefore this study examines the demand for air freight traffic. Though the loading facilities for passengers and cargo are on opposite sides of the airport, all air traffic utilizes SDIA's single runway. Currently there are five all-cargo carriers operating along the north cargo ramp at SDIA. Memphis (FedEx) and Columbus (UPS) are the most common non-stop destinations for air cargo carriers (DOT, 2013).

Though SDIA has seen a significant increase in air cargo traffic since 2002, volumes have leveled out since 2008 (Figure 2-11). This is due to the economic recession, as well as the constraints and capacity issues previously mentioned.

Figure 2-11: Air Cargo Volume (lbs.)



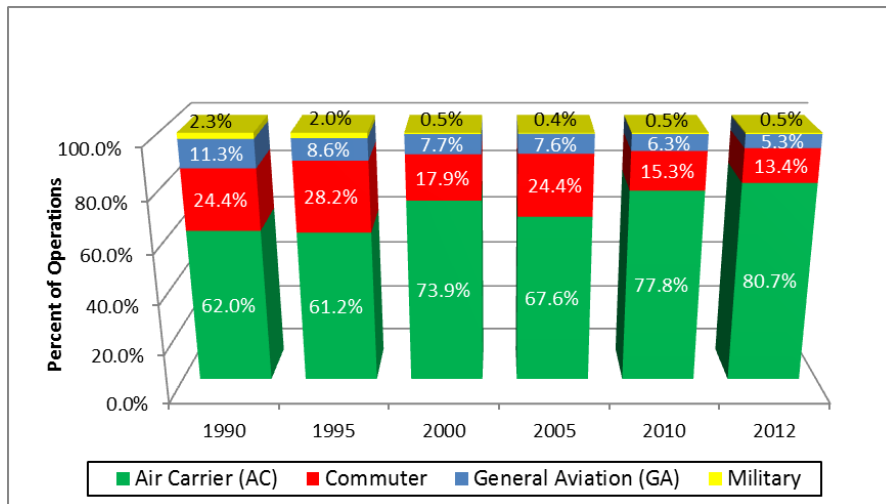
(Source: Bureau of Transportation Statistics (BTS))

Air cargo carriers at SDIA face many of the same obstacles as passenger airlines, such as airfield capacity, runway length, surrounding terrain, and restricted takeoff hours. Due to these constraints, San Diego is unlikely to see any significant growth in air cargo volume because of their proximity to the UPS hub at Ontario International Airport (ONT) and FedEx's large operation at LAX (CalTrans, 2010). Additionally, Brown Field, a municipal airport near the Mexico border, has been discussed as an alternative site to alleviate air cargo traffic at SDIA (IATA, 2013).

Airport Operations

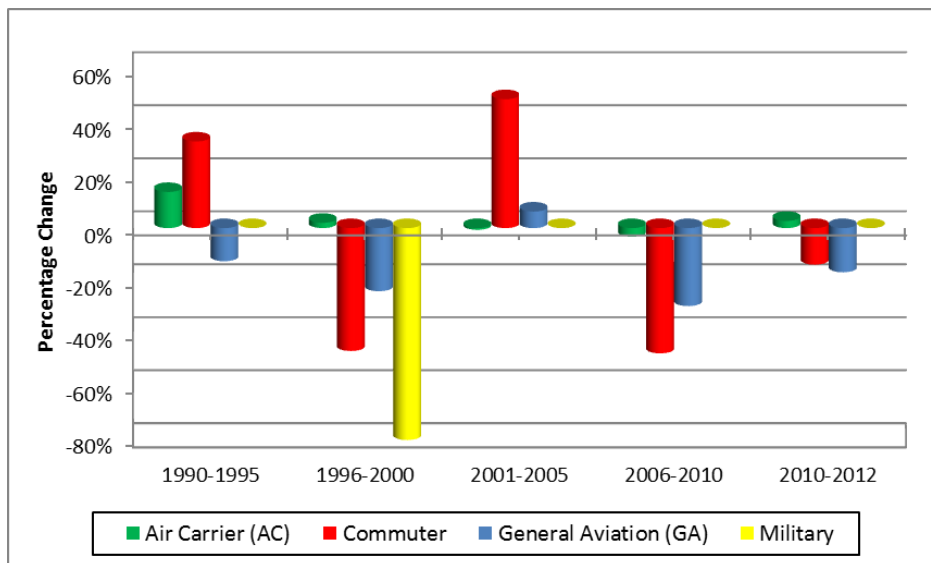
SDIA differentiates airport operations into four categories: Air Carrier, Commuter, General Aviation, and Military. SDIA's operational utilization by type is described in Figure 2-12. Air carriers dominate SDIA operations, utilizing 70.5% of operations since 1990. Additionally, Figure 2-13 examines the percentage change over time in these different types of SDIA operations.

Figure 2-12: SDIA Operational Utilization by Type



(Source: san.org)

Figure 2-133: Operational Utilization Change



(Source: san.org)

Present day military utilization at SDIA is minimal, at 1% of total. The military has decreased utilization at SDIA an average 16% per year since 1990. Air carriers had the smallest percentage change over this period, at 3%. Commuter and General Aviation (GA) have experienced utilization decreases of 5% and 15%, respectively, since 1990.

Comparison of SDIA to Similar Airports

As part of the process for forecasting air travel demand at SDIA over the next 20 years, an analysis of the current airport facility was conducted. Specifically, a unique set of comparisons of SDIA to airports of similar sized cities and regions (by population), as well as to airports of similar flight and passenger activity are provided. The intent of this analysis is to

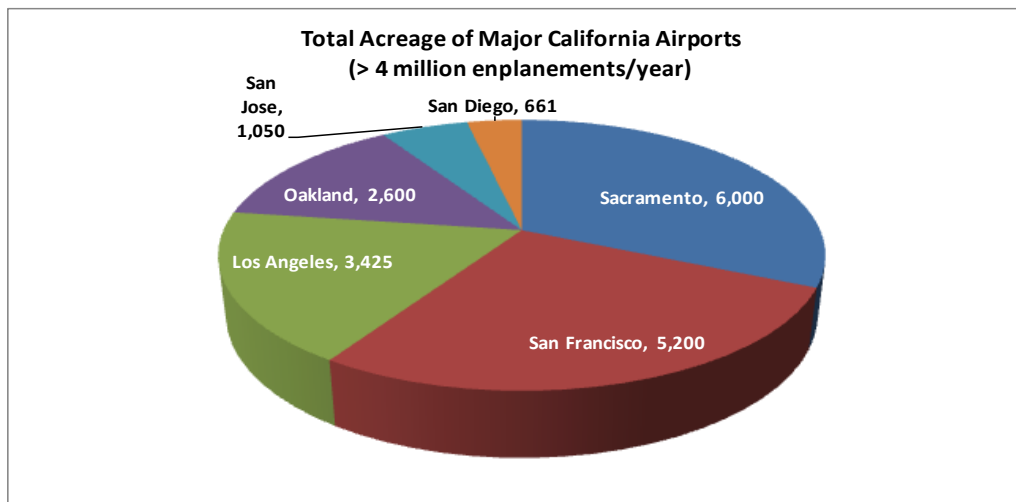
provide viewpoints of how other airports are structured (based on acreage and number of runways) under conditions similar to those of SDIA. As forecasts for air travel demand at SDIA emerge, it is important to see where the current facility stands in terms of current demand. Furthermore, comparisons to similar airports that demonstrate they have excess capacity could provide a baseline example as to the potential size and structure of any future new airport facility in the San Diego region.

While conducting the research, countless data sets emerged regarding daily, monthly and annual flight information for all airports of concern. What were not readily available were comparisons of flight activity to airport facility structure. As previously discussed, population is a major factor affecting air travel demand. As such, analyses of airport facilities as they relate to the local and regional populations have been included. The overall intent of these analyses is to provide unique comparisons of data previously not provided in other air travel demand studies.

Airport Acreage

Six major California airports, based on a minimum of 4.3 million annual enplanements, were analyzed for airport facility acreage. The six airports identified were: Sacramento International Airport, San Francisco International Airport, Los Angeles International Airport, Oakland International Airport, Mineta San Jose International Airport, and San Diego International Airport. The distribution of total airport facility acreage between these seven airports has been provided in Figure 2-14.

Figure 2-14: Comparison of Airport Facility Acreage for Major California Airports



(Sources: San Diego International Airport Website; Mineta San Jose International Airport Website; Oakland International Airport Website; Los Angeles International Airport Website; Sacramento International Airport Website; San Francisco International Airport Website)

Of the six airports analyzed, San Diego International Airport has the least acreage, at 661 total acres. Though Los Angeles and San Francisco have drastically more annual enplanements and total flights than SDIA, it is interesting to see that SDIA has significantly higher annual enplanements and total flights than the three other airports. San Jose, Oakland, and Sacramento airport acreage is 1.6 times, 4 times, and 9 times (respectively) larger than the acreage of SDIA, while handling significantly fewer flights and enplanements per year (Table 2-2).

Table 2-2: Enplanements, Flights, and Acreage of Major California Airports

| Airport | 2012 Enplanements | 2012 Departing Flights | 2012 Total Departures and Arrivals | Acreage |
|------------------|------------------------------|-----------------------------------|---|----------------|
| Los Angeles | 24,982,954 | 274,406 | 548,836 | 3,425 |
| San Francisco | 18,567,216 | 193,563 | 386,874 | 5,200 |
| San Diego | 8,479,221 | 80,602 | 161,274 | 661 |
| Oakland | 4,851,495 | 49,561 | 99,171 | 2,600 |
| Sacramento | 4,326,178 | 46,215 | 92,463 | 6,000 |
| Orange County | 4,300,976 | 41,096 | 82,204 | 500 |

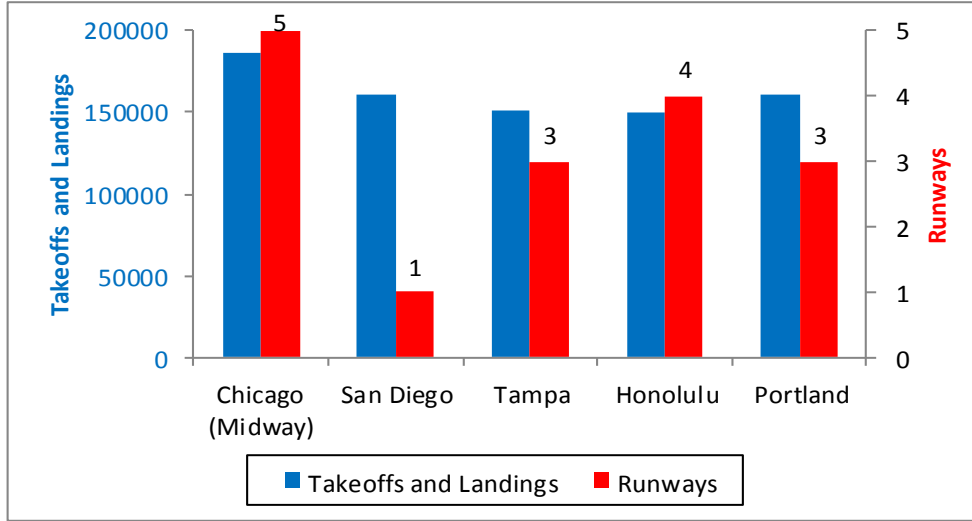
(Sources: San Diego International Airport Website; Mineta San Jose International Airport Website; Oakland International Airport Website; Los Angeles International Airport Website; Sacramento International Airport Website; San Francisco International Airport Website)

Total Takeoffs and Landings versus Number of Runways

One aspect of the current SDIA facility that has historically come under scrutiny is the lack of runways. As stated previously in this report, SDIA has only one runway. The 2004 Simat, Helliesen & Eichner, Inc. (SH&E, 2004) report on San Diego Aviation Forecasts provided several significant findings regarding the runway “issue” at SDIA. The report estimates that the one runway will begin to constrain operational growth between the years 2015 and 2022. Between 2021 and 2030, further growth will be impossible due to runway congestion. Additionally, the report estimates that SDIA will accumulate losses between 5 and 30 million total passengers (based on low and high growth scenarios) during this projection period.

To provide some insight into how SDIA compares to similarly travelled airports, the team completed a comparative analysis. Four airports with similar totals of annual commercial flights (takeoffs and landings) and enplanements to SDIA were identified: Chicago (Midway), Tampa, Portland, and Honolulu. Assuming the number of runways at an airport has significant impacts on the number of incoming and outgoing flights it can manage, the analysis compared runway count to total commercial flight takeoffs and landings at each airport. The results are presented in Figure 2-15.

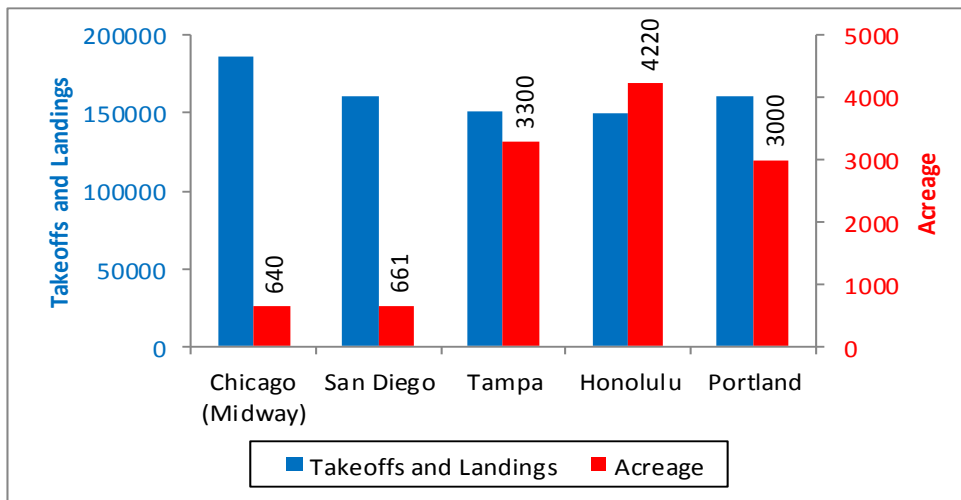
Figure 2-15: Comparison of Total Commercial Takeoffs and Landings to Number of Runways



(Sources: Bureau of Transportation Statistics; Federal Aviation Administration)

A similar analysis was performed on the same airports, but instead with a focus on total commercial takeoffs and landings versus total airport acreage (Figure 2-16).

Figure 2-16: Comparison of Airport Total Commercial Takeoffs and Landings to Airport Acreage



(Sources: Bureau of Transportation Statistics; Federal Aviation Administration)

As expected, SDIA falls short of runway count as compared to airports with similar total takeoffs and landings. Also evident with this analysis is, with the exception of Chicago Midway (which is 27 miles from Chicago O’Hare International Airport), SDIA’s total acreage is significantly less than that of the comparable airports.

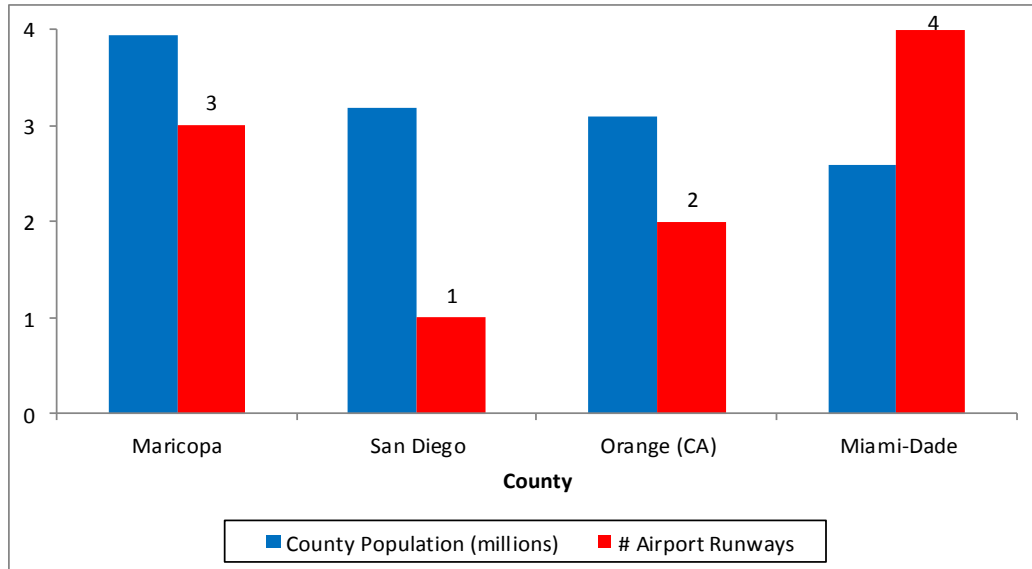
Local and Regional Population versus Airport Facility

Considering the current and projected population data provided earlier in this report, the team felt another interesting analysis would be to compare cities and counties of similar

population to the size and structure of their respective airports. The intent of this analysis is to show a generalized view of how each airport is set up to handle its local and regional populations, while considering the projected growth of such populations, as identified previously in this report. Again, airport acreage and runway count were considered. Airports in similarly populated regions to San Diego were analyzed for comparison.

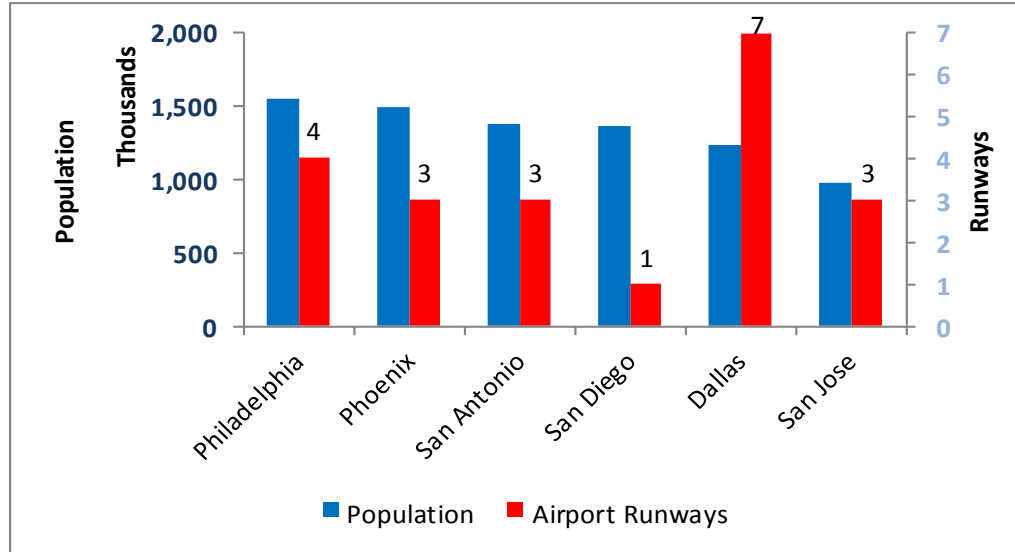
Figure 2-17 provides a comparison of county population to the number of runways at the nearest major airports. The counties of Maricopa, Miami-Dade, and Orange were selected based on their populations being similar to that of San Diego County based on the U.S. Census Bureau 2012 population estimates for these counties. Similarly, Figure 2-18 provides a comparison of city populations to the number of runways at the cities' major airport. The cities of Philadelphia, Phoenix, San Antonio, San Jose, and Dallas were chosen based on their populations being similar to that of San Diego, based on the U.S. Census Bureau 2012 population estimates for these cities.

Figure 2-17: Comparison of County Population to Number of Runways at Nearest Major Airport



Sources: U.S. Census Bureau; Federal Aviation Administration

Figure 2-18: Comparison of City Population to Number of Runways at Nearest Major Airport



Sources: U.S. Census Bureau; Federal Aviation Administration

Of the airports listed, it should be noted that Philadelphia and Phoenix are considered major hubs for U.S. Airways, and Dallas and Miami are considered major hubs for American Airlines. As evidenced by the figures provided above, counties and cities of similar resident population to San Diego have considerably more runways at the airports servicing these populations. As previously mentioned, the single runway system at SDIA is projected to reach operational maximums between the years 2021 and 2030, with potential flight operation losses in the millions, due to the facility's inability to add additional runways.

Chapter III. INDUSTRY ANALYSIS

The Tourism, Military & Defense, Biotechnology and Healthcare industries are an integral part of the local economy. Although the greater San Diego metropolitan area is home to a significantly large number of industries, the scope of this study is limited to only the four most prominent. As such, the research team analyzed each industry to determine its specific impacts on future air travel demand in the San Diego region.

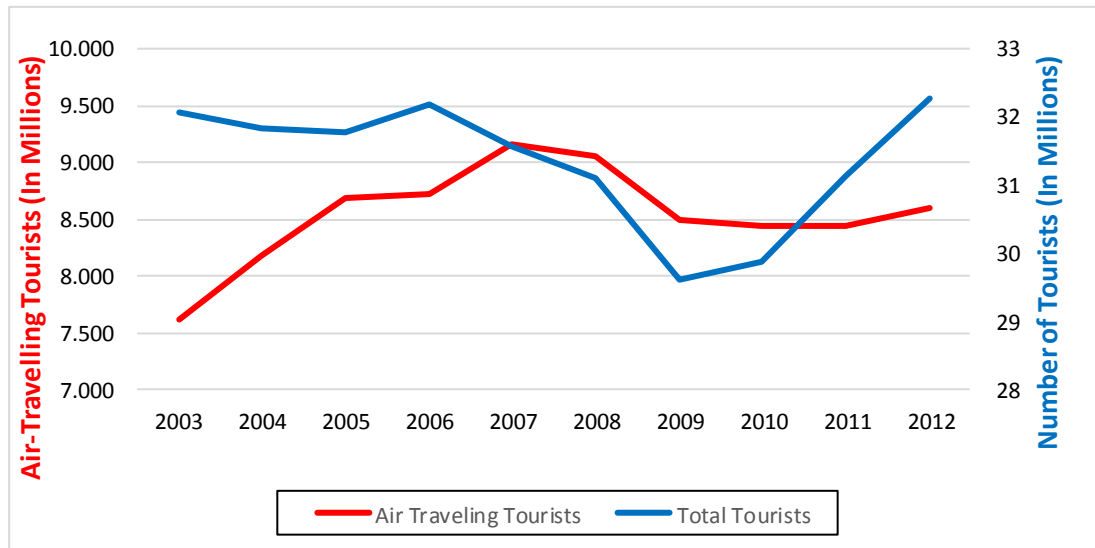
Tourism Industry

According to the San Diego Tourism Authority, the local tourism industry is the third largest in the U.S.; hosting more than 32 million tourists every year (San Diego Tourism Authority, 2013). Tourism is an industry dependent on disposable income, and was an industry that struggled significantly during the recent economic recession. The increased unemployment rate and economic uncertainty that arose as consequence of the recession caused a decline in this industry at the national level. However, data suggests that San Diego tourism was not affected as severely as the rest of the country (San Diego Tourism Authority, 2013).

The purpose of analyzing this industry was to determine the correlation between tourism in San Diego and air travel demand at SDIA. The analysis included the most recent ten years of air travel data, as reported by the San Diego Tourism Authority (SDTA). The findings suggest

there have been significant fluctuations in the number of air-travelling tourists into San Diego. Figure 3-1 compares the number of tourists arriving by air travel at SDIA to the total number of tourists that visited the San Diego region over the last 10 year period.

Figure 3-1: San Diego Air Travel and Tourism

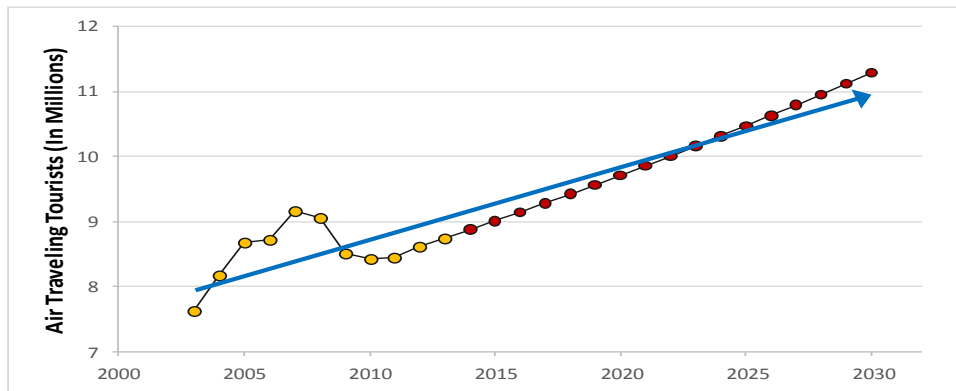


(Source: san.org)

From 2003 through 2008 (the start of the financial crisis) the number of tourists arriving and from departing San Diego was increasing at an average rate of 4.2% every year. As economic conditions worsened, this rate decreased to 1.5%.

In 2012, the total number of tourists visiting San Diego was 32.2 million, with approximately 8.6 million arriving by air (San Diego Tourism Authority, 2013). This represented an increase of almost 2% in tourism air travel demand. The research team analyzed data obtained from the San Diego Tourism Authority's annual industry report, and created two models to forecast air travel demand generated by the tourism industry in San Diego. The first forecast, as displayed in Figure 3-2, assumes air travel demand at SDIA will continue to increase at 1.5%. This model estimates that in the next 20 years, tourists arriving at SDIA will increase by approximately 2.6 million passengers, representing an increase of 31% from 2012 figures.

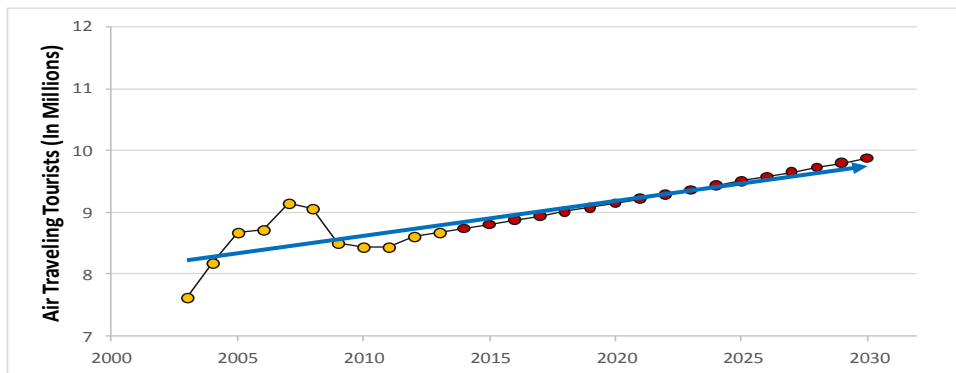
Figure 3-2: Tourism Air Travel Demand Forecast at 1.5% YOY Increase



(Source: san.org)

The second forecast was developed assuming a more conservative rate of increase. The annual growth rate of tourists arriving at SDIA has never dropped below 1.5% in any 10-year period over the last 30 years, and industry estimates indicate this trend will continue. Regardless, the research team generated a low-scenario forecast, to account for an unexpected drop in tourism air travel at SDIA. The team chose 0.75% as the low-scenario growth rate. Based on this lower rate, the 20 year projected demand indicates increase of 14% over 2012 numbers (Figure 3-3)

Figure 3-3: Tourism Air Travel Demand Forecast at 0.75% YOY Increase



(Source: san.org)

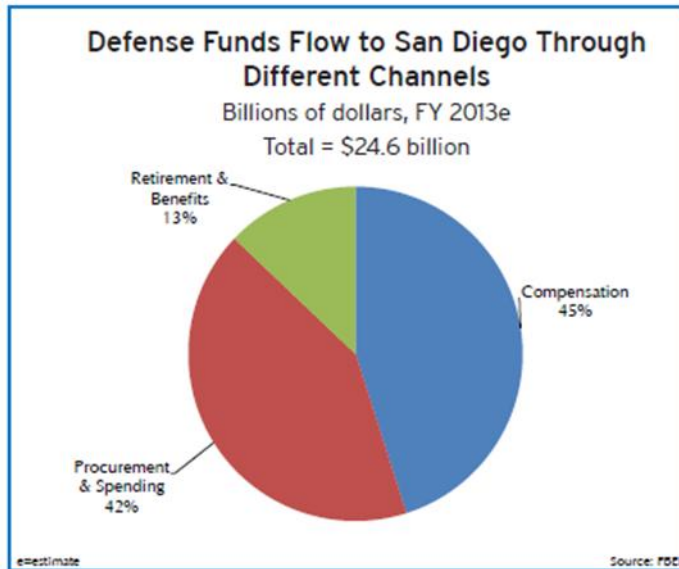
Based on these two forecast models, it can be estimated that tourism-based air travel demand at SDIA could increase between 14% and 31% over the next 20 years.

Military and Defense Industry

San Diego County has the highest military population of any region in the country (SDMAC, 2013). The region contains military installations that form the core of America's defense establishment in the southwestern region of the United States. Recruitment, basic training, special training, intelligence, analysis, research and development (R&D), manufacturing, and construction activities contribute significantly to the regional economy. The presence of the military and the complementary businesses supporting it have helped to

minimize the negative effects of past economic recessions in the San Diego region (Export Access, 2011). According to a recent report released by the San Diego Military Advisory Council, an estimated \$24.6 billion in direct spending related to defense has been sent to San Diego County during fiscal 2013, representing approximately \$7,800 for each of the county's residents (SDMAC, 2013). The military sector is responsible for over 300,000 of the region's jobs (Figure 3-4). Government spending on the military industry in San Diego accounts for approximately 22% of all existing jobs in the county (SDMAC, 2013).

Figure 3-4: Defense/Military Spending in San Diego Region



(Source: SDMAC)

Approximately 139,000 uniformed military and Department of Defense (DOD) civilians are currently working in San Diego County, making the military the single largest employer in the region (SDMAC, 2013). Table 3-1 displays the dispersion of military employees throughout the county.

Table 3-1: Active Duty and DoD Civilians in San Diego Region

| Number of employees, FY 2013* | | | | |
|-------------------------------|---------------|---------------|---------------|----------------|
| Installation | Civilian | Marine Corps | Navy | Total |
| MCAS MIRAMAR | 614 | 9,056 | 468 | 10,138 |
| MCB & MCAS CAMP PENDLETON | 2,829 | 38,710 | 4,040 | 45,579 |
| MCRD SAN DIEGO | 468 | 1,529 | 117 | 2,114 |
| MCRD RECRUITS | 0 | 4,550 | 0 | 4,550 |
| NAVMEDCEN SAN DIEGO | 2,326 | 148 | 3,498 | 5,972 |
| NB CORONADO (IMPERIAL BEACH) | 528 | 0 | 553 | 1,081 |
| NB CORONADO (NAB CORONADO) | 432 | 144 | 3,673 | 4,249 |
| NB CORONADO (NASNI and SCI) | 5,006 | 66 | 15,531 | 20,603 |
| NB POINT LOMA (NMAWC) | 242 | 2 | 1,797 | 2,041 |
| NB POINT LOMA (OTC) | 823 | 12 | 282 | 1,117 |
| NB POINT LOMA (SUBASE) | 3,927 | 0 | 1,716 | 5,643 |
| NB POINT LOMA (TOPSIDE) | 4,208 | 0 | 195 | 4,403 |
| NB SAN DIEGO | 2,755 | 19 | 18,728 | 21,502 |
| NB SAN DIEGO (Broadway) | 576 | 0 | 348 | 924 |
| NOSC SAN DIEGO, CA | 3 | 104 | 45 | 152 |
| NWS SEAL BEACH DET FALLBROOK | 285 | 12 | 0 | 297 |
| OTHER | 356 | 98 | 65 | 519 |
| Total | 25,378 | 54,450 | 51,056 | 130,884 |

*Reserves not included

Source: CNRSW; FBEI

(Source: CNRSW; FBEI)

The number of employed military in the region accounts for almost 19% of the national total. Additionally, according to the most recent U.S. Census, 240,000 military veterans reside within the region.

San Diego's military industry and related defense sector have generated slightly more total jobs, income, and gross regional product for the region in fiscal 2013 than in fiscal 2012 (SDMAC, 2013). Refer to Table 3-2.

Table 3-2: Defense Spending in San Diego

| Defense Spending Plays Major Role in San Diego's Economy | | | | |
|--|--------------|------|-------|-------|
| | Fiscal years | | | |
| | 2011 | 2012 | 2013e | 2014f |
| Direct Spending (\$ billions) | 24.4 | 24.2 | 24.6 | 24.3 |
| Jobs (thousands) | 319 | 307 | 302 | 295 |
| Income (\$ billions) | 21.2 | 20.6 | 20.9 | 20.6 |
| Gross Regional Product (\$ billions) | 32.7 | 31.9 | 32.2 | 31.9 |

Source: CNRSW; FBEI

(Source: SDMAC)

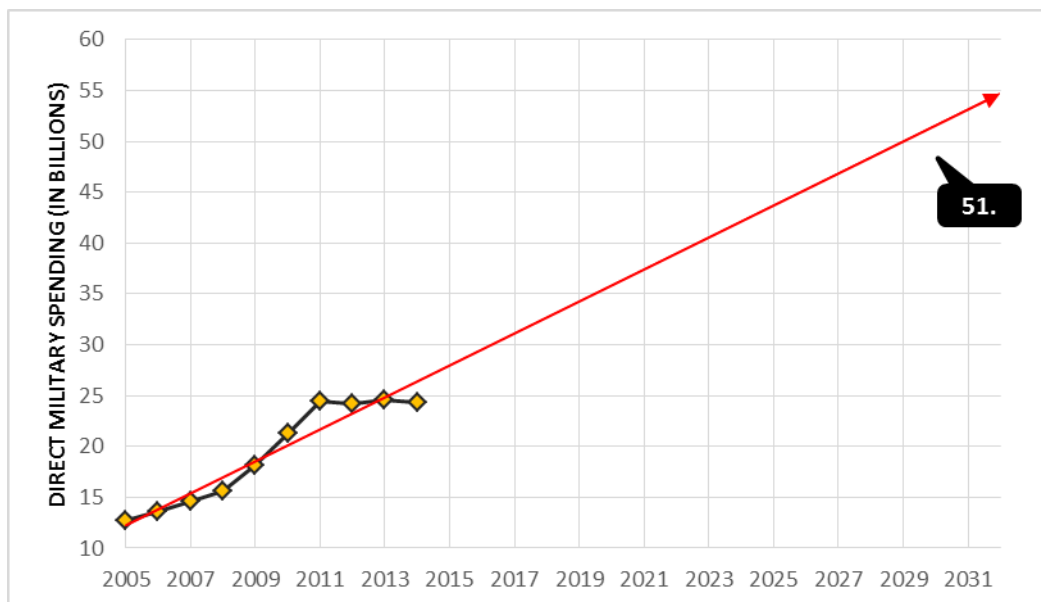
Approximately 90% of the military came to the San Diego region as part of their stationing orders. This population presents a significant potential for future air travel demand, in terms arrivals of visiting family and friends. Data from the San Diego Convention & Visitors Bureau indicate that each year approximately four visitors (per new recruit) come to San Diego to attend graduations at the Marine Corps Recruit Depot (MCRD) (San Diego Tourism Authority, 2013). In fiscal 2013, about 18,000 recruits graduated to Marines. Assuming 75% of these visitors arrive by air, this represents approximately 48,000 additional people arriving and departing at SDIA.

Budget Concerns

Due to uncertainties in governmental budget negotiations, forecasting activity levels within the military industry in San Diego has proven to be challenging. However, San Diego appears well positioned to take advantage of multiple elements of the U.S. national security strategy.

By the year 2020, the Navy will increase its presence by 20% (SDMAC, 2013). According to the San Diego Military Advisory Council, military spending is expected to decline only about 1% in fiscal 2014. However, they are quick to state that, “if budget cutbacks go forward, [the economic impact on the military industry in San Diego] would become somewhat diminished” (SDMAC, 2013). The national security strategy suggests the decrease in military spending in the San Diego region will not have long term ramifications. The forecast model in Figure 3-5 indicates that 2030 military spending in the San Diego region will increase by approximately \$26 billion, representing a growth of 109% over 2013 figures.

Figure 3-5: Military Spending Forecast in San Diego Region (to 2030)



(Source: SDMAC)

The team’s research indicates that the military industry in San Diego will continue to contribute significantly to the region’s economy, and will be a contributor to future air travel demand in the San Diego region.

Biotechnology Industry

The biotechnology industry in San Diego remains one of the most innovative in the world, and contains a high concentration of research firms from many of the industry's sectors. The growth of this industry has contributed to the development and prosperity of other supporting industries and infrastructure. San Diego is home to law, accounting, real estate, equipment manufacturing and public relations firms that specialize in the biotechnology industry (Biocom, 2013).

Joe Panetta, President and Chief Executive of Biocom, has indicated that the biotech industry in the region could produce 2000 jobs in the next 2 years (1.47% per year), and as many as 50,000 jobs by the year 2023 (Robbins, 2012). As of 2012, approximately 60,000 people were directly employed in biotechnology jobs and an additional 158,000 employed in biotechnology-related positions (Biocom, 2013).

According to Biocom's latest industry report, the average annual salary of biotech employees in San Diego is \$120,000, generating over \$5.5 billion in wages in region each year. Considering wages paid on jobs indirectly related to the industry, the total labor income generated from the industry exceeds \$14.5 billion annually. In terms of economic activity, the industry is responsible for over \$36.5 billion annually in the San Diego region (Biocom, 2013).

Table 3-3 depicts a Biocom projection estimating that the biotechnology industry could employ more than 87,253 people by 2033. Assuming a 3.5% cost of living increase in average wages, the industry would generate a total of about \$15.7 billion in wages and contribute over \$106 billion annually to the regional economy.

Table 3-3: Economic Impact of Biotech Industry to San Diego Region

| | Year | Avg. Wages | Employment (In thousands) | | | | Labor Income (In Millions) | | | | Economic Activity (In Millions) | | | |
|--|------|------------|------------------------------|----------|---------|---------|-------------------------------|----------|-----------|-----------|------------------------------------|-----------|-----------|------------|
| | | | Direct | Indirect | Induced | Total | Direct | Indirect | Induced | Total | Direct | Indirect | Induced | Total |
| Actual | 2012 | \$ 123,234 | 59,871 | 35,636 | 122,762 | 218,269 | \$ 5,413 | \$ 2,231 | \$ 7,032 | \$ 14,676 | \$ 14,293 | \$ 5,952 | \$ 16,389 | \$ 36,634 |
| F o r e c a s t | 2014 | \$ 127,547 | 68,253 | 40,625 | 139,948 | 248,826 | \$ 6,386 | \$ 2,632 | \$ 8,297 | \$ 17,316 | \$ 16,864 | \$ 7,023 | \$ 19,338 | \$ 43,224 |
| | 2015 | \$ 132,011 | 69,253 | 41,220 | 141,998 | 252,471 | \$ 6,707 | \$ 2,764 | \$ 8,713 | \$ 18,184 | \$ 17,710 | \$ 7,375 | \$ 20,308 | \$ 45,393 |
| | 2016 | \$ 136,632 | 70,253 | 41,815 | 144,048 | 256,116 | \$ 7,042 | \$ 2,903 | \$ 9,148 | \$ 19,093 | \$ 18,595 | \$ 7,743 | \$ 21,322 | \$ 47,660 |
| | 2017 | \$ 141,414 | 71,253 | 42,410 | 146,098 | 259,751 | \$ 7,392 | \$ 3,047 | \$ 9,603 | \$ 20,042 | \$ 19,519 | \$ 8,128 | \$ 22,382 | \$ 50,030 |
| | 2018 | \$ 146,363 | 72,253 | 43,005 | 148,148 | 263,406 | \$ 7,758 | \$ 3,198 | \$ 10,079 | \$ 21,035 | \$ 20,486 | \$ 8,531 | \$ 23,491 | \$ 52,508 |
| | 2020 | \$ 156,788 | 74,253 | 44,195 | 152,248 | 270,696 | \$ 8,541 | \$ 3,520 | \$ 11,096 | \$ 23,157 | \$ 22,553 | \$ 9,391 | \$ 25,861 | \$ 57,805 |
| | 2023 | \$ 173,834 | 77,253 | 45,980 | 158,398 | 281,631 | \$ 9,852 | \$ 4,061 | \$ 12,799 | \$ 26,712 | \$ 26,015 | \$ 10,833 | \$ 29,831 | \$ 66,679 |
| | 2025 | \$ 186,215 | 79,253 | 47,170 | 162,498 | 288,921 | \$ 10,827 | \$ 4,463 | \$ 14,065 | \$ 29,355 | \$ 28,589 | \$ 11,905 | \$ 32,783 | \$ 73,277 |
| | 2028 | \$ 206,460 | 82,253 | 48,955 | 168,648 | 299,856 | \$ 12,458 | \$ 5,135 | \$ 16,185 | \$ 33,778 | \$ 32,897 | \$ 13,699 | \$ 37,722 | \$ 84,319 |
| | 2030 | \$ 221,165 | 84,253 | 50,145 | 172,748 | 307,146 | \$ 13,670 | \$ 5,635 | \$ 17,759 | \$ 37,064 | \$ 36,097 | \$ 15,032 | \$ 41,392 | \$ 92,521 |
| | 2033 | \$ 245,210 | 87,253 | 51,930 | 178,898 | 318,081 | \$ 15,696 | \$ 6,470 | \$ 20,391 | \$ 42,557 | \$ 41,447 | \$ 17,259 | \$ 47,526 | \$ 106,232 |

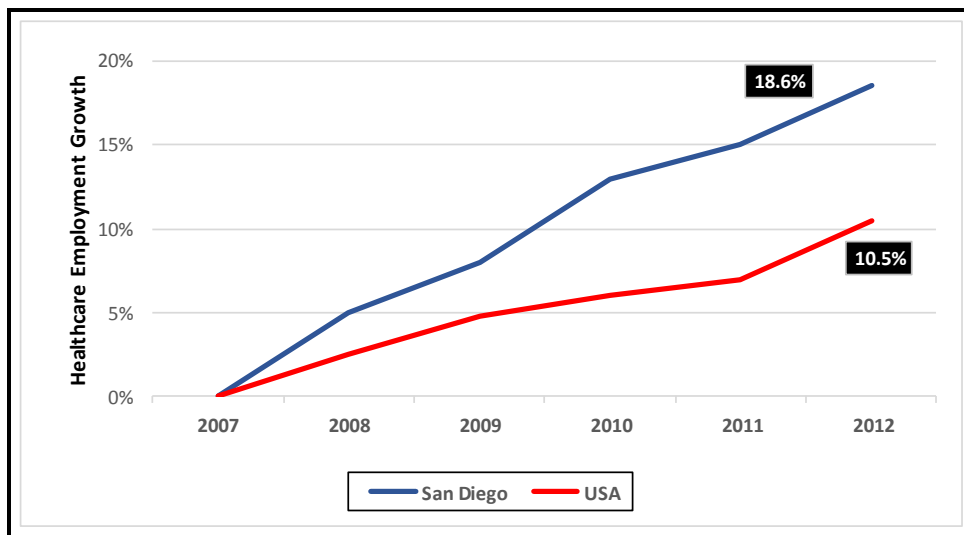
(Sources: (Biocom, 2013), (Robbins, 2012))

With such a broad economic impact on the regional economy, it is evident this industry will continue to have a direct effect on a multitude of services, including air travel.

Health Care Industry

Approximately \$2.7 trillion is spent on health care each year in the United States. According to the San Diego Regional Economic Development Council, San Diego has one of the most sophisticated healthcare industries in the country (San Diego Regional EDC, 2013). San Diego is home to 25 hospitals and more than 6,400 unique healthcare establishments that employ more than 100,000 people. This represents approximately 8% of the region's active workforce. From 2007 to 2012, employment in the local healthcare industry grew by more than 18% (San Diego Regional EDC, 2013). (Refer to Figure 3-6)

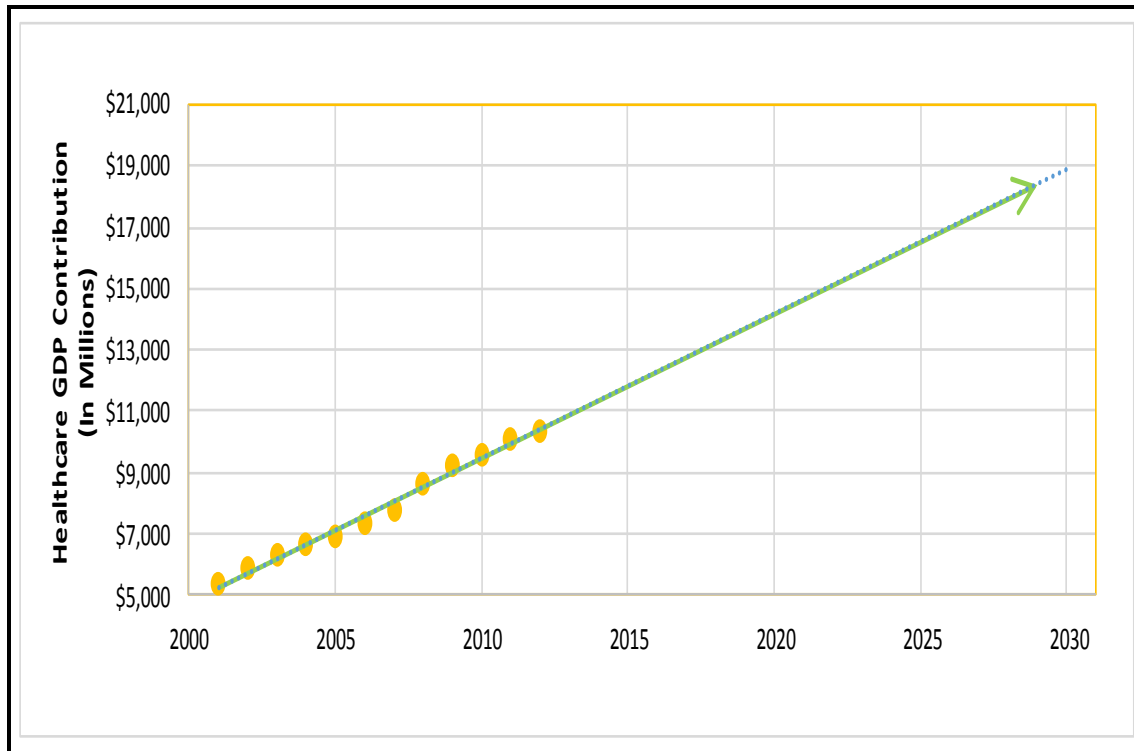
Figure 3-6: Healthcare Employment Growth (2007-2012)



(Source: SanDiegoBusiness.Org)

In 2012 the local healthcare industry contributed more than \$10.3 billion in gross regional product. Linear regression analysis indicates that the industry's contribution to the local economy will continue to increase over the next 20 years. Figure 3-7 suggests that by the year 2030, the economic impact of the healthcare industry in San Diego will be over \$18.8 billion, indicating this business sector will continue to grow and be a significant driver of employment and economic impact (San Diego Regional EDC, 2013).

Figure 3-7: Healthcare Industry GDP Contribution to the San Diego Region



(Source: Bureau of Economic Analysis)

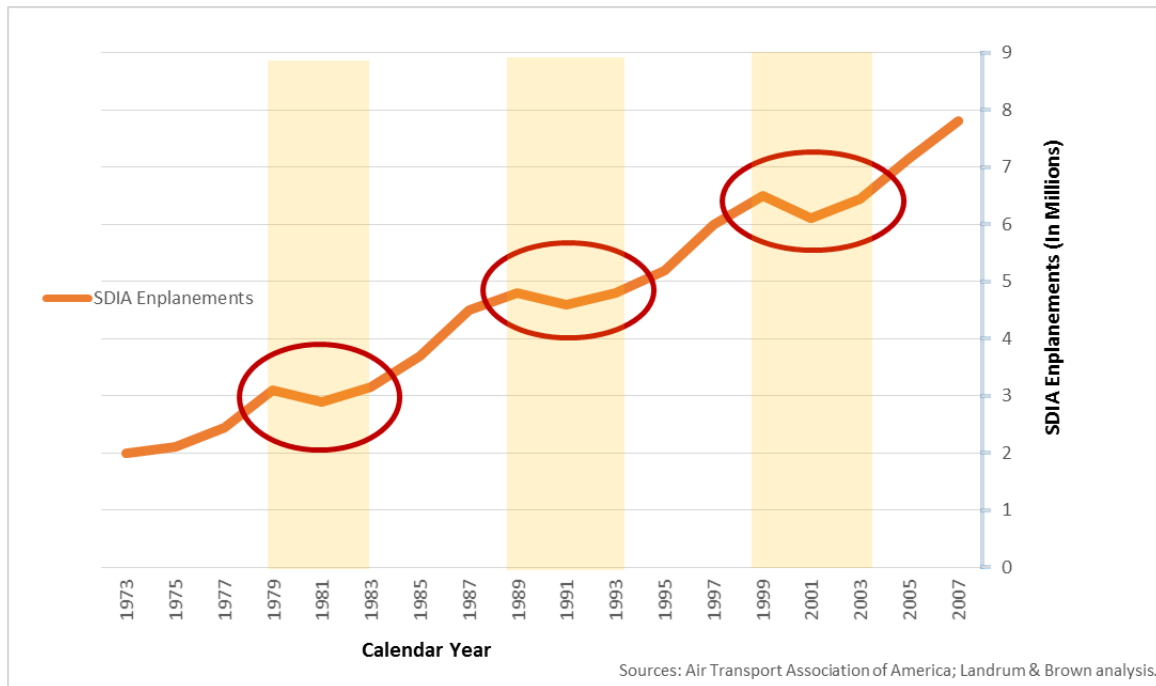
Business Growth

There have been at least 5 different studies focusing on air travel demand at San Diego International Airport. The most recent was performed by the Jacobs Consultancy Team in 2011. In that study, the Jacobs Team developed demand forecasts based on two key factors: the price of air travel and the ability to pay for air travel (Jacobs Consultancy, 2011).

The first factor, the price of air travel, is primarily affected by the price of oil and what is referred to as “airline economics” – other factors impacting the airline industry. With the recent economic downturn and drastic increases in the cost of oil, it would be expected to see an increasingly upward trend airline operating costs. Ticket prices are impacted by such factors, and research suggests that higher ticket prices will likely result in lower demand for air travel.

The second factor, the ability to pay for air travel, is related to economic conditions. The Airports Council International or North America has pointed out that a “region’s population and economic strength are significant drivers behind air service” (AirportsForTheFuture.org, 2012). Figure 3-8 displays how air travel demand declines during times of economic recession (highlighted areas) and increases during economic conditions are favorable.

Figure 3-8: SDIA Enplanements and Economic Conditions



(Source: Air Transport Association of America; Landrum & Brown analysis)

In the San Diego region, employment growth has exceeded population growth, and the unemployment rate has been well below national and state averages (Jacobs Consultancy, 2011). Such encouraging employment facts are the result of a greatly diversified network of industries operating in the San Diego region. In terms of economic conditions, this diverse business community is a significant factor driving current and future air travel demand.

Industry Analysis Findings

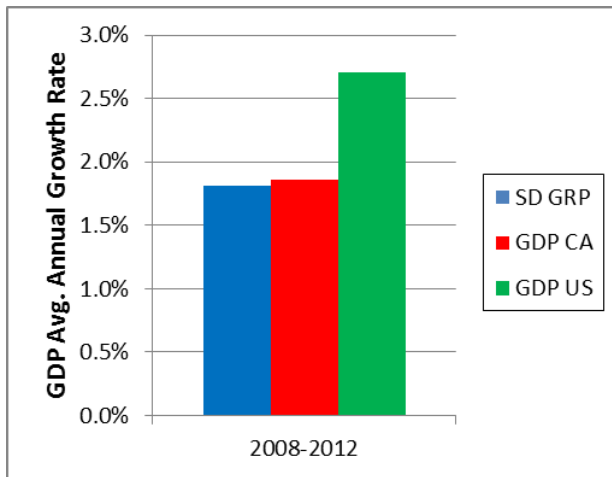
The forecasts for these four key industries in the region project strong growth in the future, and will likely have a significantly positive economic impact to the greater San Diego region. A strong business sector translates to higher employment rates and more people earning a salary. This will increase the possibility of consumers having the ability to pay for air travel, which is considered a major factor in forecasting air travel demand at SDIA.

Chapter IV. DEMAND DRIVERS

Gross Regional Product

Gross Regional Product focuses on the GDP specific to the San Diego metropolitan region. While per capita income is an individual measure of wealth, GRP is dependent on business revenues in the local economy. San Diego has a strong and diverse economy, with an average growth rate of 5.1% since 1993 (San Diego Regional EDC, 2013). However, San Diego has been slower to recover from the recession compared to state and national levels. Since 2008, San Diego's GRP has averaged 1.8% annual growth compared to state-wide GDP of 1.9% and U.S. GDP of 2.7% over the past 5 years (Figure 4-1).

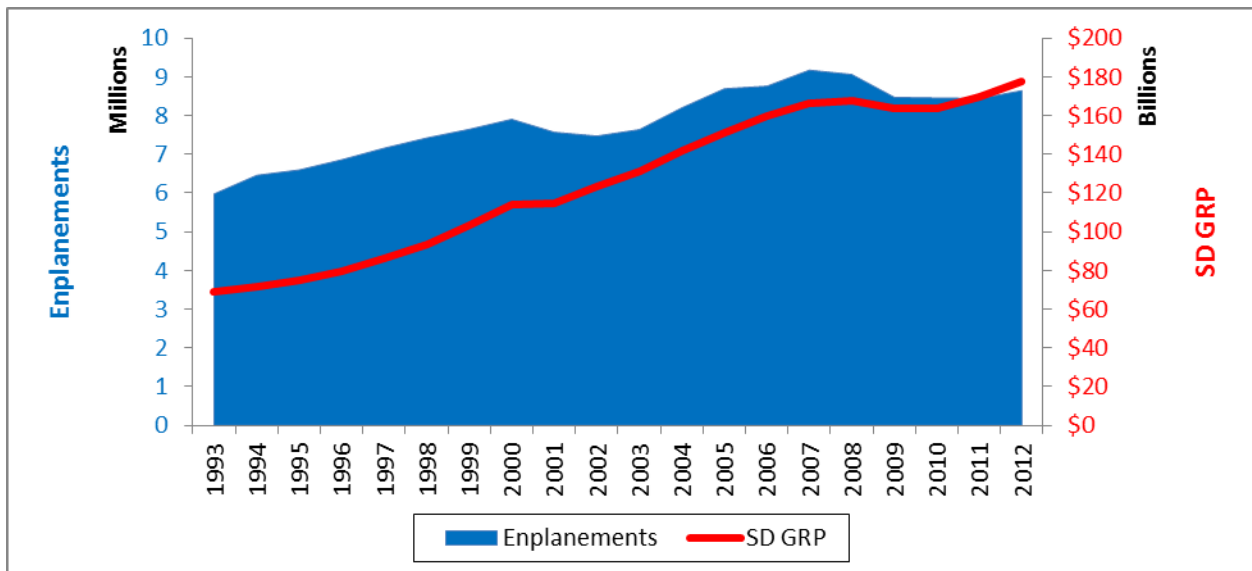
Figure 4-1: GDP Average Annual Growth Rate



(Source: Bureau of Economic Analysis)

Though San Diego’s economy has been slow to recover from the economic recession, there is a strong correlation (0.94) between San Diego GRP and annual enplanements at SDIA (Figure 4-2).

Figure 4-2: Gross Regional Product to Enplanements – SDIA (1993-2012)



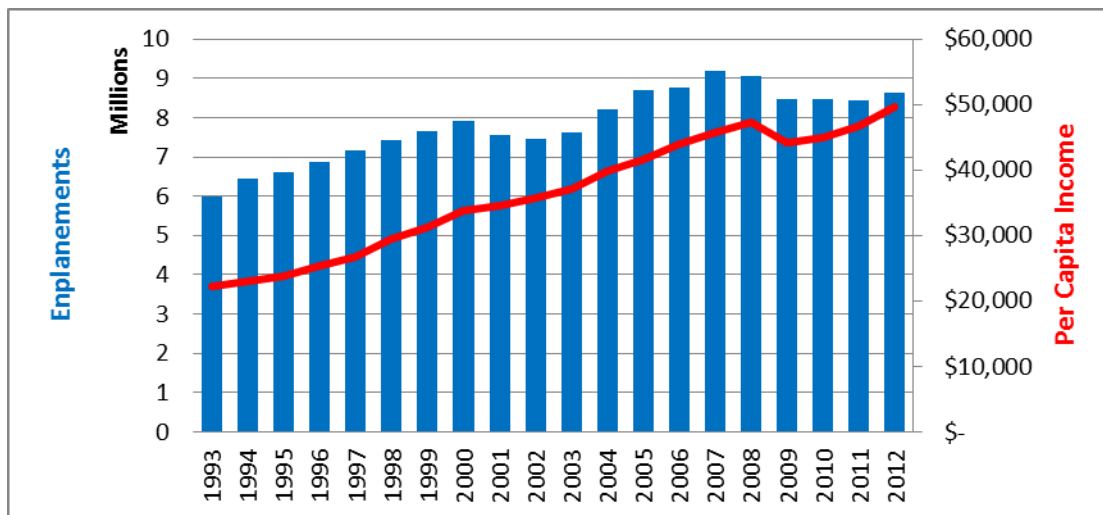
(Source: Bureau of Economic Analysis)

This analysis concludes that enplanements are closely tied to the economic growth of the region. Business travel represents an important segment of air travel demand to and from the San Diego region. It can be inferred that the recent economic downturn had a direct impact on number of enplanements at SDIA.

Per Capita Income

The ability to pay for airfare is an important component for air travel demand. While businesses tend to cut back spending by reducing budgets for employee air travel, airfares are usually paid for with disposable income by passengers travelling for pleasure. Per capita income is a measure of the average income per resident. A review of the data shows a strong relationship between per capita income and enplanements at SDIA since 1993. Per capita income in San Diego had an average growth rate of 4.4%, compared to a 2% growth rate in number of enplanements at SDIA. A strong correlation (0.95) exists between San Diego's per capita income and the number of enplanements year over year at SDIA during this timeframe.

Figure 4-3: Per Capita Income to Enplanements – SDIA (1993-2012)



(Source: Bureau of Economic Analysis, RITA)

San Diego County per capita income declined in 2008 with the onset of the economic crisis. Additionally, 2008 saw the beginning of a significant decrease in enplanements at SDIA. Historical data suggests an upward trend in per capita income will increase demand, though it may take several years to improve to pre-recession levels of growth. This will likely impact long-term forecasts for enplanements, which new estimates project to be slightly more conservative than prior research studies.

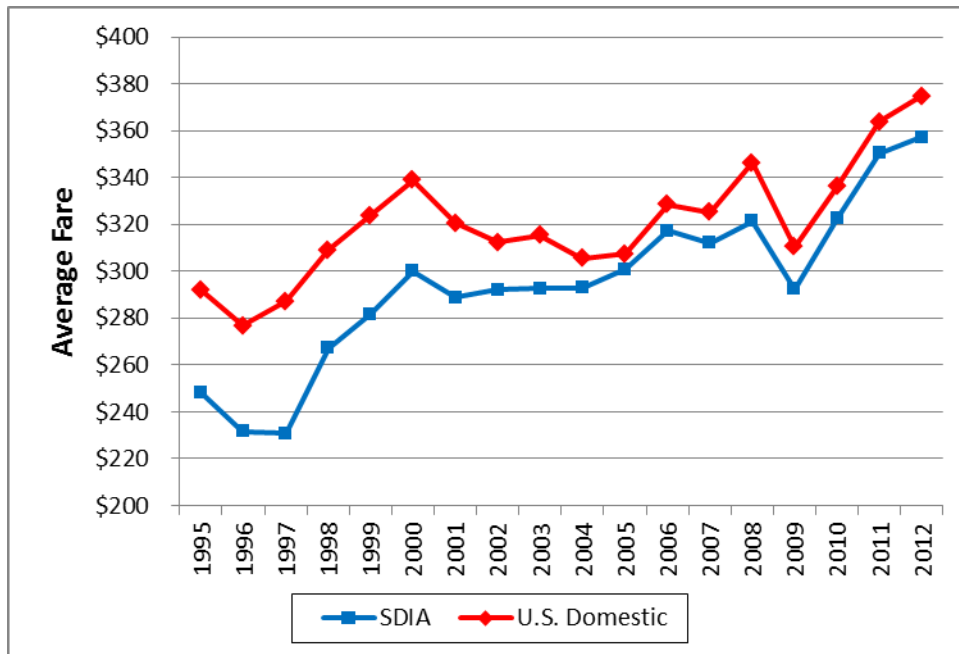
Airfares

The increase of air travel demand at SDIA can be attributed to many factors, including the price of air travel and the ability to purchase tickets (Jacobs Consultancy, 2009). The price of air fare is largely associated with oil prices and the economic conditions affecting the industry. From 2000 to 2010, airline industry profitability was one of the lowest of all U.S. industries, with a median return on equity at -11.2% (Grant, 2013). Airlines have attempted to incorporate cost saving strategies focused on optimizing resources and increasing efficiencies. Low airfare leaders, such as Southwest, pioneered new methods of enhancing efficiencies and minimizing costs to customers.

For many airlines, many complementary services historically provided have been eliminated, and replaced with additional fees for baggage and in-flight meals. Ultimately, these conditions have led to the increase in per capita airfare (SH&E, 2004).

Since 1995, SDIA has maintained an average domestic fare of \$294. Nationally, the average is approximately \$26 more per flight at \$321. Figure 4-4 displays the fluctuation in airfare from 1995 through 2012.

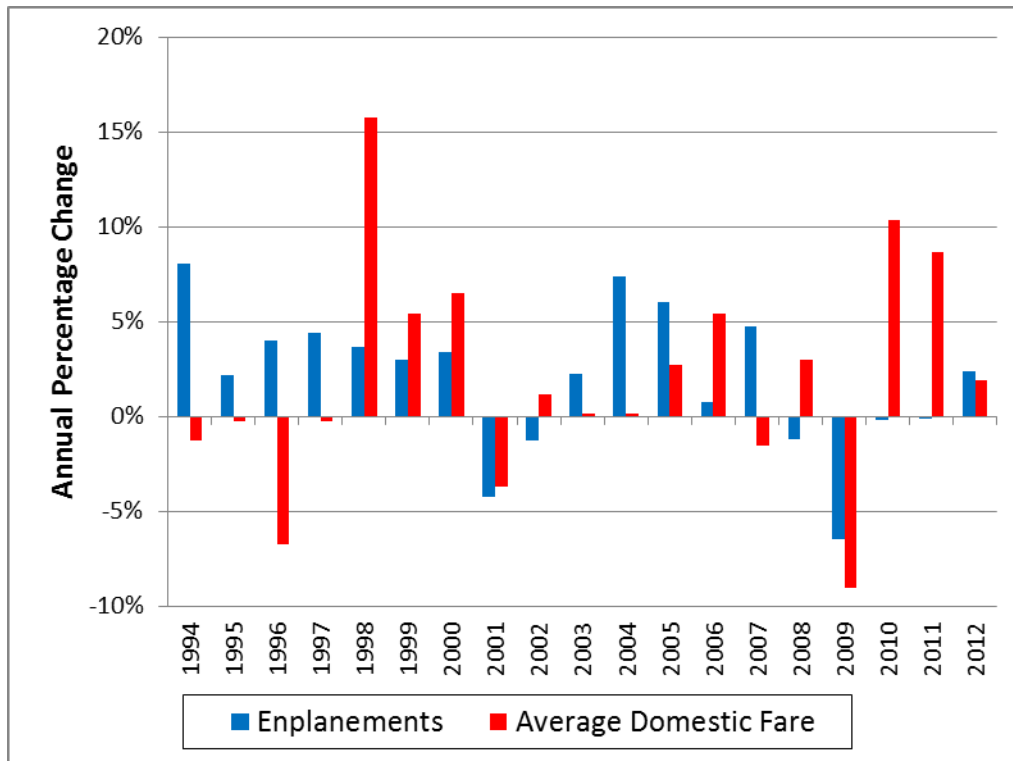
Figure 4-4: Comparing Average SDIA and U.S. Airfares



(Source: Bureau of Transportation Statistics (RITA))

When comparing SDIA passenger enplanements to average domestic airfare prices from 1993 to 2012, a moderately strong correlation of 0.82 is found. The average annual percentage change for both enplanements and average domestic fares for SDIA is a 2% increase from 1993 to 2012. Additionally, the findings indicated that 47% of the fluctuation in enplanements was consistent with the change in airfare prices. When fares increased, enplanements decreased, and vice versa. Figure 4-5 illustrates this annual percentage change and displays the variation in SDIA enplanements over a 19-year time frame.

Figure 4-5: Annual Changes of SDIA Enplanements and Average Domestic Airfares



(Source: Bureau of Transportation Statistics (RITA))

Population

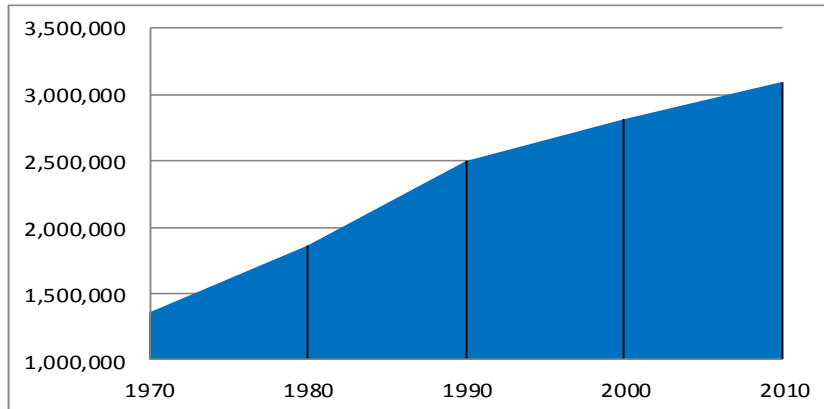
Population is a major factor in determining air travel demand. Generally speaking, an increase in population results in an increased demand for air travel. Suryani, Chou, and Chen (2010) found that population has a significant role in air passenger demand and projecting air passenger volume. As such, in-depth analyses of historical, current, and projected populations of the San Diego area are crucial to understand the projected air travel demand at SDIA. To aid in forecasting projected growth in the region, this study utilized forecast data provided by multiple credible authorities, including the United States Census Bureau, San Diego city and county offices, and the San Diego Association of Governments (SANDAG). Additionally, this study provides its own population projections, and uses regression analysis to forecast population growth based on historical population data. The team used population data dating back to 1970, in an effort to provide a more generalized view of population growth. The team feels that extending the research to over forty years of population data will allow for generalized, but accurate, population projections. These projections take into consideration the variations in growth rates due to socioeconomic factors affecting population.

Both San Diego County and the city of San Diego have demonstrated significant population growth rates over the last five decades. Projected population growth rates for both the county and city are expected to exceed growth rates of many similar sized counties and cities, as well as the national average. In 2006, the San Diego Association of Governments Board of Directors adopted the Series 11: 2030 Regional Growth Forecast Update, which stated that from 2004 to 2030, the San Diego region will have added an additional one million people to its

population (Governments, 2008). Though the same forecast projects the annual growth rate to slow to less than one percent by 2020, this is a significant increase in total population, which will undoubtedly impact the overall demand for air travel at SDIA.

From 1970 to 2010, the population of San Diego County grew 128% with an average growth of 23.5% per decade (refer to Figure 4-6).

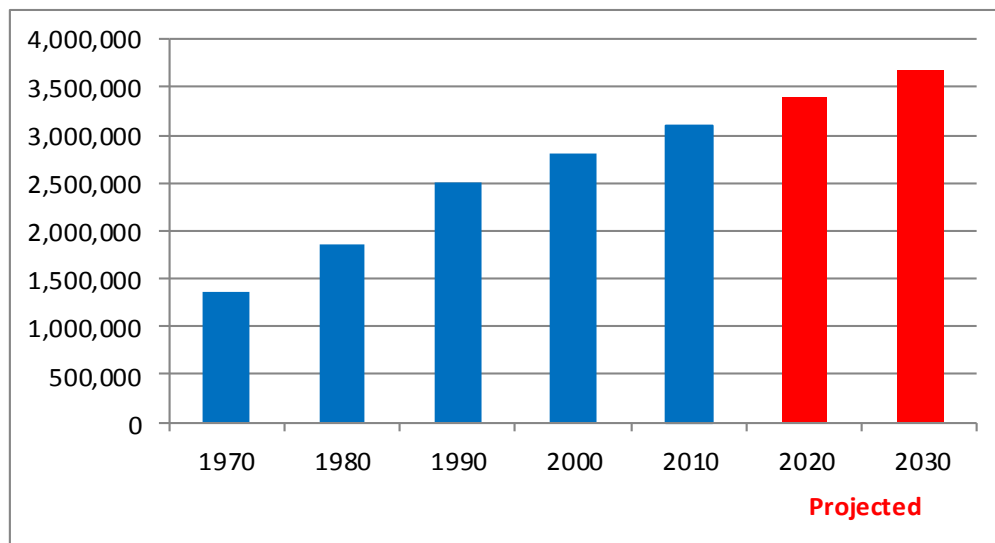
Figure 4-6: San Diego County Population Growth – 1970 to 2010



(Source: United States Census Bureau)

In 2010, the U.S. Census Bureau ranked San Diego County as the second most populated county in California, and the fifth most populated county in the United States, with a population of 3,095,313. In 2012, the San Diego County Board of Supervisors stated the population of San Diego County had risen to 3,143,429. The Board of Supervisors has projected the population of the county to reach nearly 3.67 million by 2030, representing an 18.4% increase from 2010 (refer to Figure 4-7).

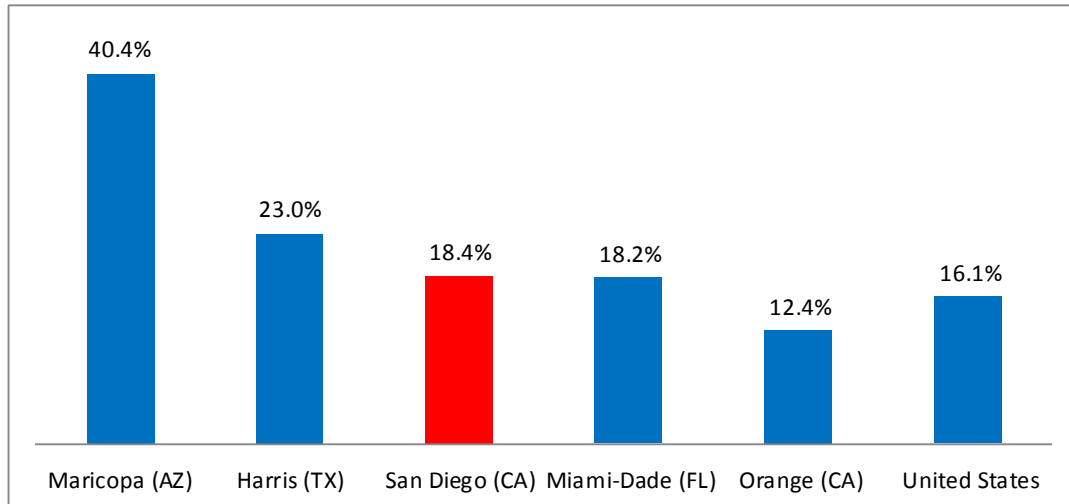
Figure 4-7: Historical and Projected Population for San Diego County



(Sources: United States Census Bureau; San Diego County Board of Supervisors)

Figure 4-8 provides a comparison of projected county population growth by 2030, based on counties of similar population in 2010. The projected growth of the United States population by 2030 has also been included for comparison.

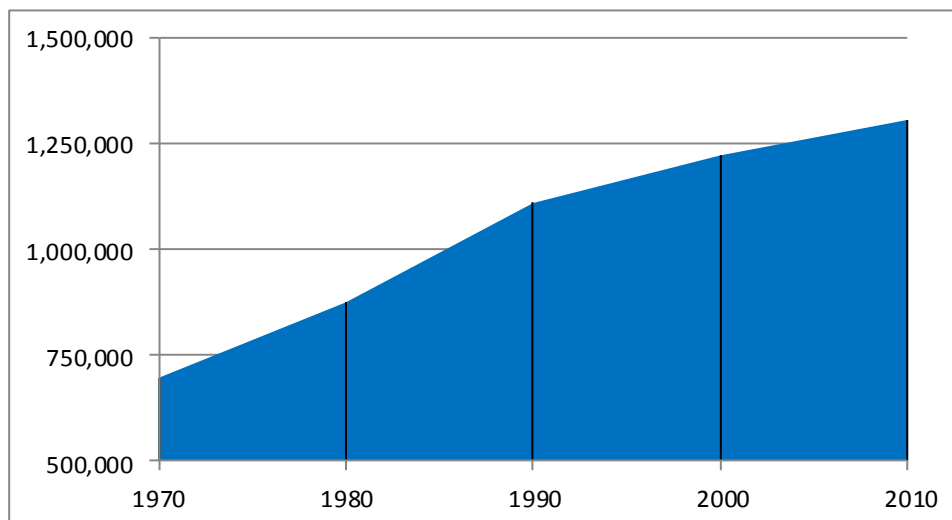
Figure 4-8: Projected Population Growth Rates of Selected Counties (2010 to 2030)



(Sources: San Diego County Board of Supervisors; United States Census Bureau; Arizona Department of Administration; Florida Housing Data Clearinghouse; Orange County Almanac Website; Texas Comptroller of Public Accounts)

The city of San Diego has also seen significant growth in its past, and is projected to grow at considerable rates into 2030. The U.S. Census Bureau indicates the city of San Diego is the second largest city in California and the eighth largest in the United States with a 2012 population of 1,322,533. From 1970 to 2010, the city of San Diego grew almost 88%, with an average growth of 17.4% per decade (Figure 4-9).

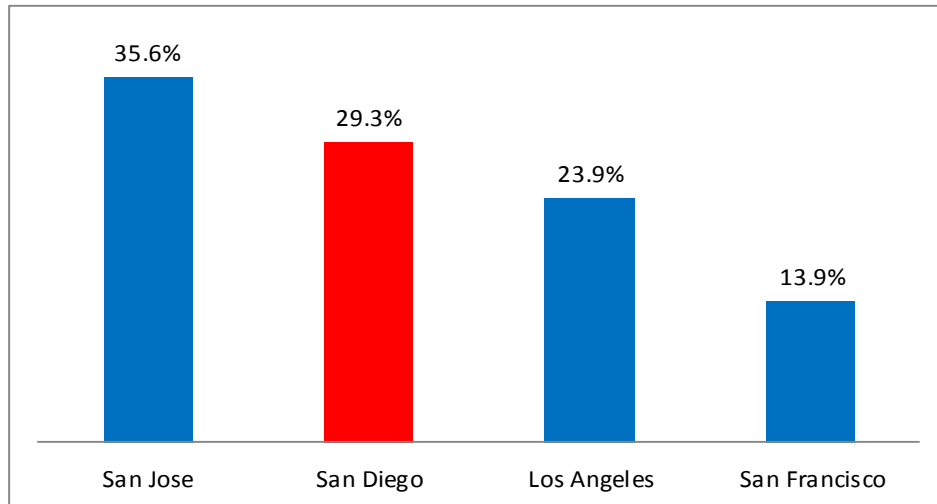
Figure 4-9: City of San Diego Population Growth – 1970 to 2010



(Source: United States Census Bureau)

The City of San Diego Economic Development Division projects the city of San Diego will grow to a population of nearly 1.7 million by 2030, representing a 29.3% increase since 2010. Of the four largest cities in California (Los Angeles, San Diego, San Jose, San Francisco), San Diego's projected percentage growth by 2030 will only be topped by the city of San Jose (Figure 4-10).

Figure 4-10: Projected Growth of California's Largest Cities by 2030



(Sources: Bay Area Association of Governments, City of Los Angeles Department of City Planning, City of San Diego Department of Economic Development)

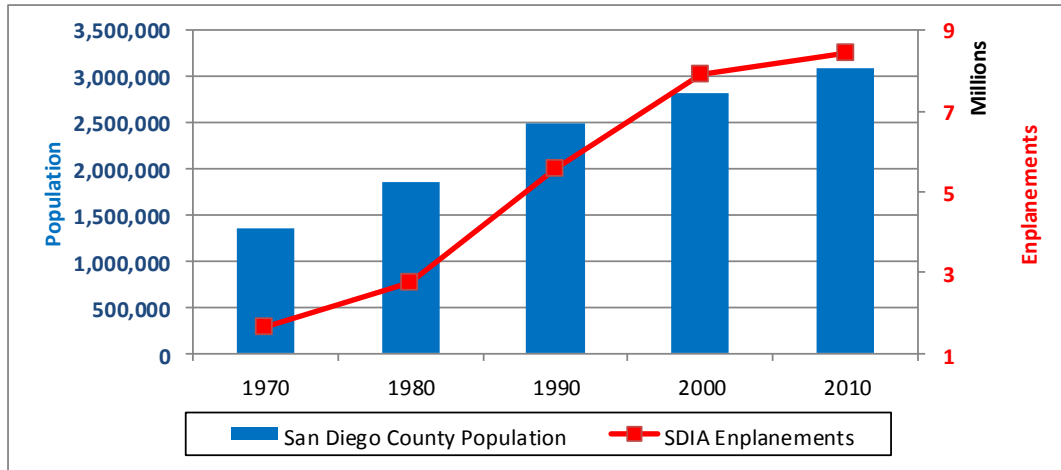
Population and Air Travel Demand

Population, income, gross regional product and airline pricing are major factors that affect the demand for air travel in any given geographic region. These specific factors were utilized in a Regression Analysis to develop a projected demand for air travel. In addition, single factor correlations to a region's demand for air travel were also examined. Various population and air travel statistics have been coupled to provide historical and projected comparisons, in an attempt to investigate how population affects air travel demand in the San Diego region.

Population and Passenger Enplanement

Historical population fluctuations have shown a direct relationship to passenger enplanement. For example, from 1980 to 1990, annual enplanements at SDIA grew 8% per year. During the same decade, San Diego County demonstrated an annual population growth of 3.4%. Similarly, from 1990 to 2000, SDIA annual enplanement growth rate decreased significantly to 3.5% (Simat, Helliesen & Eichner, Inc., 2004). This annual decrease in enplanements correlated to a reduced annual growth rate in the county, of 1.25% during the decade. Figure 4-11 provides a historical comparison of the population of San Diego County to total enplanements at SDIA.

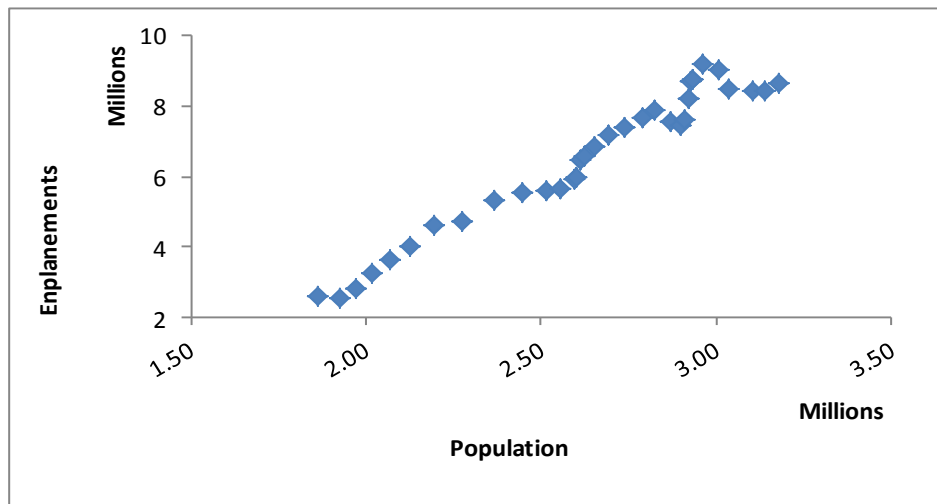
Figure 4-11: Historical Comparison of San Diego County Population to SDIA Enplanements



(Sources: United States Census Bureau; san.)

Figure 4-11 indicates a fairly consistent relationship of San Diego County’s population to number of enplanements at SDIA during the decades of 1970 through 2010. A scatter plot of San Diego County population versus enplanements at SDIA is provided in Figure 4-12. Data points for this analysis are provided for each year from 1980 to 2012.

Figure 4-12: Scatterplot of San Diego County Population and SDIA Enplanements (1980-2012)



(Sources: United States Census Bureau; San Diego International Airport Website Historical Data, 1949-Present)

Visually, the scatter plot in Figure 4-12 appears positively linear, indicating a relationship between population of the county and number of enplanements at SDIA. To test the statistical significance of this relationship, the population correlation coefficient (ρ) was calculated using Excel data analysis software. The calculation of the correlation coefficient utilizes a range of -1.0 to +1.0, where, ± 1.0 implies a perfect linear relationship (positive or negative), and 0 implies no linear relationship. Based on the calculation, the relationship of San Diego County population

to enplanements at SDIA is positively linear, with a correlation coefficient of 0.98. This indicates a nearly perfect linear relationship between the two variables.

A linear regression model was also constructed to forecast enplanements at SDIA for the years 2020 and 2030. The summary statistics for this model have been provided in Table 4-1.

Table 4-1: Regression Statistics – Population to Enplanements

| Regression Statistics | | | | | | |
|-----------------------|-------------|--|--|--|--|--|
| Multiple R | 0.9798 | | | | | |
| R Square | 0.9601 | | | | | |
| Adjusted R Square | 0.9588 | | | | | |
| Standard Error | 411294.1697 | | | | | |
| Observations | 33.0000 | | | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% |
|----------------------|--------------|----------------|--------------|-------------|--------------|--------------|
| Intercept | -7179532.684 | 504326.1748 | -14.23589146 | 3.8433E-15 | -8208112.694 | -6150952.673 |
| SD County Population | 5.210662538 | 0.190844572 | 27.30317389 | 3.02197E-23 | 4.821432469 | 5.599892608 |

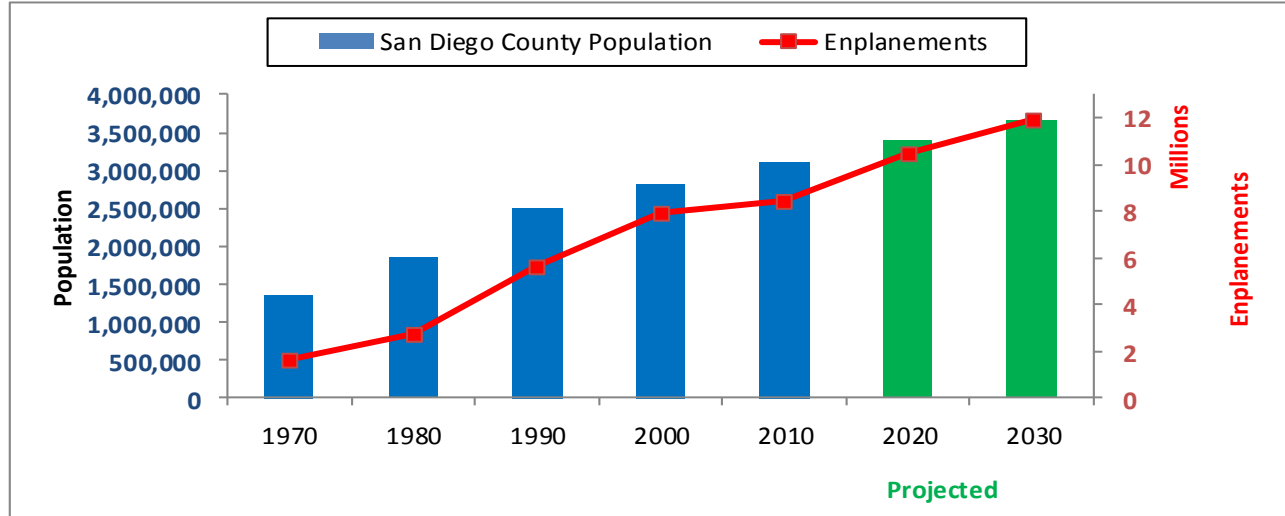
The regression model for projected enplanements based on estimated county population generates the following equation:

$$\text{Enplanements} = 5.21 \times (\text{projected population}) - 7,179,533$$

Using an estimated 2020 San Diego County population of 3,391,010, the projected enplanements at SDIA in 2020 would be 10,487,629. Using an estimated 2030 San Diego County population of 3,665,358, the projected enplanements at SDIA in 2030 would be 11,916,982. 2020 and 2030 population estimates were obtained from the San Diego County Board of Supervisors.

Figure 4-13 provides a graphical illustration of historical and projected population and enplanements at SDIA. Based on these population and enplanement projections, with San Diego County population reaching almost 3.7 million in 2030, SDIA could experience upwards of 12,000,000 enplanements- an increase of approximately 38% over 2012 enplanement totals. This enplanement projection is consistent with the “low scenario” projections of a previous study of SDIA by Jacobs Consultancy in 2011. That report, “Destination Lindbergh Technical Report”, provided estimated 2030 SDIA enplanements at approximately 12,000,000 (low scenario) to approximately 15,500,000 (high scenario) (Jacobs Consultancy, 2011).

Figure 4-13: Comparing San Diego County Population to SDIA Enplanements, with Projections to 2030



(Sources: United States Census Bureau; San Diego International Airport Website Historical Data, 1949-Present)

Technology & Future of Air Travel

The airline industry is a globalized and heavily regulated market whose participants are constantly changing due to economic conditions and passenger demand. As demand fluctuates in the industry, commercial carriers have had to evolve with the changing economic conditions.

Commoditization

Since 2001, the airline industry has faced tremendous setbacks including spiking fuel prices, economic volatility, and declining levels of customer satisfaction due to security hassles and excess fees. Airlines have been forced to focus on short-term profitability, and have resorted to removing unprofitable routes, charging for services that were previously free, and alienating core customers by complicating loyalty program redemptions (AirportsForTheFuture.org, 2012). The industry consistently generates some of the lowest scores in U.S. customer satisfaction surveys (IBM Institute for Business Value, 2010).

This has led to a decrease in brand equity for commercial airlines, and a relative commoditization of the industry as price has become the primary basis of competition. Consumers do not see much difference between airlines and are unwilling to pay more for what is perceived to be the same exact service. A typical airline consumer researches at least 20 travel websites prior to purchasing a ticket (Harteveldt, 2012). Various intermediaries such as Kayak, Travelocity, Expedia, etc. allow consumers to shop for the best bargains, while also extracting a small percentage of the airlines' profit. Consumers value price as their most important decision factor, followed by schedules and routes when purchasing an airline ticket. Airline brand is a distant third in decision factor value for consumers (IBM Institute for Business Value, 2010).

Substitution

Communication technology is developing at an exponential rate. Individuals and businesses can now communicate instantly with anyone practically anywhere on the planet. Alternative transportation, such as high-speed trains, is also being utilized in increasing amounts.

As such, an analysis was performed on the potential impacts these technologies and alternative transportation choices will have on the demand for air travel in the next 20 years.

The September 11, 2001 terrorist attacks in the United States have created significant changes to airport security programs. Such changes, including heightened screening procedures for passengers, have contributed to increased total time required for air travel. These increased time requirements, as well as the increased associated costs, can contribute to passengers seeking alternatives to air travel, especially for short distance trips. Businesses are also increasingly identifying the inefficiencies and costs of travel. As such, video- and web-based conferencing technologies are being increasingly utilized in the business world. A survey in 2009 reported that 60% of travelers worldwide had reduced their travel by using various forms of remote conferencing (Baker, 2009).

High speed rail is an attractive substitute for consumers as the gap between travel times, costs, and accessibility narrow for short to moderate length trips (California High Speed Rail Authority, 2008). California Prop 1A is a measure that enacts the construction of a statewide high-speed rail network connecting all major metropolitan areas from Sacramento to San Diego. While this is an attractive scenario, court rulings and land rights have plagued the initiative and the final corridor connecting San Diego likely will not be completed until at least 2030. While high-speed rail has proven to be a viable substitute in Europe and parts of Asia, the U.S. market is not as feasible due to the significant distances between major cities.

The airline industry has shown improved efficiencies in a numerous areas over the past decade in order to battle declining revenues and increasing consumer service expectations. Much of the innovation in the industry is coming from the aircraft manufacturers who have been designing and implementing larger, faster, and more fuel-efficient fleets. Jet fuel accounts for approximately one-third of airline costs, making fuel efficiency the single most important R&D expenditure (AIRBUS, 2013). Utilization software is also a driving component for increased efficiencies in runway usage and airline efficiency (FAA, 2012).

Chapter V: FORECASTS

Passenger Projections

The following sections provide various air travel demand data produced by the research team. Where appropriate, comparisons of data from previous air travel demand studies at SDIA have been discussed. The purpose of these comparisons is to provide current data, analyze any variances, and consider which demand variables may have contributed to the differences.

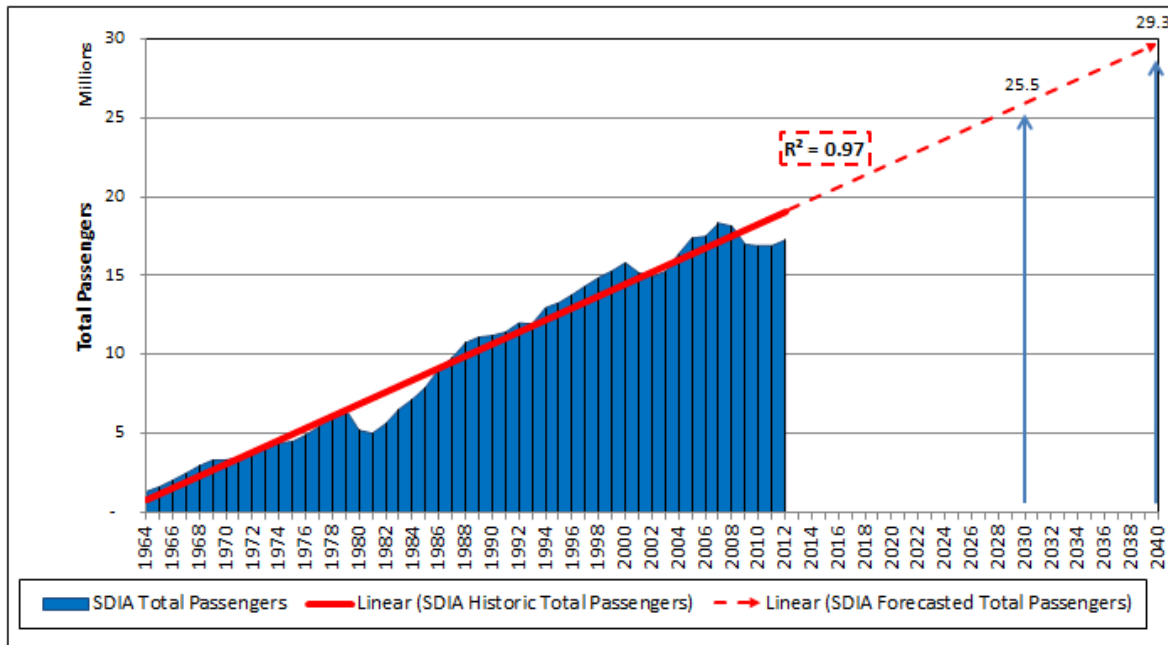
Historical data taken from San Diego International Airport's website (San Diego Tourism Authority, 2013) indicate a 5.8% annual growth in total passengers since 1964. Utilizing the data from the website, a forecast for total passengers was completed using linear regression. Figure 5-1 forecasts total projected passengers of 29.3 million by 2040. This forecast is calculated by taking the slope in y-intercept form where y (total passengers) is the dependent variable.

$$y = 379,921x + 441,785$$

$$x = 76(2040 - 1964)$$

$$y = 29,315,843$$

Figure 5-1: SDIA Total Passengers Forecast (2040)

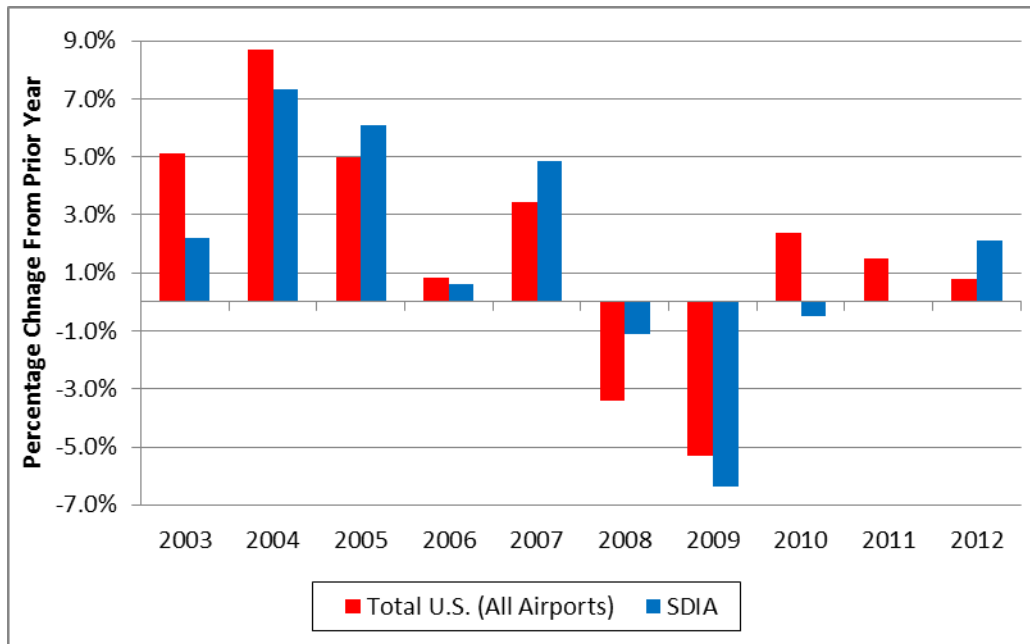


(Source: san.org)

Figure 5-1 predicts 25.5 million SDIA total passengers by 2030. This projection is approximately 4.4 million less passengers as compared to previous studies (refer to 2006 Ricondo & Associates study of high-low forecast scenario) (The Ricondo & Associates Team, 2006). The forecast provided in Figure 5-1 considers the economic recession occurring after 2006. The negative economic impact associated with this downturn is the most likely reason for the research team's lower projection.

Figure 5-2 compares SDIA total passengers to U.S. totals. The annual U.S. passenger growth rate is 0.4% greater than SDIA over the ten year time span (2003-2012).

Figure 5-2: Total Passengers Percentage Change



(Source: Bureau of Transportation Statistics (RITA) and san.org)

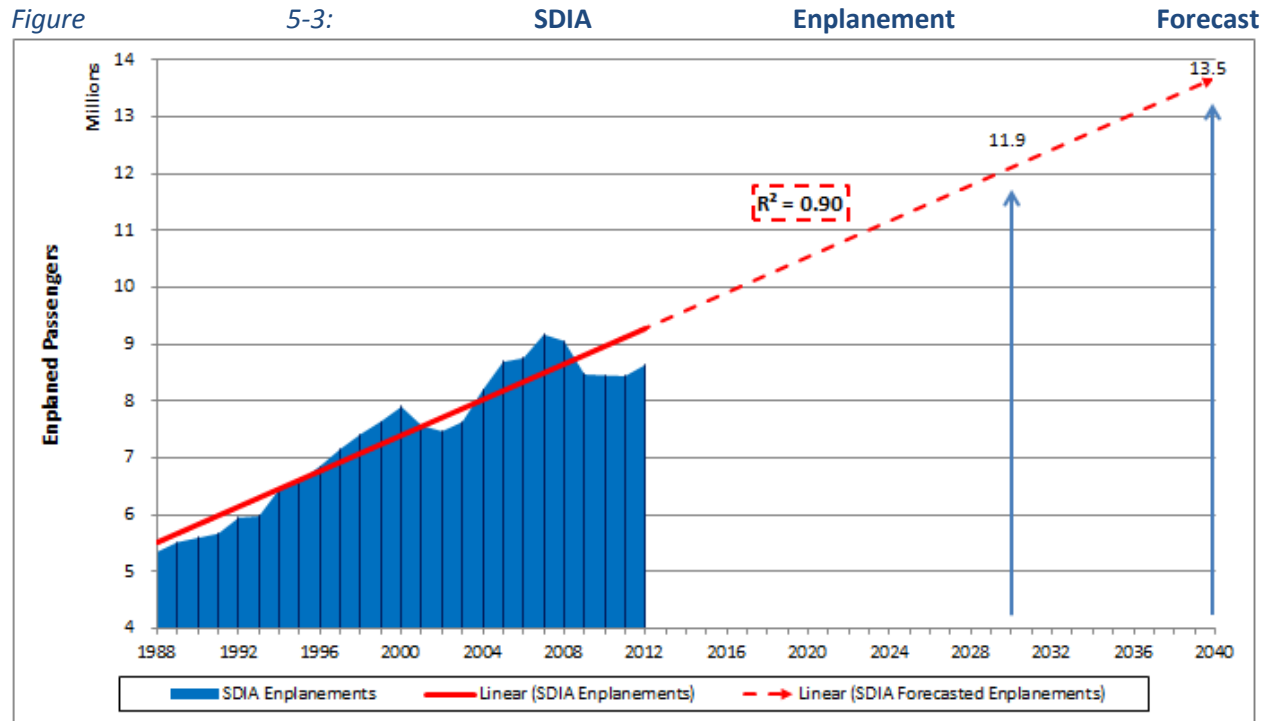
Enplanement Projections

Since 1988, SDIA has experienced a 2.1% annual growth rate in enplanements (san.org, 2012). In 2009, enplanement declined 6.5%, the largest decrease in 24 years. Figure 5-3 compiles historical enplanement data from san.org, generating a regression trend-line forecasting to 2040. Similar to calculation for total passengers, the slope is taken in y-intercept form where y (passenger enplanements) is the dependent variable.

$$y = 156,707.25x + 5,351,113.23$$

$$x=52 (2040-1988)$$

$$y=13,499,890$$

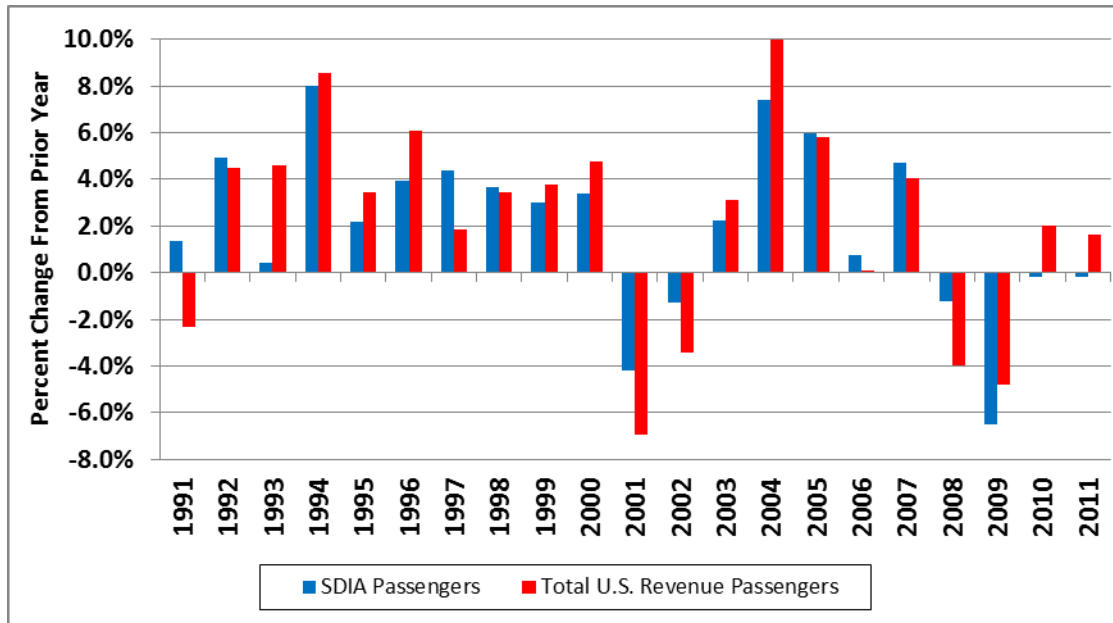


(Source: san.org)

This forecast estimates passenger enplanement of 11.9 million in 2030 and almost 13.5 million in 2040. It is approximately 2.4 million less than the projection provided in the SH&E San Diego Aviation Activity Forecast from 2004, and 2.3 million less than the 2008 SDIA study produced by the Jacobs Consultancy Team. Again, the research team concludes that the variance between this forecast and the forecasts of the prior studies is attributable to the effects of the economic downturn beginning in 2008.

Figure 5-4 indicates SDIA enplanements increased an average of 2% versus the national average of 2.2% from 1991 to 2011.

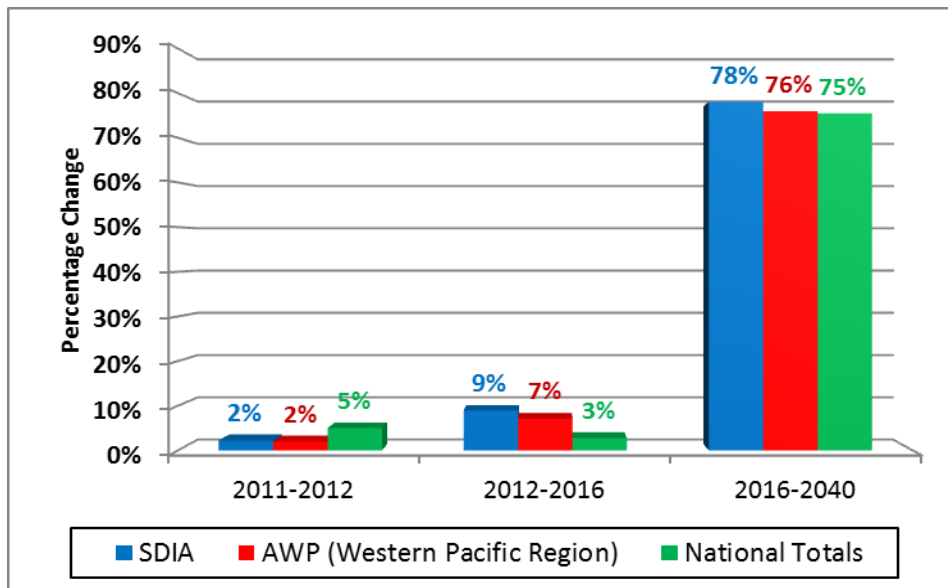
Figure 5-4: Annual Percentage Change in Enplanement Comparison



(Source: Bureau of Transportation Statistics (RITA) and san.org)

According to the FAA Terminal Area Forecast (TAF) 2012-2040 report, SDIA enplanement growth rate will outpace those of the Western Pacific Region (AWP) and national totals from 2012 to 2040 (Figure 5-5).

Figure 5-5: SDIA Enplanement Forecast Comparison

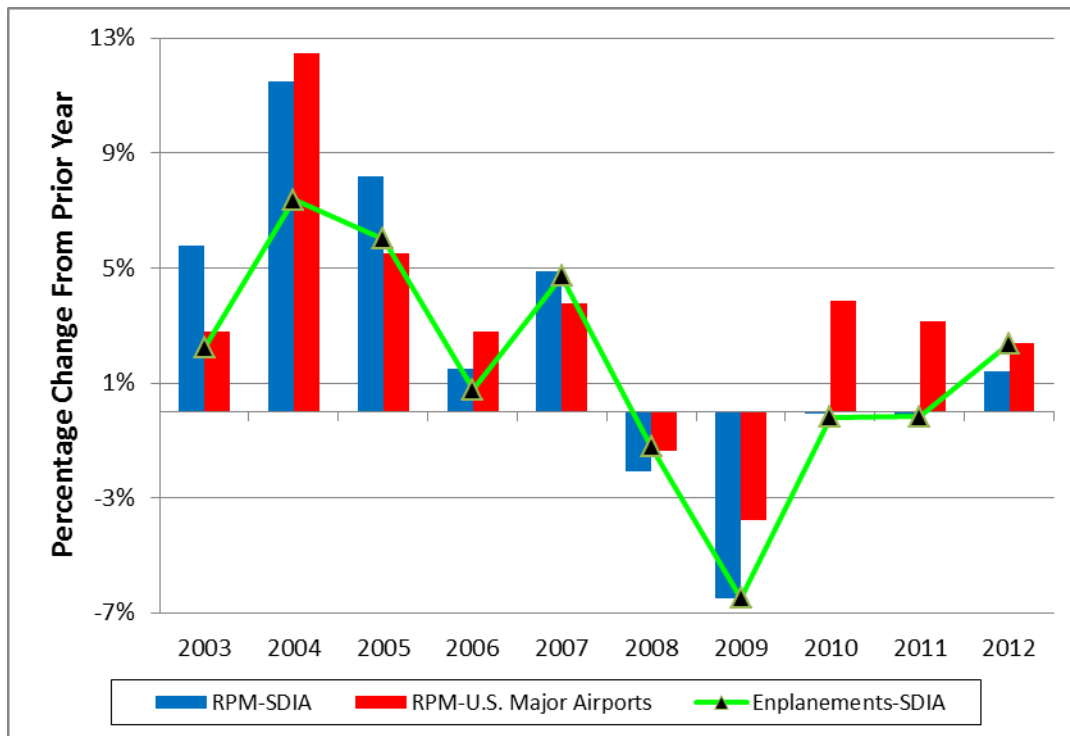


(Source: FAA TAF 2012-2040)

Operational Efficiency

Revenue passenger miles (RPMs) are the airline industry's measure of traffic. One RPM refers to one paid passenger flown one mile (Southwest Airlines, 2012). Since 2003, RPMs at SDIA have grown on average 2.4%. RPMs at U.S. airports have grown 3.2%. A comparison of SDIA RPMs to enplanements indicates a nearly a nearly perfect correlation, at 0.99. Figure 5-6 demonstrates the direct relationship between enplanement and RPMs at SDIA.

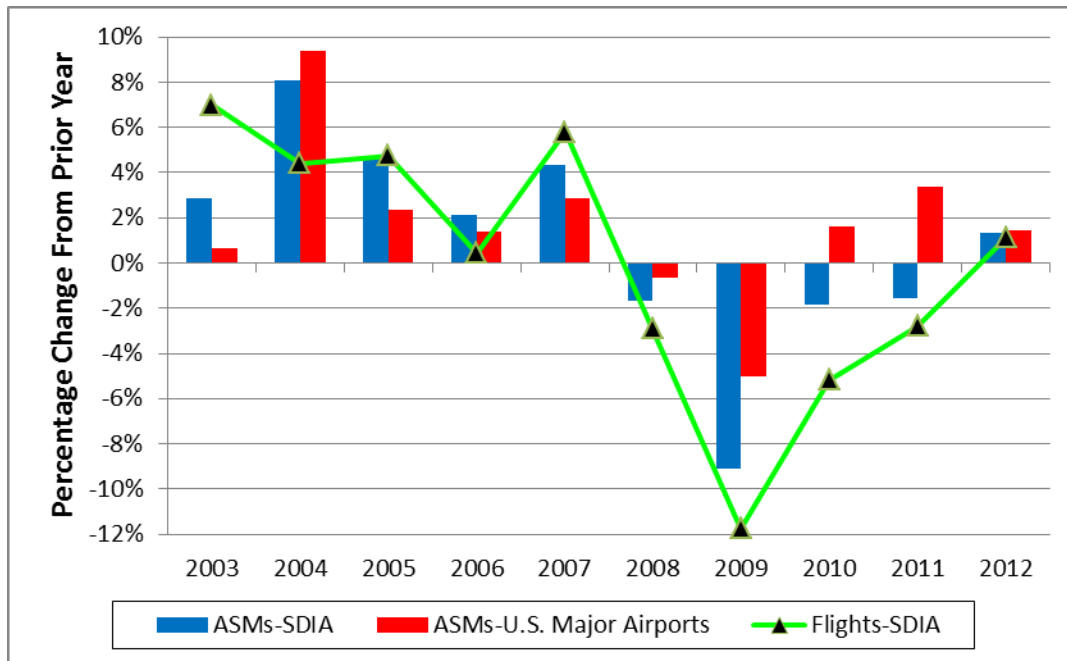
Figure 5-6: Comparing RPM's to Enplanements



(Source: Bureau of Transportation Statistics (RITA) and san.org)

Available seat miles (ASMs) are the airline industry's measure of capacity (Southwest Airlines, 2012). One ASM is equal to one empty or filled seat flown one mile. ASMs at SDIA have grown at an average of 0.9% annually, from 2002 through 2012. ASMs at major airports across the country have increased an average of 1.7% in the same period. Figure 5-7 displays the relationship between ASMs and flights at SDIA. ASM's of major U.S. airports have also been included for comparison.

Figure 5-7: Comparing ASM's to Flights

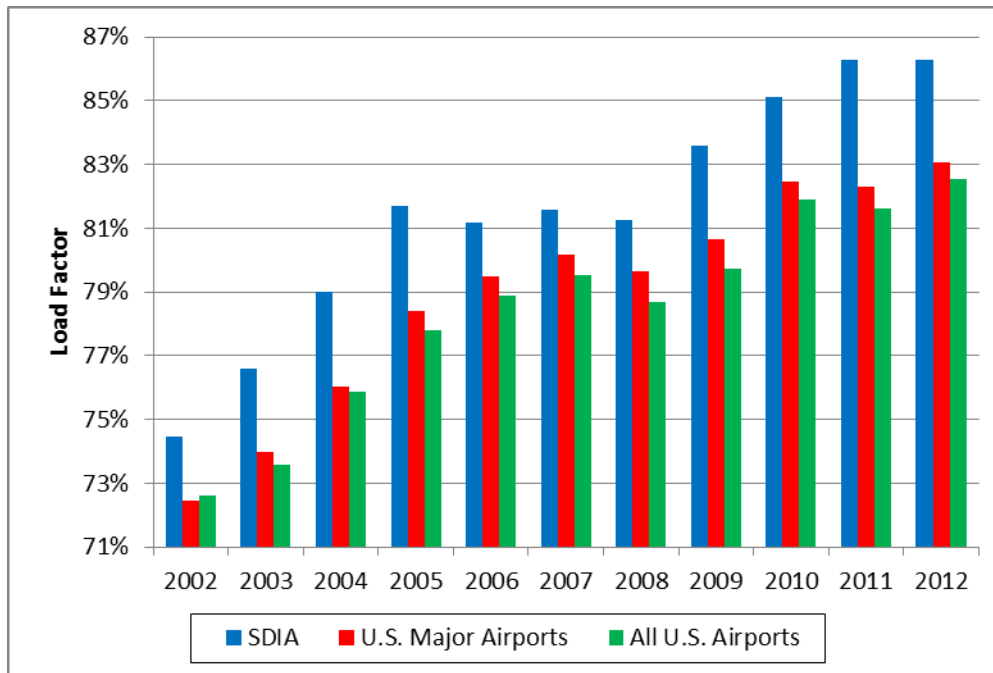


(Source: Bureau of Transportation Statistics (RITA) and san.org)

A correlation of 0.89 was calculated between ASMs and flights at SDIA. SDIA averaged 122 ASMs per flight from 2002 through 2012, growing at a rate 0.9% during the period.

Load factor is defined as the percentage of an aircraft occupied by paying customers (Southwest Airlines, 2012). Load factor is calculated as RPM divided by ASM. SDIA's total load factor (including domestic and international passengers) has grown an average of 1.5% annually since 2002. Comparatively, major U.S. airports grew 1.4%, and U.S. airports as a whole grew 1.3%. SDIA's average total load factor is 81.5%, compared to 78.4% for all U.S. airports, since 2002. Figure 5-8 displays SDIA's consecutive annual growth, exceeding U.S. major airports, and all U.S. airports.

Figure 5-8: Comparing Load Factor Totals (Domestic and International)

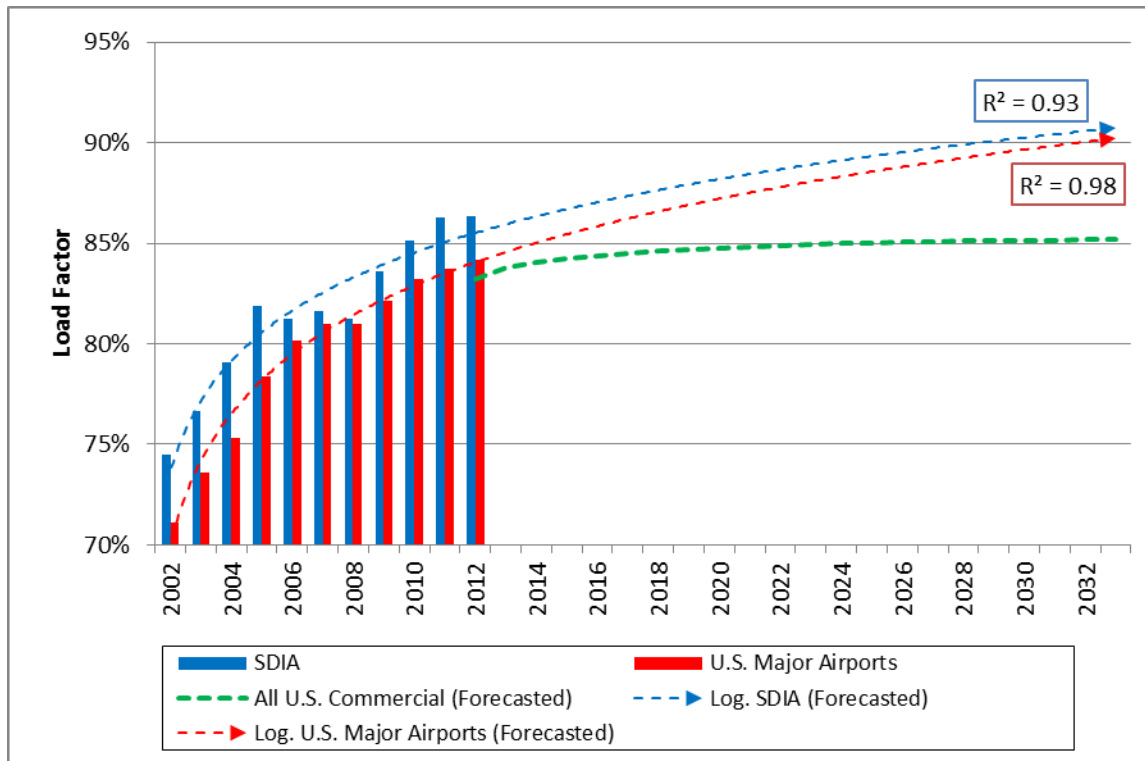


Source: Bureau of Transportation Statistics (RITA)

Figure 5-8 indicates that SDIA has consistently maintained greater load factor efficiency than major airports throughout the nation. This represents higher capacity utilization per aircraft leaving SDIA.

Figure 5-9 displays SDIA's domestic load factor to be projected at 91% by 2033. Logarithmic trend-lines were utilized to forecast the domestic load factor. Major U.S. airports are forecasted to be just below SDIA at 90%, while the FAA Aerospace Forecast 2013-2033 predicts all domestic commercial load factors at 85% by 2033.

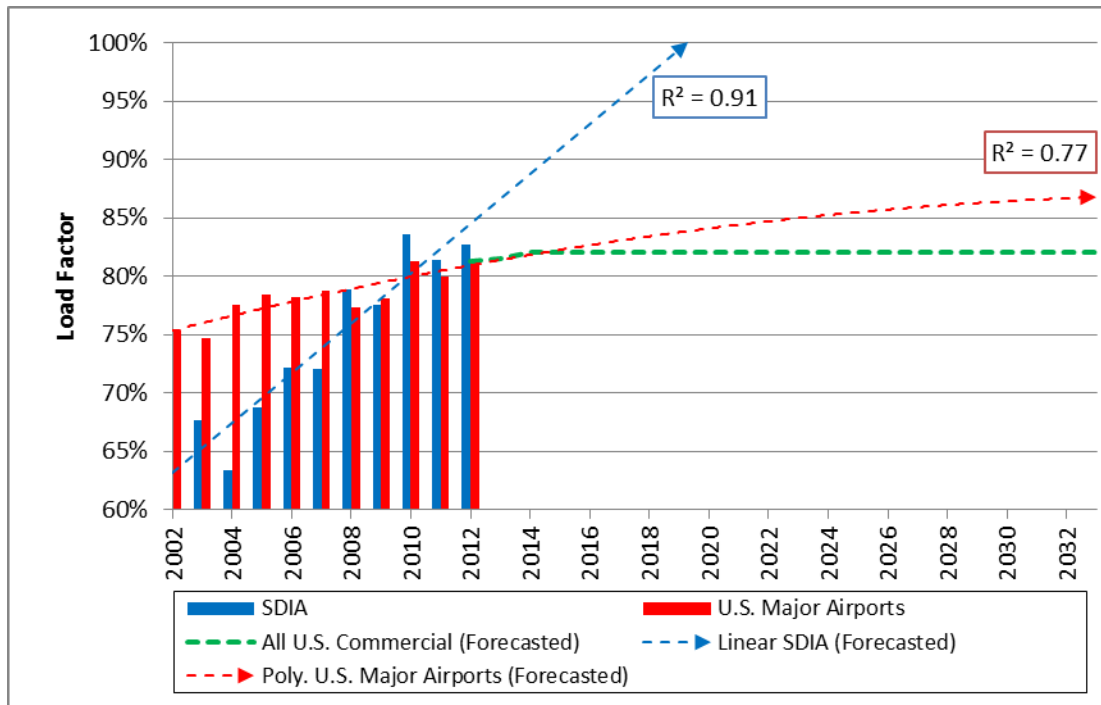
Figure 5-9: Forecasted Load Factor – Domestic Passengers



(Source: Bureau of Transportation Statistics (RITA) and FAA Aerospace Forecast 2013-2033)

Figure 5-10 indicates a drastic variance in SDIA’s forecasted load factor when compared to major U.S. airports, and all U.S. commercial airports. Based on the linear regression model, SDIA international passengers load factor will reach 100% by 2022.

Figure 5-10: Forecasted Load Factor – International Passengers



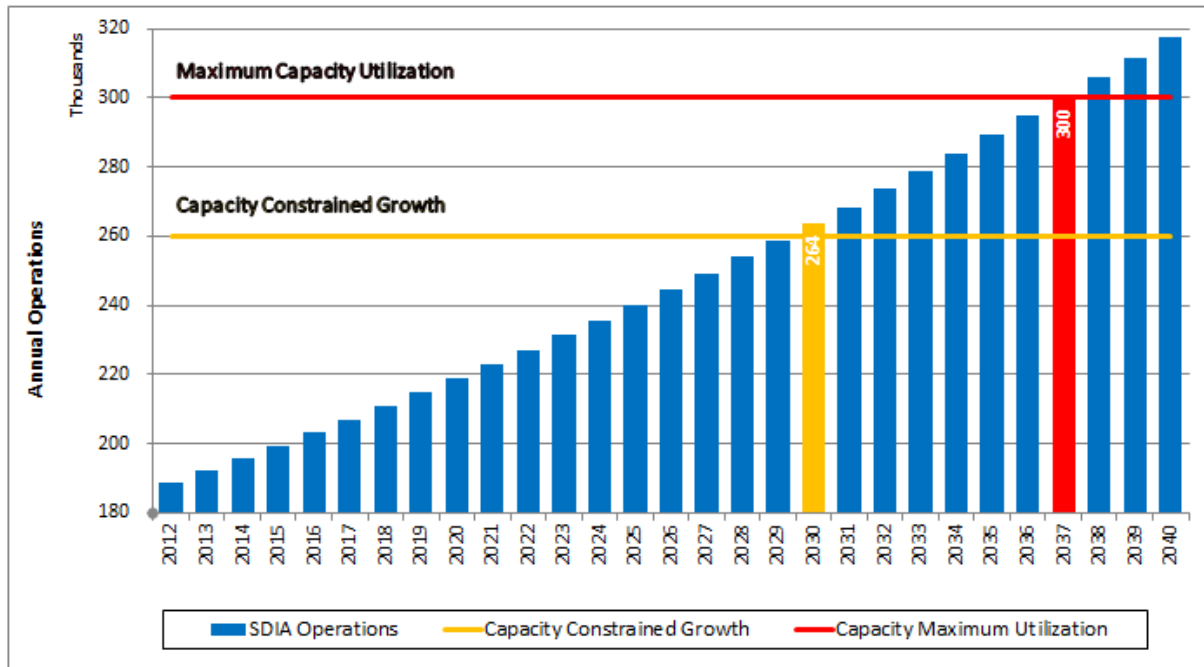
Source: Bureau of Transportation Statistics (RITA) and FAA Aerospace Forecast 2013-2033

Although this level of utilization may not be realistic for SDIA, the analysis compares SDIA to other airport facilities. It details the potential growth in international flight utilization given an unconstrained scenario.

Operational Capacity

Airport operations refer to all takeoffs and landings at an airport facility. The 2006 Ricondo study identified SDIA's airfield constrained capacity level to be 260,000 annual operations. Additionally, the 2009 Jacobs Consultancy Team report indicated that when annual operations at SDIA reach 300,000, congestion on the runway will not support any further growth. Forecasted operational capacity (Figure 5-11) is based on an annual compounding growth rate of 1.88% as provided by the TAF report (FAA, 2012).

Figure 5-11: SDIA Operational Forecast



(Source: FAA TAF 2012-2040)

The forecast also shows that SDIA will not reach a capacity constrained growth level (260,000 annual operations) until 2030. Additionally, the forecast predicts SDIA will not reach maximum capacity (300,000 annual operations) until 2037.

Table 5-1 illustrates the variance among the research teams’ findings as compared to three other project reports prepared for SDIA. Much of the variation can be attributed to recent changes in the economic climate, resulting in a forecast that extends the timeline of a constrained SDIA runway scenario beyond the projections of previous studies.

Table 5-1: Annual SDIA Operating Capacity Comparison

| | Capacity Constrained Growth (260,000 annual operations) | Capacity Maximum Utilization (300,000 annual operations) |
|--------------------------------|--|---|
| CSUSM MBA Team 2013 | 2030 | 2037 |
| Jacobs Consultancy Team 2009 | 2015-2020 | 2026 |
| Ricondo & Associates Team 2006 | 2015-2022 | N/A |
| SH&E Team 2004 | 2015-2022 | 2021-2030 |

(Sources: Jacobs Consultancy Team, Ricondo & Associate Team, and SH&E Team)

Alternative Scenario Forecasts

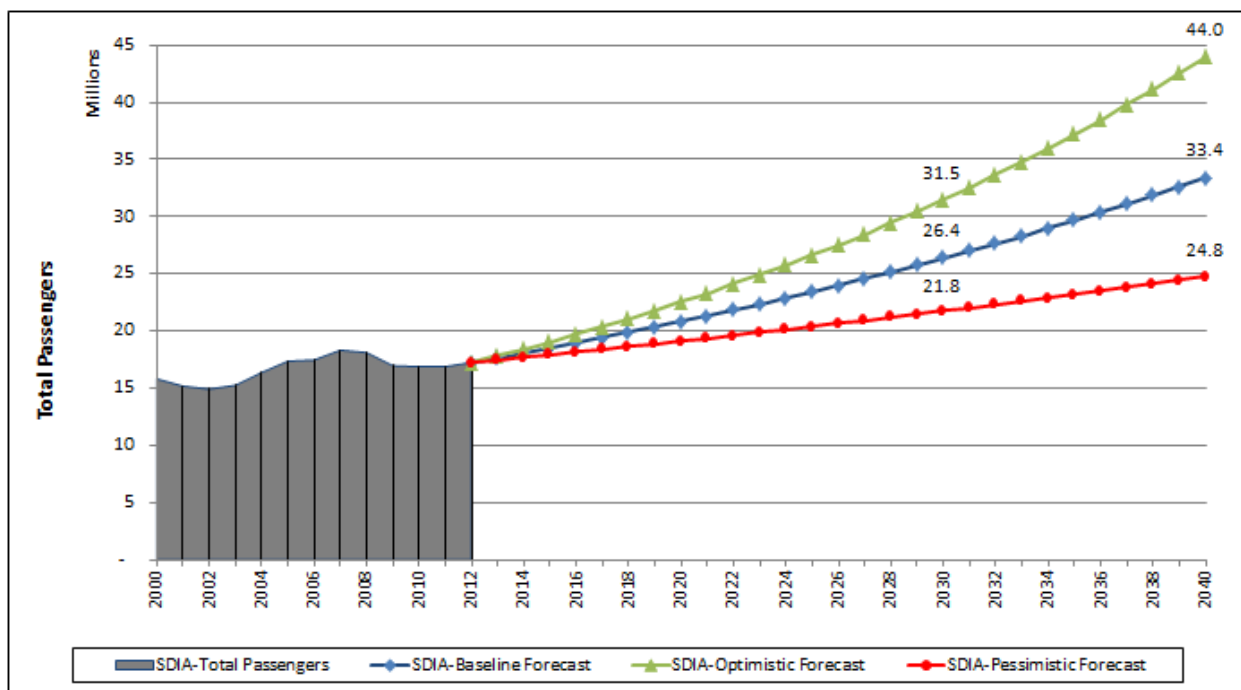
The alternative forecasts provided assume certain demand driver changes, such as growth of the regional economy and the stabilization of oil prices. In an optimistic scenario, San Diego would experience a decreasing unemployment rate, growth in the housing sector, and a strengthened overall economy. Alternatively, the pessimistic scenario would entail rising

unemployment rates, a decrease in the local business growth, and a recession-like economic state (Schaufele, 2012). The FAA Aerospace Forecast 2012-2033 has considered these factors and compiled annual average growth rates for total airline passengers. Additionally, San Diego-specific growth rates have been applied to strengthen the model in terms of relevancy to the local economic environment. Unforeseen situations, such as terrorist attacks or various uncontrollable states of nature, are considered in the optimistic and pessimistic scenarios.

Total Passenger Forecast

SDIA-specific compounding annual growth rate is forecasted to be 2.39% until the year 2040 (Schaufele, 2012). The FAA Aerospace Forecast 2013-2033 indicates an average annual baseline growth among all airports at 2.4%. The forecast provides an optimistic average annual compounding growth rate of 3.4%, and a pessimistic average annual compounding growth rate of 1.3%. These rates are derived from economic factors including the price of airfare, and the ability of the consumer to pay for it. Figure 5-12 provides an alternative total passenger forecast which utilizes the compounding annual rates mentioned.

Figure 5-11: Alternative Scenario Forecast – SDIA Total Passengers



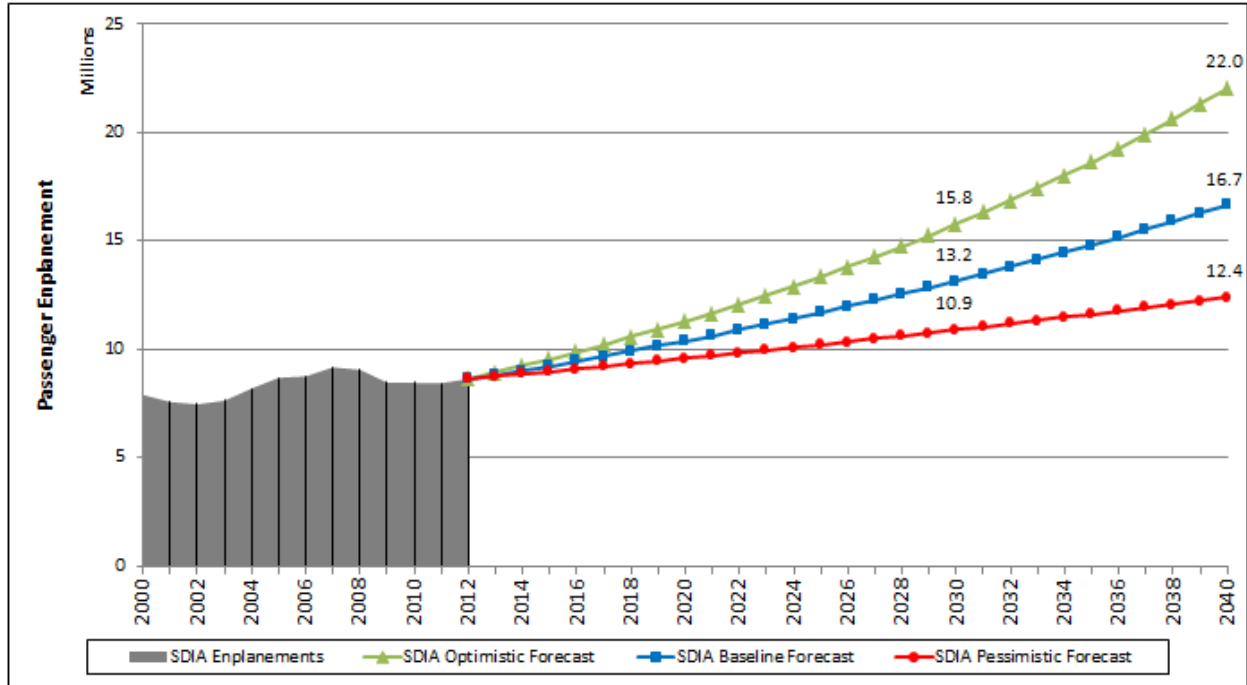
(Source: FAA TAF 2012-2040 and FAA Aerospace Forecast 2013-2033)

The optimistic scenario estimates 44 million total passengers at SDIA by 2040, while the pessimistic scenario projects approximately 25 million. The forecast model in the alternative scenario uses growth rates based on 2012 calendar year data. Comparing this forecast to that in Figure 5-1, which utilized 48 years of historical data, a difference of 4.1 million total passengers can be observed. Based on these projections, the research team estimates the total number of passengers at SDIA to be between 29.3 and 33.4 million by 2040.

Total Enplanement Forecast

A similar methodology was used for calculating the alternative forecast scenarios for enplanements at SDIA. Figure 5-13 predicts an optimistic scenario of 22 million, and a pessimistic scenario of 12.4 million passenger enplanements by 2040.

Figure 5-12: Alternative Scenario Forecast – SDIA Enplanements



(Source: FAA TAF 2012-2040 and FAA Aerospace Forecast 2013-2033)

A comparison of this projection to the enplanement forecast in Figure 5-3 (based on a 24 year historical data regression model), indicates a difference of 3.18 million enplaned passengers. Based on these forecasts, the research team estimates a baseline range of 13.5 to 16.7 million enplanements at SDIA by 2040.

Chapter VI. CONCLUSION

There are a multitude of factors affecting air travel demand in the San Diego region. In this report, population growth, airfare pricing, GRP, per capita income, and growth of regional industries were examined to study their individual and aggregate impacts on air travel demand in the San Diego region, and specifically at the region’s major airport facility, San Diego International Airport.

Population is a major factor affecting air travel demand. San Diego County and the city of San Diego have demonstrated significant population growth rates over the last five decades. The city of San Diego is expected to reach a population of 1.7 million by 2030. San Diego County is projected to reach nearly 3.7 million by 2030.

When comparing population and enplanement data from as far back as 1980, a correlation coefficient of 0.98 was calculated, indicating an almost perfect linear relationship

between the two variables. When these variables are analyzed in aggregate with other demand drivers (since 1993), San Diego County population and enplanements at SDIA were found to have a moderately strong correlation coefficient of 0.82. In general, as population increases in the San Diego region, total enplanements at SDIA increase.

Based on this strong correlation, the research team has projected future enplanements at SDIA based on population estimates alone. By 2020, the team projects the population of San Diego County to reach approximately 3.4 million, corresponding to a total of 10.5 million enplanements at SDIA. By 2030, with a projected county population of 3.7 million, the projected enplanements at SDIA will reach nearly 12 million.

Since 1995, domestic airfares at SDIA have averaged approximately \$294. The national average for the same time period is \$321. When comparing price of airfare to enplanements at SDIA, a correlation coefficient of 0.82 was calculated, suggesting a moderately strong correlation between these two variables. Though it would be intuitive to believe that the growth rate of enplanements would be lower when cost of airfare is increasing, the findings indicate that 47% of the time enplanement growth rate actually increases even when airfare prices go up.

Over the last five years, San Diego County gross regional product averaged 1.8% annual growth. This growth is consistent with the rest of California, but below the national rate of 2.7% (Projections, 2012). Gross regional product in the San Diego region shows a very strong correlation to enplanements at SDIA, with a correlation coefficient of 0.94, indicating that when the region's economy is growing, there is a corresponding increase in enplanements at the airport. Conversely, the findings indicate a decrease of enplanements at SDIA when GRP declines, which was specifically evident in the recent economic downturn beginning in 2008.

Similar to GRP, a strong correlation also exists between San Diego's per capita income and the number of enplanements at SDIA. Since 1993, per capita income in San Diego had an average growth rate of 4.4%, compared to a 2% growth rate in number of enplanements at SDIA. Conversely, when per capita income in the region decreased, a corresponding decrease in enplanements was observed.

Four major industries (healthcare, biotechnology, military, and tourism) are significant contributors to the San Diego regional economy. Each of these industries show positive growth and play a major role in the region's GRP and per capita income statistics. These industries have a unique mix of employees, customers, and suppliers. In aggregate, these industries and the businesses supporting them, contribute to demand for air travel demand at SDIA.

Comparisons of SDIA to airport facilities with similar operational numbers and regional populations reveal significant differences. SDIA's single runway and limited total acreage (661 acres) are less than those of airports with similar flight activity and regional populations. For example, the airports supporting the cities of Tampa, Honolulu, and Portland have approximately the same number of total takeoffs and landings as SDIA. However, compared to SDIA's single runway, Tampa, Honolulu, and Portland each have at least three runways, as well as total facility acreage of approximately five times that of SDIA.

Additional factors considered in this analysis are the destinations passengers are traveling to, as well as where they are coming from. SDIA is not utilized as a hub for any airline.

However, SDIA connects to all the major airlines hub cities, accounting for 55% of outgoing enplanements, with the remaining 45% flying direct to end destinations.

Due to its relatively close proximity, longer runways, additional gates and terminals, and established infrastructure, LAX accommodates the majority of southern California's direct international passengers. In 2012, LAX serviced 16 million international passengers (approximately 25% of total passengers), compared to approximately 500,000 at SDIA (less than 3% of total passengers). SDIA's relatively short runway (9,400 feet) limits its usage by larger commercial aircraft which are often used in international flights, such as the Boeing 747 and 787, and Airbus 350 and 380 models. Based on this analysis, it is conceivable to conclude that the current configuration of the runway system at SDIA will continue to limit growth in direct international flights.

In this report, select factors affecting current and future demand in the San Diego region were analyzed to create projections of future air travel demand at SDIA. Projected demand for the airport is based on total projected enplanements and total passengers. The research team's projection considers various demand drivers, including population as well as economic factors, including GRP, per capita income, and regional industry growth. Additionally, the team has reviewed and considered projections from previous SDIA studies. Projections indicate that SDIA is forecast to grow at a greater compounding rate than other major airports. The existing infrastructure at SDIA is insufficient to sustain long-term growth in operations.

Based on the analysis and findings by the research team, this report projects that by 2040, total enplanements at SDIA will be between 13.5 to 16.7 million. Additionally, the report concludes that total passengers at SDIA are projected to reach between 29.3 to 33.4 million by 2040. The team's research suggests SDIA will reach an operational capacity constrained level by 2030, and a maximum utilization by 2037.

Glossary of Terms

| | |
|-------------------------------------|--|
| Air Carriers (AC) | Aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. |
| Aircraft Utilization | The hours and minutes in a day an aircraft is used. |
| Airport Operations | FAA air traffic controllers count landing and takeoffs at FAA towered airports. Controllers employed by an FAA contractor count operations at FAA contract towers. At non-FAA facilities, operations, operations counts represent an estimate. |
| ASM (Available Seat Mile) | One seat (empty or full) flown one mile. Often referred to as the airlines industry's measure of capacity. |
| Commuter | Aircraft intended for short distance trips usually using a Turboprop design or Regional Jet. |
| Enplaned Passenger | One passenger, originating or connecting, boarded on an aircraft. |
| General Aviation (GA) | Takeoff and landing of all civil aircraft, except those classified as air carriers, air taxis or military. |
| Load Factor | The percentage of a plane filled with paying passengers. Calculated as Revenue Passenger Miles/Available Seat Miles. |
| Military | All classes of military takeoffs and landings. |
| RPM (Revenue Passenger Mile) | One paying passenger flown one mile. Often referred to as the airline industry's measure of "traffic". |

Source: Southwest Airline Glossary, san.org, FAA TFA 2012-2040

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