CHAPTER 3 – AVIATION DEMAND FORECAST

This chapter summarizes the forecasts of aviation demand for SDIA. The last forecast prepared for SDIA was published in 2004. Since then, there have been many changes in the aviation industry. New forecasts were prepared to reflect the current industry conditions and outlook for SDIA.

SDIA is the busiest single-runway airport in the United States, handling over 18 million passengers and 230,000 aircraft operations in 2007.

SDIA is among the busiest airports in the United States (in terms of passengers served) and is a critical component of County of San Diego's (County) transportation infrastructure. In 2007, SDIA handled 9.2 million passenger enplanements (18.3 million total passengers), almost 230,000 aircraft operations, and approximately 155,000 tons of air cargo. SDIA's physical footprint is the smallest of any large commercial airport in the U.S. at 661 acres. The Airport also has the distinction of being the busiest single-runway airport in the country. Physical expansion capability is limited, and as a result, SDIA may not be able to accommodate all of its future demand.

Two forecasts were developed for this planning effort: unconstrained and constrained. The unconstrained forecast was developed to represent market-driven demand for air service which in turn was used to determine the level of activity the Airport can accommodate. The difference between the demand and the level of activity the Airport can accommodate then serves as a basis for the development of constrained forecasts. As part of the *Regional Aviation Strategic Plan* (*RASP*), the other airports in the County and adjacent regions will be analyzed to determine if one or more of the airports could accommodate demand that cannot be accommodated at SDIA.

3.1 Unconstrained Forecast

Three unconstrained forecast scenarios were developed to show the broad range of possible aviation activity that could be experienced over the next 22 years through 2030. The baseline forecast represents the most likely scenario. High and low scenarios were developed to provide the Authority with a full range of information from which it will be able to anticipate the Airport's future activity, and plan for facilities that will be needed for SDIA's ultimate build out.

Two key factors drive the demand for air service at SDIA: (1) the price of air travel and (2) the ability to pay for it. The first factor – *the price of air travel* – is influenced by the price of fuel, recent domestic service capacity cutbacks, airline economics, aircraft economics, and future emissions costs. Ticket prices ultimately reflect these factors. The second factor – *the ability to pay for air travel* – relates to the local and national economies and the local socioeconomic profile. Growth in population, income, and business activity typically leads to increased demand for air travel. An individual's demand for air travel is often referred to as "underlying demand" in that it cannot be realized without the presence of air service at a price that results in a decision to fly.

3.1.1 The Price of Air Travel

High oil prices in 2007 and 2008 led to reductions in airline seating capacity and implementation of fees for traditional amenities such as checked baggage.

The aviation industry currently faces an unprecedented period of uncertainty. Oil prices have surged to historically high levels just as the U.S. airline industry as a whole returned to profitability in 2006 and 2007 following the most recent economic downturn and the aftermath of the September 11, 2001 terrorist attacks. Airlines face significant upward pressure on their costs but have limited ability to extract further cost savings from labor, which provided significant concessions in the last round of restructuring. With fuel costs largely beyond their control, airlines are increasing fares, cutting traditional amenities, and charging for checked bags, among other measures to balance the variables of supply and demand.

Airline passengers are experiencing increased airfares as airlines attempt to offset higher operating costs due to high fuel prices.

Until now, the post deregulation airline industry environment has been characterized as a period of declining fares which has ostensibly commoditized air travel causing passenger traffic to reach record levels. This decline in fares was especially true at SDIA where the expansion of service by low-cost carriers has resulted in less than average airfares driving traffic growth at a faster rate than many other U.S. airports.

Now as the industry is collectively facing significantly higher costs and the traveling public sees higher fares, there is the possibility that fewer people will fly. In the current weak consumer environment, increases in airfares are likely to have a much greater dampening effect on demand. Airlines are recognizing this and are reducing capacity, parking aircraft, and restructuring route networks. A proposed federal bill addressing climate change also has the potential to further

increase airline operating expenses as a cost is attached to airline emissions as part of a cap and trade system.

Historically, SDIA has endured industry downturns better than other airports.

The new higher-cost industry will affect each airport differently, depending upon the mix of airlines, aircraft, and air services offered. Historical activity indicates that SDIA tends to weather industry downturns better than other airports. Overall, passenger enplanements have continued to grow over time – requiring airports to continue to plan for the future, especially given the long lead time required to implement airport improvements.

3.1.2 The Ability to Pay for Air Travel

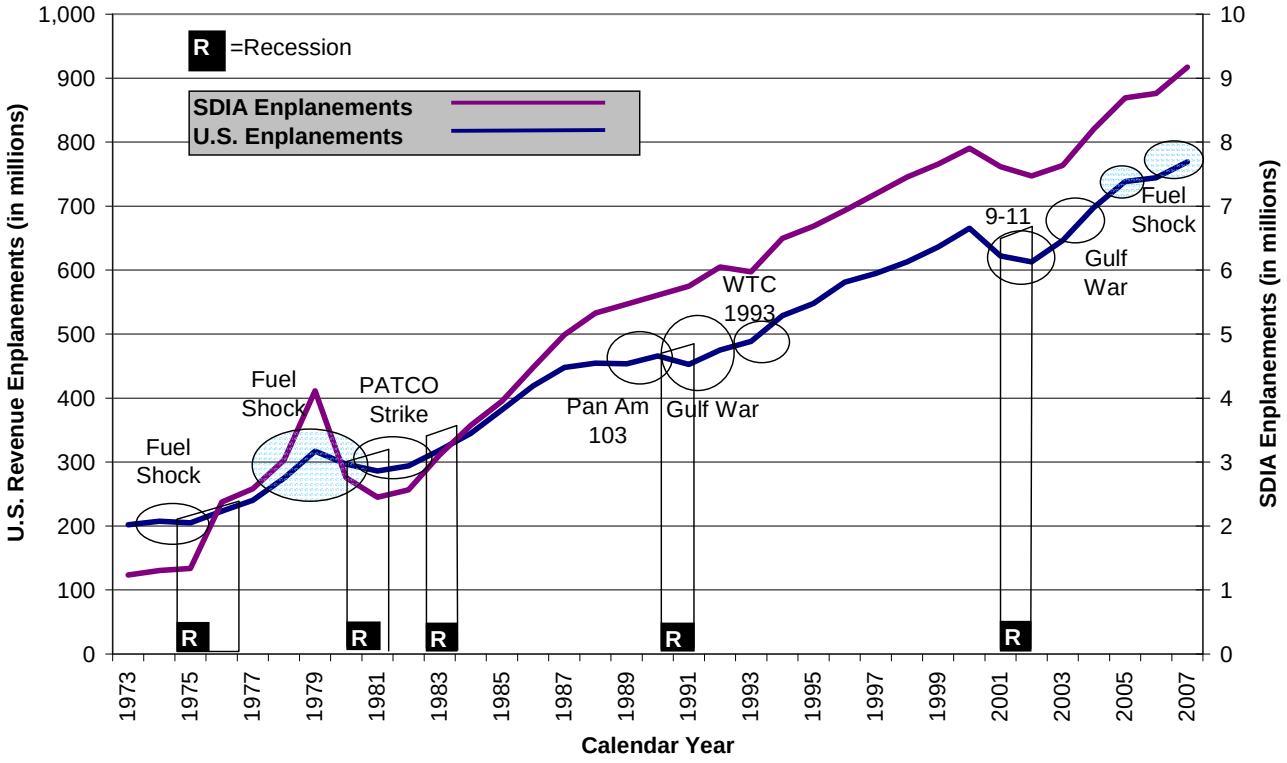
The intrinsic links between the level of aviation activity and economic growth are well documented. Demand for air travel in the U.S. correlates strongly with fluctuations in the economy. As shown on **Figure 3-1**, passenger traffic has typically declined during economic contractions and returned to positive growth during subsequent economic expansions. However, traffic at SDIA has been more resilient than U.S. travel since the early 1980s.

Air travel in the San Diego region is likely to grow alongside predicted demographic and economic expansion.

The San Diego region is well-positioned to experience future economic expansion. The population in the County has grown at a faster rate than the U.S. as a whole, indicating the desirability of the County as a place to live and work. International migration has been an important component of population growth in the County, resulting in an increasingly diverse population base. As this trend continues in the future, community interest for international travel is also likely to increase.

Per capita personal income (PCPI), which is a measure of the wealth of the population, has also generally tracked above U.S. averages. However, inflation has inhibited real PCPI growth, largely due to the rising cost of housing in the County, and, as a result, the differential with national averages is narrowing.

Figure 3-1. Aviation System Shocks and Recoveries



Sources: Air Transport Association of America; Landrum & Brown analysis.

Encouragingly, employment growth has exceeded population growth in the County, and the unemployment rate has been lower than state and national benchmarks since the mid-1990s. While traditional military, defense-related and tourism industries continue to be integral parts of the local economy, there has been considerable diversification of industry into high technology sectors such as bio-technology which typically pay higher than average wages. The diversification of the San Diego economy is also widely assumed to make the local economy more resistant to future economic downturns.

The overarching conclusion of the SDIA forecasts is that both demographic and economic growth will support increased demand for air travel to and from the County over the long term. While most states and many municipalities are experiencing tax collection shortfalls due to the downturn in the housing market, inflationary pressures related to the price of oil and food, and increasing unemployment, San Diego's economy appears to be

more resilient than most. Over the long-term, it is anticipated that growth will be positive albeit at generally slower rates than recently experienced which is largely indicative of continued maturation of the local San Diego and broader economies.

3.1.3 Unconstrained Enplanements Forecast

Forecast passenger traffic was divided into four segments:

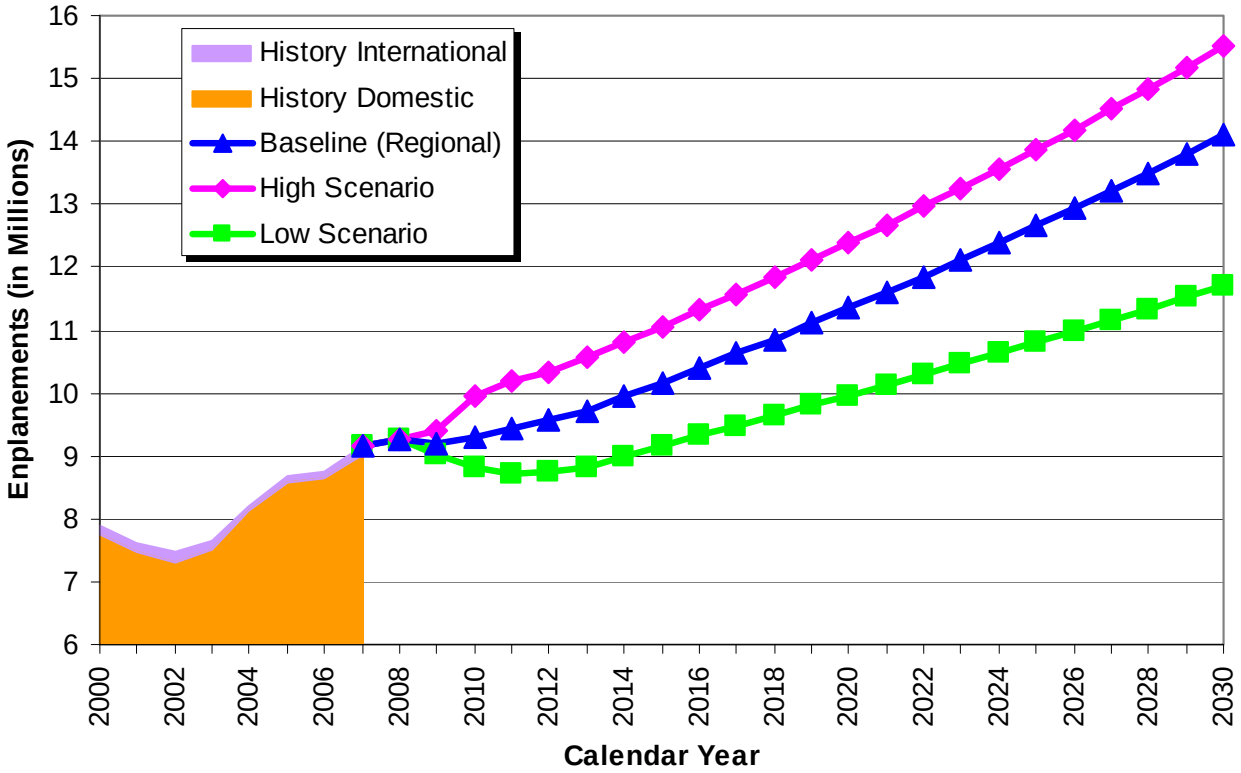
- Domestic O&D
- Domestic O&D connecting in other U.S. cities to international destinations
- International O&D
- Connecting

Passenger traffic at SDIA was divided into four segments for purposes of developing the forecast: (1) domestic origin and destination (O&D or local) passengers that travel on purely domestic itineraries, (2) O&D passengers that board domestic flights at SDIA and travel to another U.S. gateway to connect with international flights, (3) O&D passengers that board international flights at SDIA on purely international itineraries, and (4) connecting passengers. The forecasts for O&D traffic (segments 1-3) were developed using econometric and linear regression models, while the connecting traffic forecast, which is a relatively small component of the passenger base, was developed using a trend analysis.

Domestic O&D traffic currently accounts for approximately 90% of traffic at SDIA.

The passenger forecast is driven principally by the domestic O&D traffic which accounts for almost 90 percent of enplanements at SDIA today. The domestic O&D forecast was developed based on assumptions related to growth in personal income (the product of population and per capita personal income) and projections of future fare levels (expressed as fare paid per passenger mile or yield) at SDIA. The results of the domestic O&D forecast reflect growth in the underlying economic variables but in a higher fare environment than has traditionally been the case at SDIA. In spite of increased fare levels, the enplanement forecast projects growth at SDIA, albeit at slower rates than have been experienced historically. Under the baseline scenario, enplanements are forecast to increase from 9.2 million enplanements in 2007 to 14.1 million enplanements in 2030, averaging growth of 1.9 percent per year as illustrated on **Figure 3-2**.

Figure 3-2. Enplanements Forecast Comparison



Sources: USDOT, Air Passenger Origin-Destination Survey; Landrum & Brown analysis.

Baseline, low, and high scenarios are presented to account for future variations in oil prices and overall economic conditions.

The forecast is dependent on the projections related to the price of jet fuel which drive the yield forecasts. Significant deviations in the price of oil from projected levels could result in actual results deviating markedly from forecast values. The price of oil is inherently difficult to predict, and therefore low and high scenarios were developed to provide the probable range of passenger enplanements. The low forecast projects 11.7 million enplanements in 2030, and the high forecast projects 15.5 million enplanements in 2030.

3.1.4 Unconstrained Air Cargo Tonnage Forecast

It can be reasonably assumed that the tonnage of air cargo handled at SDIA will, over the long-term, be linked to economic activity both locally and nationally. The expected growth of population, employment, and income projected for the SDIA Air Service Area and the broader U.S. economy should increase the

demand for the shipment of goods and services over the forecast period.

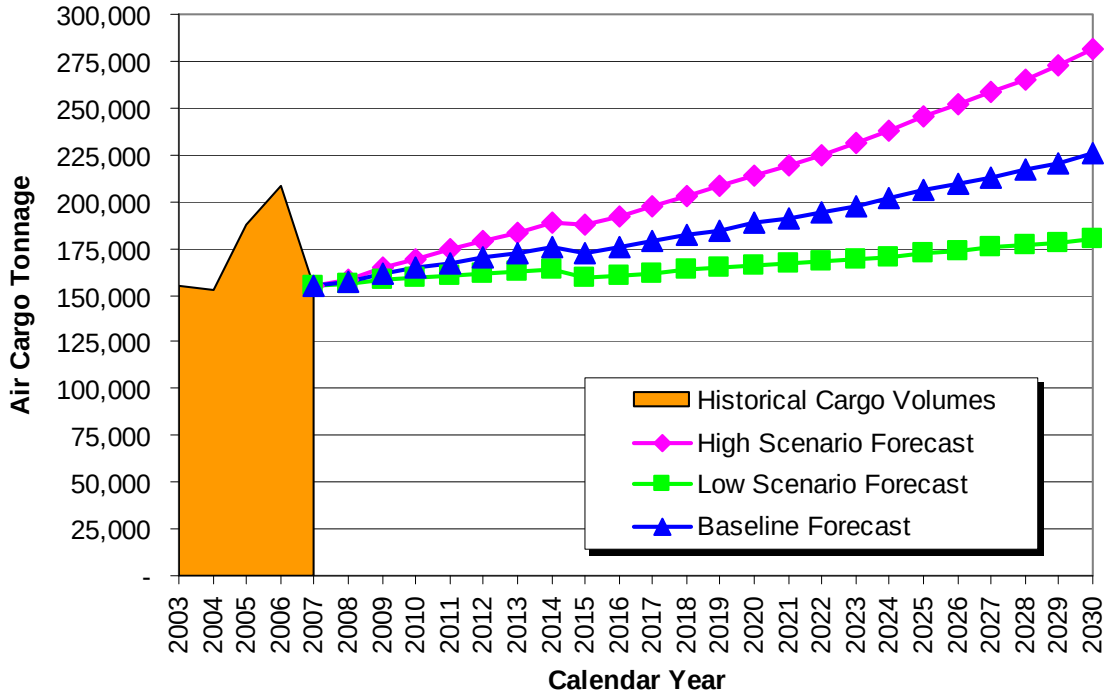
National cargo forecasts prepared by the Federal Aviation Administration (FAA), Boeing, and Airbus were reviewed and analyzed to determine their applicability to the San Diego market. The three industry forecasts predict higher growth rates for international cargo than for domestic. All of the air cargo at SDIA leaves on domestic flights. As a result, the higher growth rates that industry analysts have projected are not expected to apply at SDIA. Moreover, the higher end of the domestic growth rate is more likely to be experienced at the national and regional air hubs of the major integrated carriers (e.g., FedEx and UPS).

Based on these assumptions, all-cargo tonnage at SDIA is expected to grow at two thirds of the FAA forecast growth rates. Under the high scenario, it is projected that all-cargo tonnage at SDIA will grow at the full FAA growth rate. With the low scenario, all-cargo tonnage is expected to grow at one third the rate forecast by the FAA. All three scenarios reflect a decreasing share of belly cargo volumes based on historical trends and the requirement that 100 percent of belly cargo be screened by August 2010.

Air cargo is expected to grow between 0.7 and 2.6 percent annually in the next 22 years, slower than the national average.

The resulting cargo volume forecasts are shown on **Figure 3-3**. SDIA cargo tonnage is predicted to grow at a rate of 1.7 percent annually from 154,689 tons in 2007 to 225,600 tons by 2030 in the baseline scenario. In the high scenario, it is projected that cargo tonnage at SDIA would grow at an average annual growth rate of 2.6 percent through 2030. In the low scenario, an increase of 0.7 percent per annum in cargo tonnage is projected.

Figure 3-3. Air Cargo Tonnage Forecast Summary



Sources: FAA Aerospace Forecast 2008-2025; SDCRAA; Landrum and Brown analysis.

Aircraft operations were derived separately for the four major categories of users: commercial passenger airlines, commercial all-cargo carriers, civil aviation[8], and military. The assumptions for each of these categories are listed below:

Load factors are expected to increase as a result of high fuel prices and capacity reduction.

Commercial passenger airlines. Commercial passenger operations are derived from the projection of passenger levels coupled with assumptions regarding aircraft fleet mix and flight frequency. Specifically, domestic passenger operations were developed based on the assumption that the historical deployment of 135- to 145-seat narrowbody jets at SDIA would continue into the future, with the evolution of the fleet being towards similarly sized, next generation replacement aircraft. Small regional jets are expected to be replaced with larger regional jets. In general, domestic load factors are expected to

[8] Civil activity includes all activity which is not composed of commercial passenger, cargo, or military operations.

increase in the short-term due to high increases in fuel prices and corresponding capacity reductions. International activity is expected to grow in the future, with nonstop service to Europe and Pacific destinations by 2015, which will lead to more wide body aircraft in the fleet.

Commercial all-cargo carriers. The air cargo tonnage forecast for the all-cargo operators was used to derive the all-cargo operations forecast, based on assumptions regarding the amount of air cargo tonnage handled per flight. The freighter fleet is not expected to change substantially throughout the planning horizon. It is assumed the cargo carriers will become more efficient with the amount of cargo carried on each flight in order to minimize fuel costs.

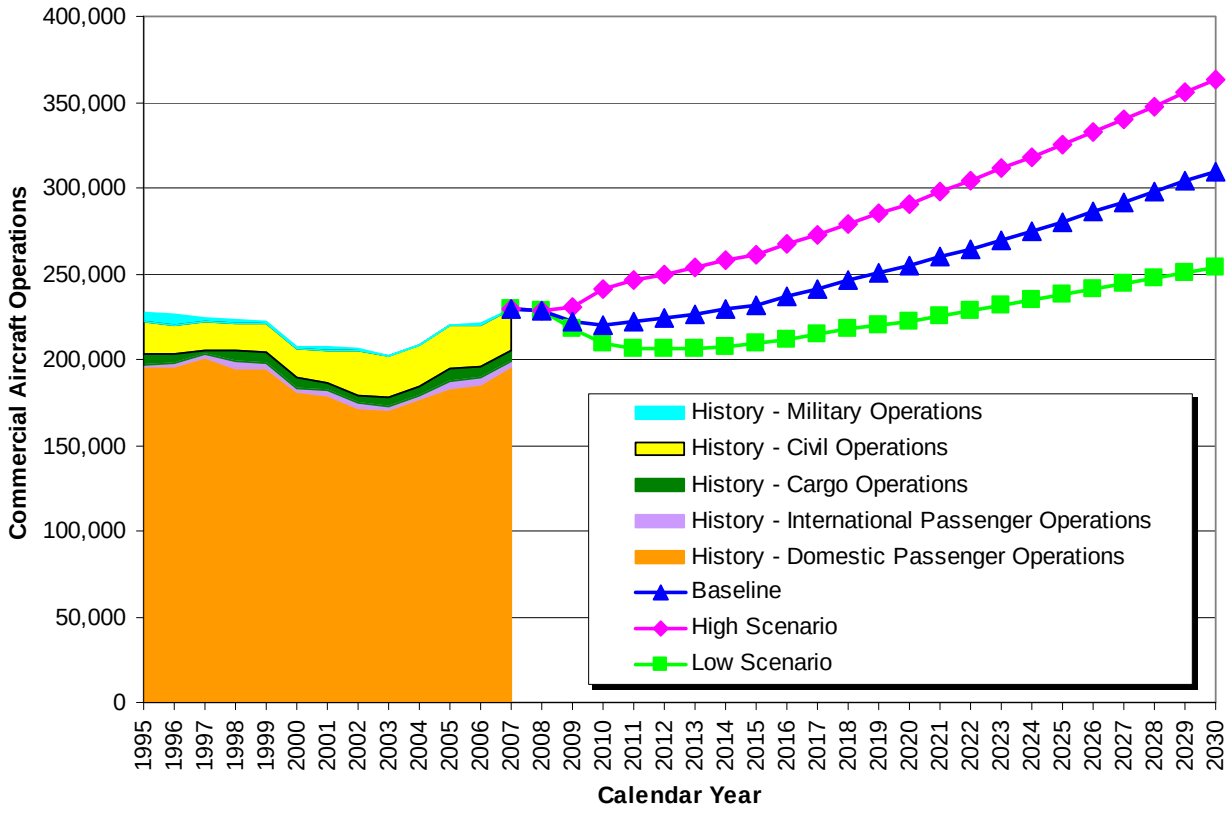
Civil aviation (general aviation) activity is expected to decrease at SDIA, as pilots opt instead to use other less-congested airports in the region.

Civil aviation. Civil aviation activity in the San Diego region is mainly handled by the eleven other airports owned and operated by the County or the cities of San Diego and Oceanside. SDIA's share of the County's civil operations has experienced an overall decline from 1995 to 2007. The civil aviation operations forecast was developed based on the assumption that SDIA's share of the County's civil aviation activity would continue to decline from 2007 levels.

Military activity. Military operations have varied widely over the last 13 years and have fallen dramatically since their peak in 1996. Recent years show military operations remaining relatively low at less than 250 operations a year. Military operations were assumed to remain flat over the forecast period.

The resulting aircraft operations forecast is illustrated on **Figure 3-4**. In the baseline scenario, aircraft operations are forecast to grow from 229,486 in 2007 to 309,800 in 2030, representing average annual growth of 1.3 percent. In the high scenario aircraft operations are forecast to grow 2.0 percent annually versus 0.4 percent in the low scenario.

Figure 3-4. Total Aircraft Operations Forecast



Sources: Airport Records; U.S. DOT, Schedule T-100; *Official Airline Guide*; Landrum & Brown analysis.

A summary of the unconstrained aviation demand forecast is presented in **Table 3-1** on the following page.

Table 3-1

UNCONSTRAINED AVIATION DEMAND FORECAST SUMMARY

San Diego International Airport

		Enplanements				Aircraft operations								Cargo tonnage		
		Domestic				Commercial passenger										
						Domestic										
	Year	Air carrier	Commuter	International	Total	Air carrier	Commuter	International	Total	Air Cargo	Civil	Military	Total	Freighter	Belly	Total
	Actual															
	2006	8,143,613	490,058	125,998	8,759,669	148,114	37,665	3,847	189,626	6,592	24,209	193	220,620	190,351	17,642	207,992
	2007	8,452,620	587,660	132,686	9,172,966	155,194	40,433	3,317	198,943	6,682	23,645	216	229,486	141,653	13,036	154,689
	Forecast															
	2008	8,587,700	548,200	128,300	9,264,200	160,600	36,400	2,800	199,800	6,600	21,500	200	228,100	144,300	12,900	157,200
	2010	8,612,300	520,600	153,500	9,286,400	152,800	34,400	3,400	190,600	6,500	22,500	200	219,800	151,400	12,800	164,200
	2015	9,719,500	218,600	225,600	10,163,700	177,000	17,900	4,600	199,500	6,700	25,400	200	231,800	166,600	5,800	172,400
	2020	10,854,600	199,000	297,600	11,351,200	197,700	16,300	5,700	219,700	7,100	27,600	200	254,600	183,300	4,900	188,200
	2025	12,097,500	196,700	356,200	12,650,400	220,300	16,100	6,700	243,100	7,700	29,300	200	280,300	201,700	4,200	205,900
BASELINE	2030	13,487,900	191,500	427,400	14,106,800	245,700	15,700	7,800	269,200	8,400	32,000	200	309,800	222,000	3,600	225,600
	CAGR 2007-30	2.1%	-4.8%	5.2%	1.9%	2.0%	-4.0%	3.8%	1.3%	1.0%	1.3%	-0.3%	1.3%	2.0%	-5.4%	1.7%
	Forecast															
	2008	8,588,600	548,200	128,300	9,265,100	160,600	36,400	2,800	199,800	6,700	21,500	200	228,200	145,600	13,000	158,600
	2010	9,238,400	558,400	153,500	9,950,300	171,100	37,000	3,400	211,500	6,700	22,700	200	241,100	156,400	13,200	169,600
	2015	10,590,800	238,200	225,600	11,054,600	203,200	19,500	4,600	227,300	7,300	26,500	200	261,300	180,400	6,900	187,300
	2020	11,882,200	217,800	297,600	12,397,600	228,000	17,800	5,700	251,500	8,000	30,900	200	290,600	208,100	5,600	213,700
	2025	13,297,300	216,200	356,200	13,869,700	255,100	17,700	6,700	279,500	9,200	36,100	200	325,000	240,100	5,000	245,100
HIGH SCENARIO	2030	14,883,100	211,300	427,400	15,521,800	285,500	17,300	7,800	310,600	10,500	42,100	200	363,400	277,100	4,500	281,600
	CAGR 2007-30	2.5%	-4.3%	5.2%	2.3%	2.7%	-3.6%	3.8%	2.0%	2.0%	2.5%	-0.3%	2.0%	3.0%	-4.5%	2.6%
	Forecast															
	2008	8,588,600	548,200	128,300	9,265,100	160,600	36,400	2,800	199,800	6,600	21,500	200	228,100	143,000	12,800	155,800
	2010	8,169,300	493,800	153,500	8,816,600	144,900	32,700	3,400	181,000	6,300	21,900	200	209,400	146,500	12,400	158,900
	2015	8,725,100	196,300	225,600	9,147,000	158,900	16,100	4,600	179,600	6,200	23,100	200	209,100	153,700	5,900	159,600
	2020	9,494,200	174,000	297,600	9,965,800	171,800	14,300	5,700	191,800	6,200	24,300	200	222,500	161,200	4,300	165,500
	2025	10,282,800	167,200	356,200	10,806,200	184,900	13,700	6,700	205,300	6,500	25,600	200	237,600	169,200	3,500	172,700
LOW SCENARIO	2030	11,130,500	158,000	427,400	11,715,900	198,900	12,900	7,800	219,600	6,700	27,000	200	253,500	177,600	2,900	180,500
	CAGR 2007-30	1.2%	-5.6%	5.2%	1.1%	1.1%	-4.8%	3.8%	0.4%	0.0%	0.6%	-0.3%	0.4%	1.0%	-6.3%	0.7%

CAGR = Compound annual growth rate

Source: SDCRAA, Landrum and Brown, September 2008

3.2 Constrained Forecast

The aviation forecasts presented thus far for passengers, air cargo, and resulting aircraft operational levels were developed on an unconstrained basis. The unconstrained forecasts are purely market-driven, and as such do not take facility limitations or other environmental/community constraints into consideration. The unconstrained forecasts were developed based on the assumption that facilities (airside, terminals, and landside) could be provided to meet demand.

However, the Authority may not be able to provide the facilities necessary for SDIA to accommodate the unconstrained forecast activity levels. SDIA, which is among the largest airports in the U.S. in terms of passengers served, has the smallest land area (661 acres) of any large commercial airport in the U.S. and is the busiest single-runway airport in the country. In addition, SDIA is constrained by its location – it is bounded by the U.S. MCRD to the north, the Pacific Highway and I-5 to the east, North Harbor Drive and San Diego Bay to the south, and the Navy water channel and Liberty Station to the west. Due to its proximity to downtown San Diego (the Airport is located within two miles of downtown); the area surrounding the Airport is densely populated.[9]

The unconstrained forecasts were used to test the ultimate capacity of SDIA in order to determine the level of activity that could be accommodated in the future. Based on an analysis of the unconstrained forecasts, a constrained forecast was developed to determine whether or not the forecast passenger traffic could be accommodated through the forecast period (i.e., the year 2030).

3.2.1 Capacity Determination

An airport consists of three primary components – airside (runways, taxiways, and airspace), terminal (gates and interior terminal area), and landside (roadways and auto parking). The most limiting of these components will dictate future activity levels. For example, if the terminal has more capacity than the

[9] San Diego International Airport *Final Environmental Impact Report*, April 2008.

roadways, then activity would not be expected to increase beyond the maximum capacity of the landside component.

At this point, only the capacity of the SDIA airside component has been analyzed and determined. As a result, the constrained scenarios were developed strictly based on airside capacity limitations. If the terminal and/or landside components are found to have a lower capacity threshold than the airside, the constrained scenarios would require adjustment.

The capacity of the SDIA airside was last assessed as part of the June 2004 *San Diego International Airport Aviation Activity Forecasts* report which was developed for the *2008 SDIA Master Plan*. The 2004 forecast report included the development of unconstrained forecasts and a demand/capacity analysis that was used to develop constrained forecasts.

To determine an updated basis for a reasonable constrained forecast for the Destination Lindbergh study, delays associated with the previously developed 2030 flight schedule and two variations of that schedule in 2008 were evaluated. This section contains a description of the existing SDIA airside operating environment and a summary of the demand/capacity analysis.

SDIA has a single 9,400-foot long runway oriented in a 09-27 direction. Runway 9 has a 700-foot displaced threshold[10] while Runway 27 operates with a 1,810-foot displacement. Runway 9 is equipped with an Instrument Landing System (ILS)[11] while Runway 27 is equipped with a localizer.[12] There are many factors that influence the capacity and use of Runway 9/27:

- Runway 27 has a higher capacity because there are four high speed exits for Runway 27 arrivals while there are none for Runway 9 arrivals. Also, Runway 27 departures have two diverging departure headings while there is only one departure heading for Runway 9 departures.

[10] A displaced threshold relocates the beginning point of the runway for arrivals (shortening the available runway length) but does not impact departure runway length.

[11] An ILS allows for precision approaches to the airport by providing an approach lighting system, an electronic localizer (horizontal guidance), a glide slope facility (vertical guidance), and distance markers.

[12] A localizer provides horizontal guidance which allows for non-precision approaches.

- The direction and speed of prevailing winds are significant factors in the selection of runway use because aircraft land and depart into the wind. Based on prevailing winds, the Runway 27 direction is the preferred mode of operation at SDIA.
- Cloud ceiling and visibility dictate the Air Traffic Control (ATC) rules in effect at any given time. There are two general categories of weather – visual meteorological conditions (VMC) and instrument meteorological conditions (IMC). VMC occurs when the cloud ceiling is at least 1,000 feet and visibility is at least three miles. Generally, the FAA's visual flight rules (VFR) apply under VMC which means the pilot is primarily responsible for maintaining visual separation from other aircraft.[13] IMC requires that pilots operate under instrument flight rules (IFR). IFR result in greater separation requirements between aircraft in the air, which decreases runway capacity when compared to VFR operations. At SDIA, visual approaches to Runway 27 are only permitted when the cloud ceiling is at least 1,200 feet and visibility is at least three miles. When conditions deteriorate below these minimums, IFR apply.
- The type of instrumentation available on a runway dictates the weather conditions for which the runway can be used. The localizer on Runway 27 only provides horizontal guidance. As a result, when the cloud ceiling drops below 700 feet or visibility drops below two miles, Runway 27 cannot be used. The instrument landing system on Runway 9 permits landings so long as the cloud ceiling is at least 400 feet and visibility is at least one mile.
- The Airport sometimes has to operate in mixed flow (Runway 9 arrivals and Runway 27 departures) in conditions where the cloud ceiling and visibility conditions require use of Runway 9 for arrivals but the winds are such that pilots request Runway 27 for departure so they can depart into the wind.

[13] Although most commercial pilots operate under IFR regardless of the weather conditions, ATC typically allows IFR aircraft to maintain visual separation during VMC.

Based on the above factors, four primary operating configurations were identified and the capacity of each was estimated in the *San Diego Aviation Activity Forecasts*, June 2004 report, as shown in **Table 3-2**.

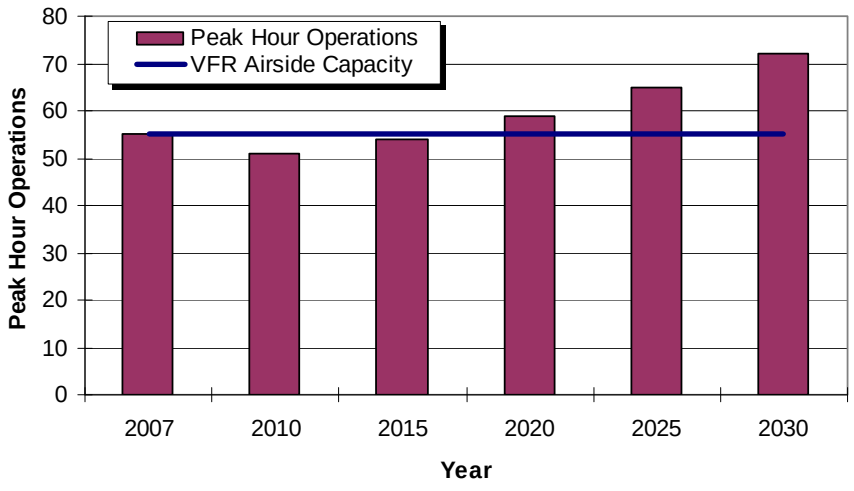
Table 3-2
MAXIMUM AIRSIDE CAPACITY
San Diego International Airport

Operating configuration	Approach Minimums		Annual occurrence	Maximum hourly capacity
	Ceiling	Visibility		
Rwy 27 VFR	1,200 feet	3 miles	71.0%	55
Rwy 27 IFR	700 feet	2 miles	25.5%	49
Rwy 9	400 feet	1 mile	3.5%	40
Rwy 9 arrivals / Rwy 27 departures IFR	400 feet	1 mile		36

Note: maximum capacity values are based on 2030 aircraft fleet mix.
Source: *San Diego Activity Forecasts*, June 2004.

When compared to the baseline unconstrained forecast, SDIA peak hour operations will exceed the Runway 27 VFR capacity prior to 2020 (see **Figure 3-5**). At this point, delays will begin to increase and become more noticeable.

Figure 3-5. Airside Demand/Capacity



Source: Landrum & Brown analysis.

As the capacity of airside facilities is reached, aircraft delays increase rapidly, with relatively small increases in the number of operations served. The point at which increases in delay indicate the capacity has been reached varies by airport. For the purpose of determining the maximum level of activity that can be accommodated at SDIA in a constrained environment, the following maximum delay thresholds were assumed:

- Average daily arrival delays in VFR conditions of no more than 6 minutes per arrival
- Peak arrival delays in VFR conditions of no more than 15 minutes
- Average daily arrival delays in IFR conditions of no more than 30 minutes per arrival
- Peak arrival delays in IFR conditions of no more than 60 minutes
- Overall average daily arrival delays of no more than 15 minutes per arrival.

To determine the level of activity that would correspond to these maximum delay levels, three PMAWD (peak month average week day) flight schedules were tested against the master plan capacity[14] of both the Runway 27 VFR and Runway 27 IFR configurations.[15] The first schedule used was the 2030 master plan flight schedule. The second and third were derived by modifying the master plan schedule to target a maximum hourly count of about 31 arrivals in any 60-minute period of the day. Based on this demand/capacity analysis, it was estimated that the maximum PMAWD activity level was approximately 848 operations, corresponding to a peak hour of 64 operations. **Table 3-3** provides a summary of the delays associated with this level of activity compared to the target maximums.

[14] The Master Plan total operations capacities were rounded up to 28 arrivals per hour in VFR capacity and 25 arrivals per hour in IFR.

[15] The Runway 9 IFR and the Runway 9/27 IFR configurations were not analyzed in detail for this analysis because together these configurations occur only 3.5 percent of the time.

Table 3-3
DELAY LEVELS ASSOCIATED WITH 848 PMAWD OPERATIONS
San Diego International Airport

Performance Metric	Delay (minutes per arrival) 848 PMAWD Ops. Schedule	Target Maximum
Average daily arrival delays in VFR	6.1	6
Peak arrival delays in VFR	17	15-20
Average daily arrival delays in IFR	32.8	30
Peak arrival delays in IFR	57	60
Average annual arrival delays	13.8	15

Source: Jacobs Consultancy.

This level of operations (848 PMAWD) corresponds to approximately 286,000 annual operations. Therefore, the constrained forecast will evaluate the number of passengers that can be accomodated given this constraint.

3.2.2 Constrained Forecast of Enplanements and Operations

This section presents a discussion of the constrained forecast that represents the maximum activity SDIA will be able to accommodate in the future.

The demand/capacity analysis determined that 848 daily operations is an appropriate point at which to cap operations at SDIA for purposes of developing the constrained forecast. The base unconstrained forecast predicts this level of activity will occur in approximately 2026. Peak hour operations will actually begin to exceed peak hour capacity prior to 2026 (most likely in the 2015 to 2020 time period). However, delays will not exceed the maximum levels identified in Section 3.2.1 until approximately 2026. The corresponding unconstrained activity levels for 2026 are summarized in **Table 3-4**.

Table 3-4
2026 UNCONSTRAINED BASELINE FORECAST
San Diego International Airport

Annual enplanements	12,929,880
Annual operations	286,047
PMAWD operations	845
Peak hour operations	66

Source: Landrum & Brown analysis.

The airlines are expected to begin to alter their air service offerings in response to the increasing delays beginning in 2022. The airlines have several options to maximize passenger throughput in a constrained airfield situation:

- Adjust flight schedule to shift activity from congested hours to off-peak hours
- Increase aircraft size
- Reduce frequency to some markets which would lead to an increase in load factors
- Increase pricing to reflect the limited supply in the market.

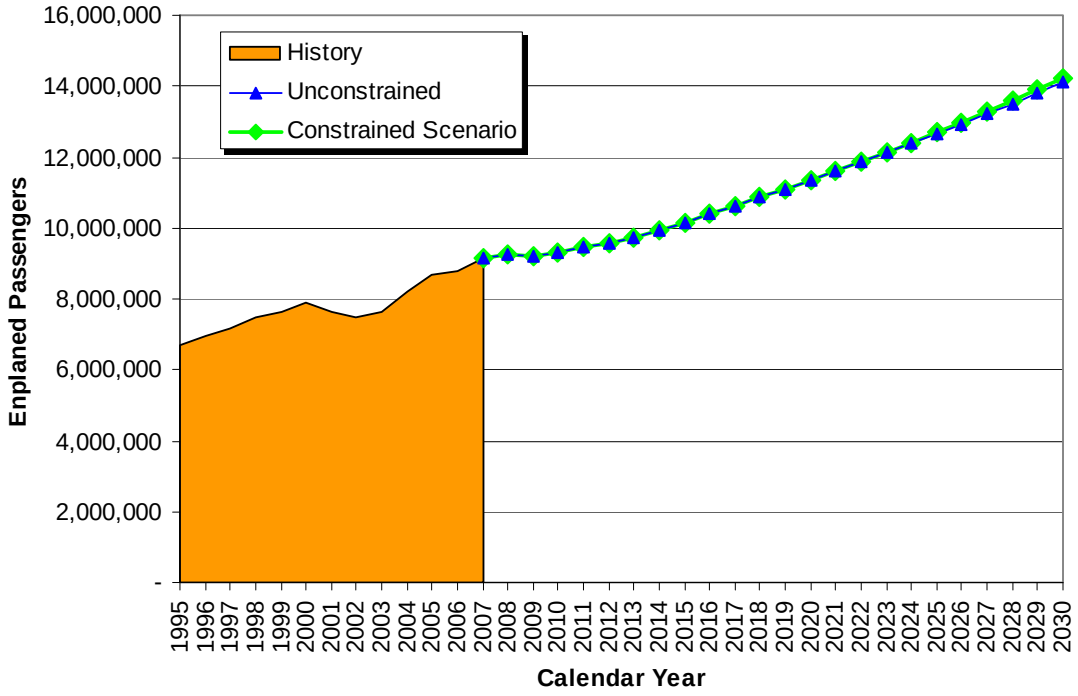
In addition, changes to the cargo and civil aircraft operational levels could occur due to the projected increase in congestion and delays.

In the constrained forecast, civil operations are held at the 2007 level (23,645 operations), effectively creating a no growth scenario for general aviation over the forecast period. It was assumed that airfield capacity constraints would displace a relatively small segment of more discretionary general aviation users at SDIA which tend to fly piston engine aircraft rather than larger turboprop and jet aircraft. It was assumed that the incremental operational capacity (+6,000 annual operations) would accrue to the passenger airlines over the forecast period.

Even with the additional capacity created by allotting the reduction in civil operations to passenger aircraft, airlines would still need to increase aircraft size and passenger load factors to accommodate the unconstrained demand, but at lower operational levels to minimize delays. Based on the type of carriers expected to serve SDIA over the forecast period, the mix of aircraft would reflect a larger proportion of Boeing 737-800s

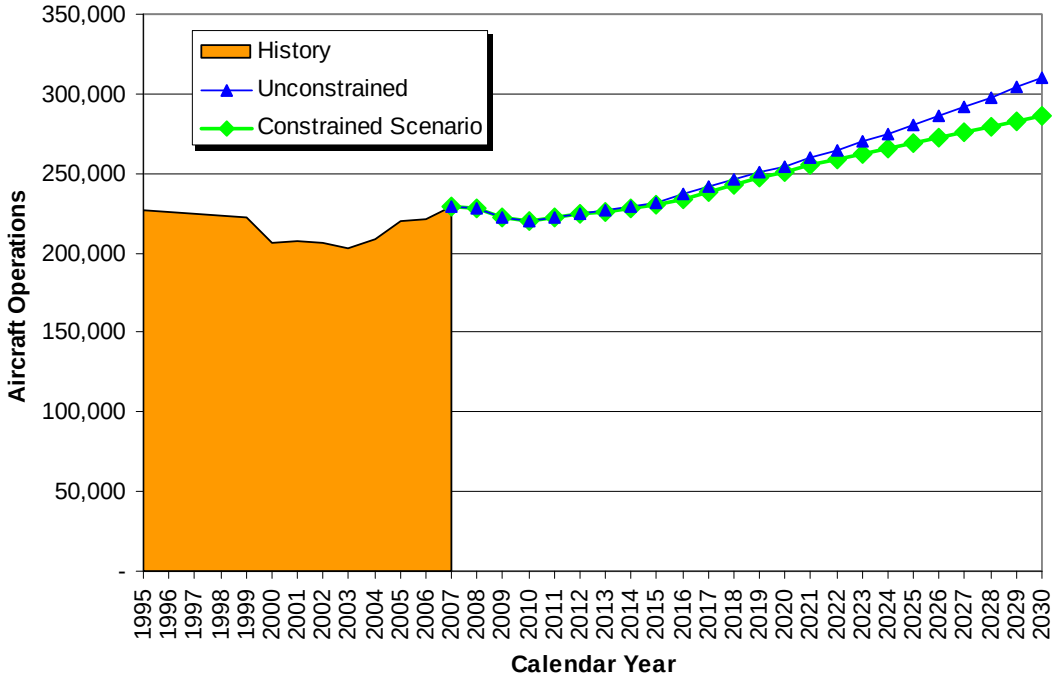
and -900s, as well as more Airbus A320s and A321s. It was assumed that airlines would begin this transition when the level of operations reaches 90 percent of the airfield capacity (around year 2021). Airlines would progressively increase their aircraft gauge and load factors to 139.5 seats per departure and 80.1 percent, respectively, by 2030 (compared to 132.9 seats per operation and an average load factor of 78.9 percent in the unconstrained baseline forecast). Based on these assumptions, SDIA would be able to accommodate the projected unconstrained passenger demand of 14.1 million enplanements (28.2 million annual passengers) by 2030. **Figures 3-6** and **3-7** provide a comparison of the unconstrained and constrained scenarios for annual enplanements and operations. **Figure 3-7** clearly illustrates the potential impact on operations levels as a result of the airfield capacity constraints at SDIA.

Figure 3-6. Enplanements Forecast Comparison – Unconstrained vs. Constrained



Source: Landrum & Brown analysis.

Figure 3-7. Aircraft Operations Forecast Comparison – Unconstrained vs. Constrained



Source: Landrum & Brown analysis.

A summary of the constrained aviation demand forecast is presented in **Table 3-5** on the following page.

Table 3-5
CONSTRAINED AVIATION DEMAND FORECAST SUMMARY
San Diego International Airport

	Enplanements				Aircraft operations								Cargo tonnage		
	Domestic				Commercial passenger: Domestic										
Year	Air carrier	Commuter	International	Total	Air carrier	Commuter	International	Total	Air Cargo	Civil	Military	Total	Freighter	Belly	Total
Actual															
2006	8,143,613	490,058	125,998	8,759,669	148,114	37,665	3,847	189,626	6,592	24,209	193	220,620	190,351	17,642	207,992
2007	8,452,620	587,660	132,686	9,172,966	155,194	40,433	3,317	198,943	6,682	23,645	216	229,486	141,653	13,036	154,689
Forecast															
2008	8,587,700	548,200	128,300	9,264,200	160,600	36,400	2,800	199,800	6,600	21,500	200	228,100	144,300	12,900	157,200
2010	8,612,300	520,600	153,500	9,286,400	152,800	34,400	3,400	190,600	6,500	22,500	200	219,800	151,400	12,800	164,200
2015	9,719,500	218,600	225,600	10,163,700	177,000	17,900	4,600	199,500	6,700	23,700	200	230,100	166,600	5,800	172,400
2020	10,854,600	199,000	297,600	11,351,200	197,700	16,300	5,700	219,700	7,100	23,700	200	250,700	183,300	4,900	188,200
2030	13,630,800	208,300	369,400	14,208,500	231,000	16,500	6,900	254,400	7,800	23,700	200	286,100	222,000	3,600	225,600
CAGR 2007-30	2.1%	-4.4%	4.6%	1.9%	1.7%	-3.8%	3.2%	1.1%	0.7%	0.0%	-0.3%	1.0%	2.0%	-5.4%	1.7%

CAGR = Compound annual growth rate
Source: SDCRAA, Landrum and Brown, September 2008.