Transportation

Southern California Association of Governments

Regional Aviation Forecasts

Analysis of Airport Capacity Constraints Technical Memorandum

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Statement of Qualifications and Limitations

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1. Introduction

1.1 Background

The Southern California Association of Governments (SCAG) awarded Contract Number 14-013-C1 to AECOM Technical Services, Inc. to provide professional services for the development of new 2040 regional aviation demand forecasts and a new airport ground access element for the 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Aviation demand includes air passengers, operations, and air cargo. The scope of services also includes development of air passenger trip tables for incorporation in the regional travel demand model. The demand allocation process will reflect the varying attributes at the different airports in the regional system, including travel times to airports, physical capacity constraints at constrained airports, and future flight frequencies, and portfolios.

1.2 Objective of Task 5 – Analysis of Airport Capacity Constraints

The objective of this analysis is to develop a planning-level physical capacity limit for each of the four capacity constrained urban airports - Los Angeles International Airport (LAX), John Wayne Airport (SNA), Burbank Bob Hope Airport (BUR), and Long Beach Airport (LGB. Since the time horizon of this analysis is 2040, only the major components of each airport—the airfield and the terminal gates—are evaluated, based on current airport plans. Some airports in the SCAG region operate under legal or policy constraints that may limit the number of passengers that they can accommodate. This analysis does not consider such legal or policy constraints.

1.3 Purpose of this Technical Memorandum

This technical memorandum describes the methodology and conclusions of the airport capacity constraints analysis. Each of the four capacity constrained airports is described separately.

2. Methodology

The overall airport capacity is defined by the most constraining component of an airport. The airport is a complex system made up of different components through which passengers and aircraft flow in a sequential order. Each component of the airport system has a throughput capacity level, which is typically a function of the physical and operational characteristics of the component. For example, the number of runways, the number of gates, and the operating procedures determine the throughput or processing rate of the airport. The capacity of the overall airport system is determined by the capacity of its weakest component, i.e., the controlling facility.

Only the capacity of the airfield and terminal gates were analyzed in this study. The methodology used is summarized below:

- Identify the controlling facility that constitute the overall capacity-constraint for each airport based on the available Airport Master Plans or similar study for each airport, and the feedback from meetings with the airports.
- Review the capacity limit identified in previous reports and studies.

The following approaches were used for the review of the airfield and terminal capacity limits. The configuration of the airfield and terminal at each airport was identified from available Airport Master Plans and similar studies. The ultimate airport capacity is the combined effect of the two limits.

Methodology used to Determine Airfield Capacity:

- Based on the ultimate airport layout plan from each airport with the feasible ultimate runway configuration; estimated the annual service volume (ASV) utilizing processes and formulas prescribed in FAA AC 150/5060-5 Airport Capacity and Delay.
- Estimated the percentage of commercial operations, load factor and seating capacity from historical data and future trends.
- Estimated the maximum annual passenger volume from the above results.

Methodology used to Determine Terminal Capacity:

- Based on the ultimate airport layout plan from each airport with the feasible ultimate terminal gate (active and remote) configuration; analyzed the current gate utilization from historical data (e.g. design day schedule and gate chart, average number of turns per gate, fleet mix, seating capacity), and estimated the maximum gate capacity by maximizing the usage of each gate in the ultimate terminal layout plan.

In most cases, a series of sensitivity analyses were conducted around the airfield and terminal capacities. In these sensitivity analyses, input assumptions were varied to develop a range of possible capacity limits for each airport. Since this is a planning-level study, no attempt was made to identify a most likely scenario from among the scenarios analyzed. Because of the wide range of assumptions considered, in some cases, the low end of the range identified for an airport may be below the historical peak passenger volume at that airport.

3. Capacity Analysis

The following subsections present the capacity analysis performed for each of the four constrained airports.

3.1 Los Angeles International Airport (LAX)

LAX is the 6th busiest airport worldwide in terms of passengers, 4th in terms of aircraft operations, and 14th worldwide in air cargo tonnage[1]. In 2014, 70.7 million passengers traveled through LAX and the total aircraft operations were 637,000.

3.1.1 Previous Capacity Analysis for LAX

Capacity in Previous RTP

In the aviation system planning conducted for SCAG's 2001 RTP, a physical capacity analysis was conducted for LAX, including the capacities of the facility's curbside, terminal, terminal gate and runway systems. It determined that the overriding constraint that governs the physical capacity of LAX was its runway system, and the LAX runway capacity was estimated at 78 million annual passengers (MAP). This capacity constraint was adopted for the 2001

[1] Airports Council International (ACI), March 2014.

RTP, and carried over into the 2004 RTP. The SCAG's 2001 RTP noted that Los Angeles World Airports (LAWA) has estimated the existing runway capacity of LAX at about 86 MAP. Also, if the LAX capacity analysis was updated using SCAG's updated 2030 regional aviation forecast, which accounts for increased aircraft load factors after 9/11 and more very large aircraft in the future fleet mix, the estimate of existing runway capacity at LAX would be above 78 MAP.[2]

Capacity in the LAX Master Plan

A passenger limit of 78.9 MAP was established as the "practical capacity" of LAX in a Settlement Agreement between LAWA and surrounding communities and other parties arising from lawsuits over the latest update of the LAX Master Plan[3]. The 78.9 MAP limit was estimated base on the physical (runway) capacity for the 2004 LAX Master Plan Alternative D. The Master Plan also included three other alternatives: Alternatives A, B, and C. Alternatives A and B included a fifth runway and would accommodate 97.9 MAP. Alternative C was designed to test the limit of the market to serve passenger and cargo demand within the limit of a four-runway system. The projected capacity for Alternative C was 89.6 MAP.

Capacity in the Specific Plan Amendment Study (SPAS)

As a result of lawsuits challenging the LAX Master Plan, a Settlement Agreement was reached that requires LAWA to proceed with a Specific Plan Amendment Study (SPAS) to identify potential alternative designs, technologies, and configurations that would provide solutions to the problems that certain projects (designated as "Yellow Light Projects") were designated to address. LAWA completed the SPAS Final Report, dated January 2013, which was based on the plan for the modernization and improvement of LAX in a manner that is designed for a practical capacity of 78.9 MAP and no more than 153 passenger gates.[4]

3.1.2 Summary of LAX Historical Data

LAX Historical Passenger Volume

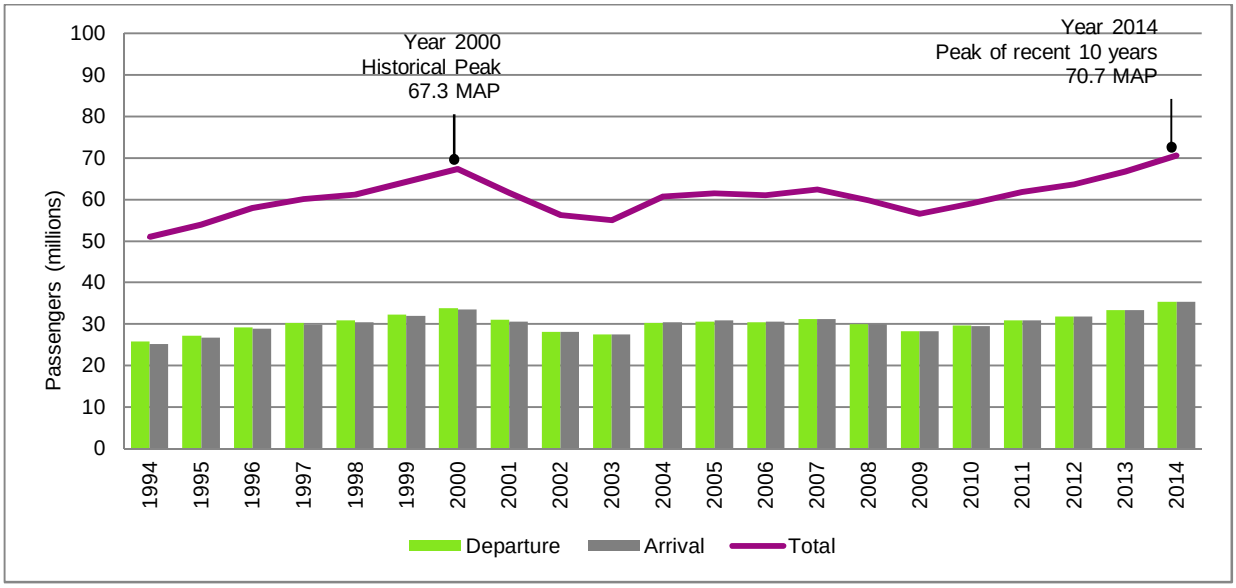
The annual passenger volume at LAX has been increasing since the economic turmoil that ended in 2009. In 2014, LAX had a record high 70.7 million passengers, exceeding the historical peak of 67.3 million experienced in 2000. **Figure 1** presents the annual passenger volumes from 1994 to 2014.

[2] 2004 Regional Transportation Plan, Technical Appendix D-6: Aviation, SCAG.

[3] 2012-2035 Regional Transportation Plan, Appendix - Aviation and Airport Ground Access, SCAG.

[4] LAX Specific Plan Amendment Study Final Report, January 2013, LAWA.

Figure 1: LAX Historical Annual Passengers



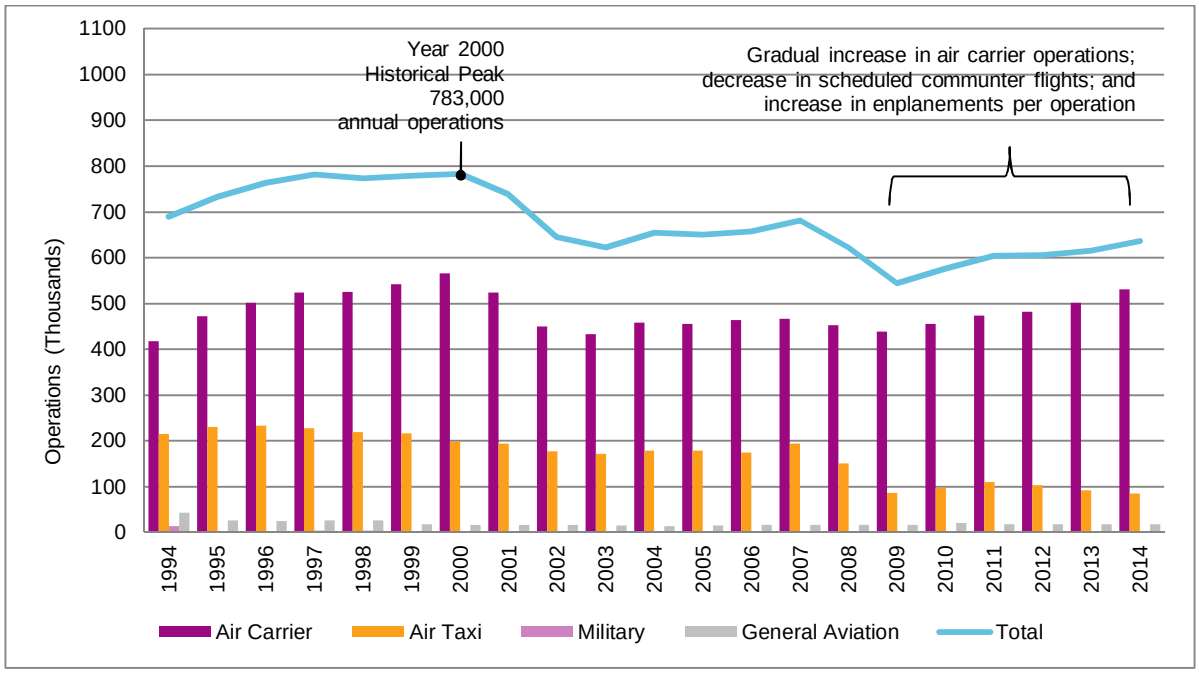
Source: Los Angeles International Airport, http://www.lawa.org/LAXStatistics.aspx.

LAX Historical Operations

The total annual operations at LAX has also been recovering since the economic downturn, but the rate of increase is less than the rate of the annual passenger volume increases. The total annual operations in 2014 (637,000) are still below the historical peak in 2000 (783,000). The air carrier operations in 2014 (531,000) are also below the historical peak in 2000 (566,000). There has been a decrease in commercial commuter operations in the last three years. This trend reflects the increase in passengers per operation (e.g. increase in load factor and/or size of commercial carriers) which is the result of changes in airline operations to maximize utilization. The capacity analysis for this study is based on the data in recent years to reflect the latest pattern in LAX.

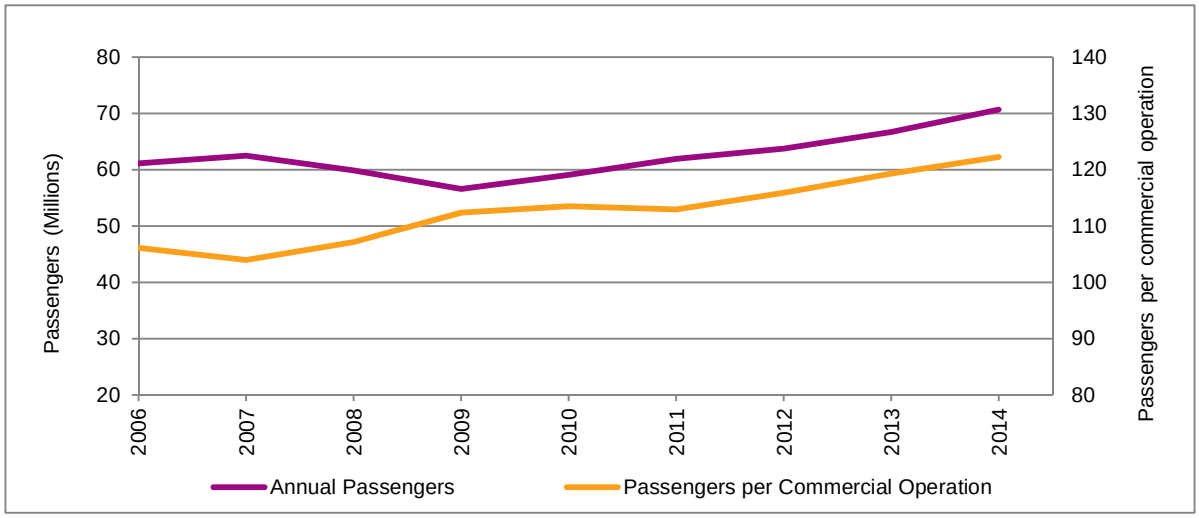
Figure 2 presents the annual aircraft operations from 1994 to 2014. **Figure 3** illustrates the passengers per commercial operation from 2006 to 2014.

Figure 2: LAX Historical Annual Operations



Source: Los Angeles International Airport, http://www.lawa.org/LAXStatistics.aspx.

Figure 3: LAX Historical Passengers per Commercial Operation



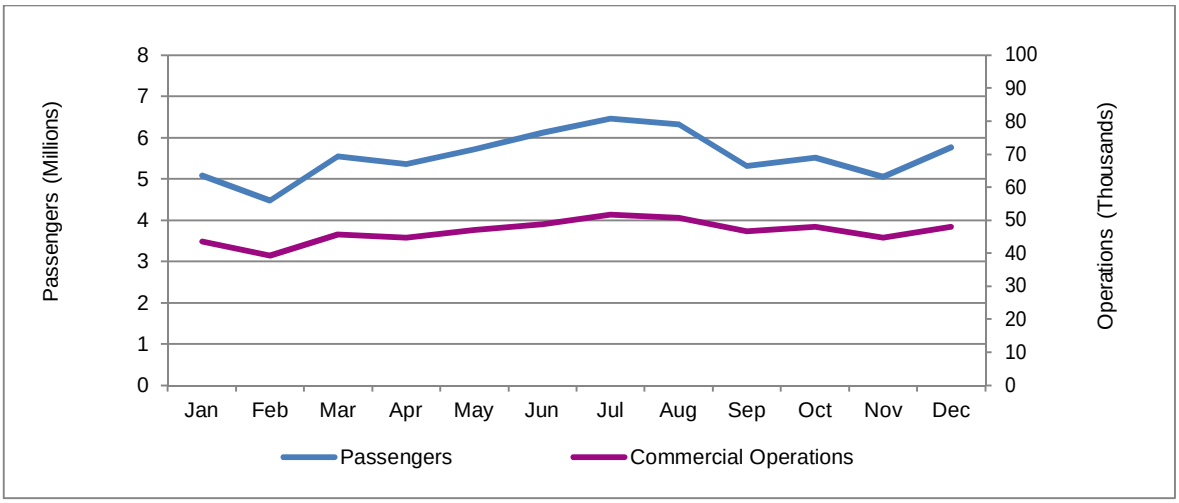
Source: Los Angeles International Airport, http://www.lawa.org/LAXStatistics.aspx and AECOM analysis.

LAX Peak Month, Design Day, and Peak Hour

The 2013 monthly passenger and operation detail is presented in **Figure 4**. The peak month for passengers and operations is July. The peak month passenger volume in July was approximately 9.7 percent of the annual total in 2013. The commercial operations in the peak month constitute approximately 9.2 percent of the total annual commercial operations. In view of LAX's facilities and role in the regional aviation system, it is anticipated that the

nature of the current traffic patterns (i.e. mix of short-, medium-, and long- haul stage lengths) will be similar in future years. Thus historical data serves as a reasonable guide to future hourly passenger patterns.

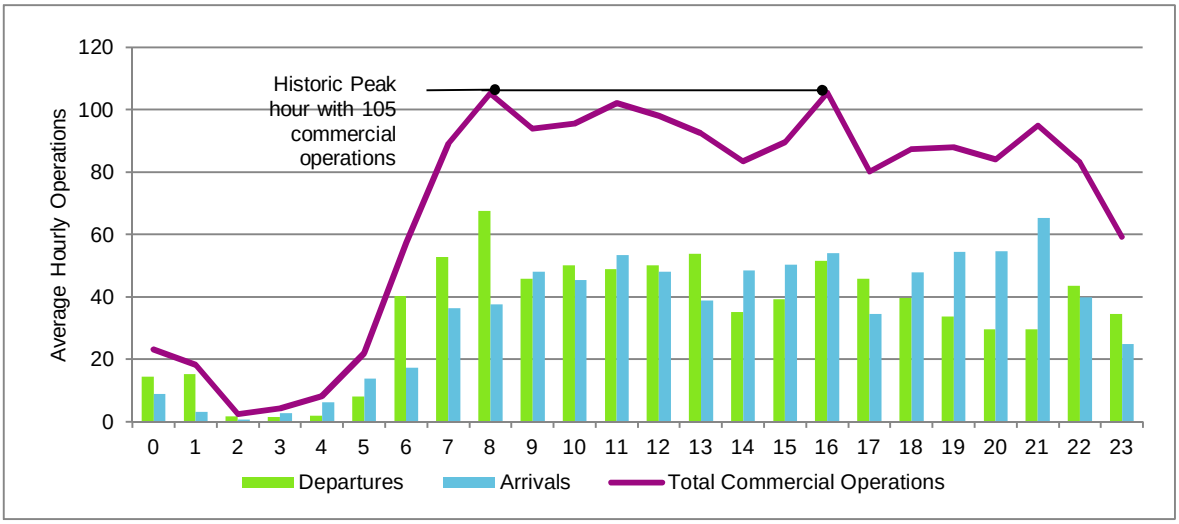
Figure 4: LAX 2013 Monthly Passengers and Commercial Operations



Source: Los Angeles International Airport, http://www.lawa.org/LAXStatistics.aspx.

Historical hourly operation profile for the average day of the peak month (ADPM) in July 2013 was analyzed. The estimated average hourly commercial (excluding air cargo, general aviation, and military) operations are presented in **Figure 5**.

Figure 5: LAX Average Hourly Operations (July, 2013)



Source: FAA Aviation System Performance Metrics (ASPM) Database, Accessed July 2014, and AECOM analysis.

Based on the historical data between 2009 and 2013, the following demand ratios are estimated for LAX:

- **Daily Demand Ratio (D)** - the ratio of annual demand (aircraft operations) to average daily demand during the peak month. D was estimated to be approximately 342.

- **Hourly Demand Ratio (H)** - the ratio of average daily demand to average peak hour demand during the peak month. H was estimated to be approximately 15.7.

LAX Fleet Mix, Load Factor, and Seat Capacity

The characteristics of the fleet mix, load factors and seat capacity for the airlines operating at LAX were analyzed and included in **Appendix A**. **Table 1** presents a summary according to different aircraft categories including passenger flights such as scheduled carrier, commuter carrier, charter, and other non-passenger flights.

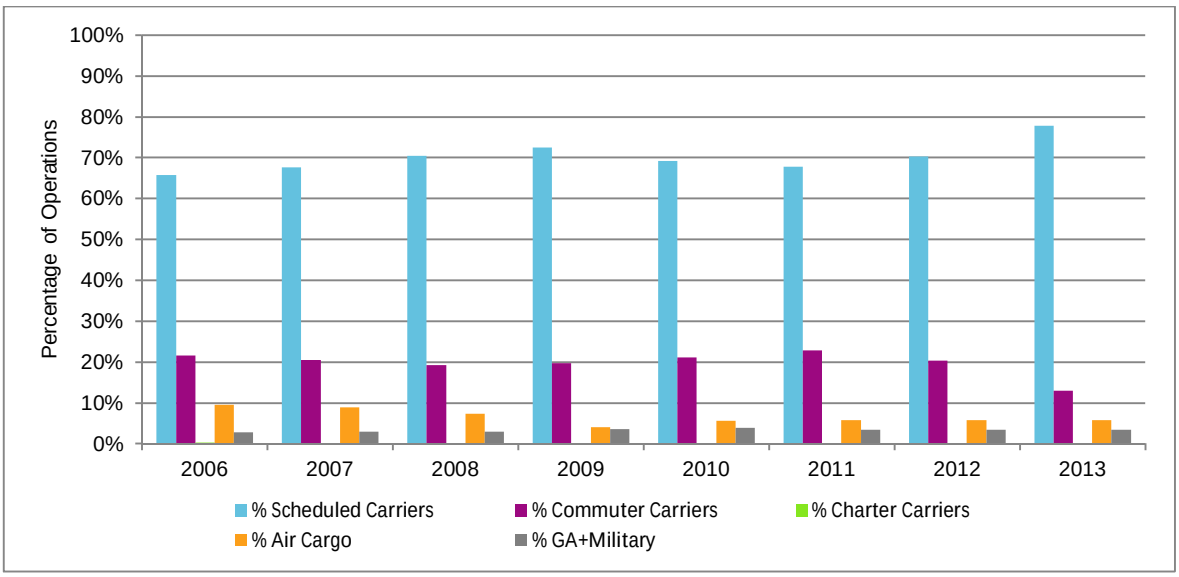
Table 1: LAX Load Factor and Seat Capacity by Categories, 2013

Aircraft Category	Load Factor	Average Seat Capacity	No. of operations recorded
Scheduled Carriers	82.10%	173	473,255
Commuter Carriers	70.06%	41	84,868
Charter Carriers	60.29%	105	881
Other non-passenger flights	N/A	N/A	24,509
Total (Commercial Operations)			**583,513**

Source: U.S. DOT T100 Database 2013; AECOM analysis.
Notes: 1. Scheduled carriers include aircraft with passenger services and more than 60 seats;
2. Commuters are scheduled passenger services with less than or equal to 60 seats;
3. Non-scheduled passenger services are provided by charter carriers.

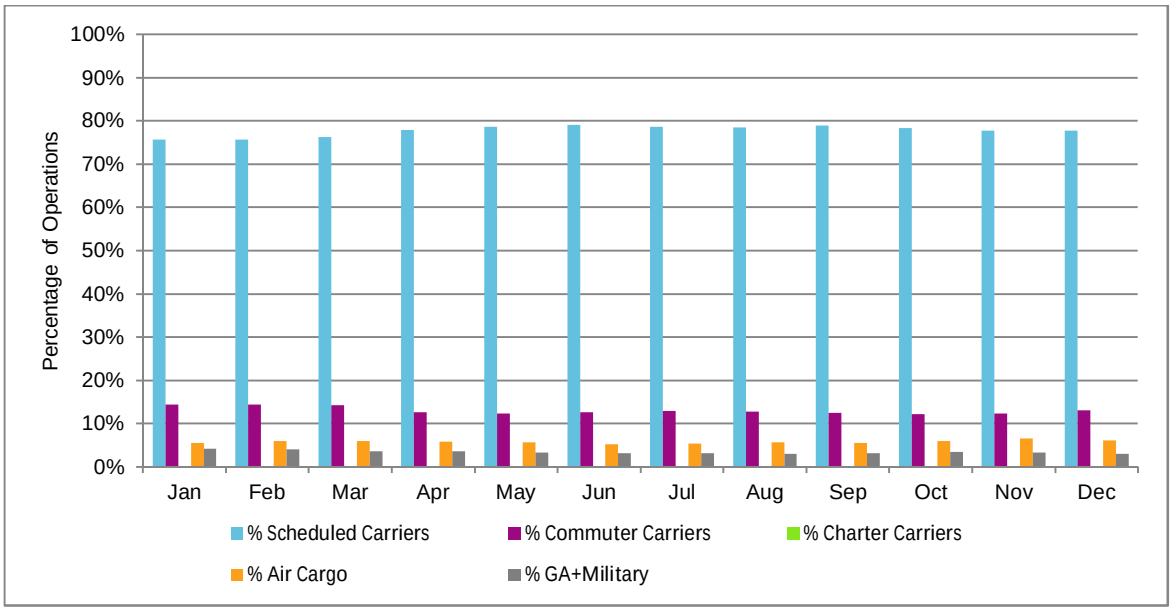
The historical proportion of commercial operations at LAX are presented in **Figures 6** and **7**. **Figure 6** summarizes the percentages from 2006 to 2013. **Figure 7** summarizes the monthly totals in 2013.

Figure 6: LAX Percentage of Operations (2006 to 2013)



Source: Los Angeles International Airport (http://www.lawa.org/LAXStatistics.aspx) and AECOM analysis.

Figure 7: LAX Percentage of Operations (Jan to Dec 2013)



Source: Los Angeles International Airport (http://www.lawa.org/LAXStatistics.aspx) and AECOM analysis.

3.1.3 LAX Airfield Capacity Analysis

Description of the Runway Operating Configurations

The runway system at LAX consist of two sets of dual parallel runways. The north runway complex consists of Runways 6L-24R (8,925 feet long and 150 feet wide), and 6R-24L (10,285 feet long and 150 feet wide). There is 700 feet runway centerline-to-centerline separation between the north complex runways. The close separation of the two parallel north runways preclude independent operations during weather conditions where cloud ceilings are less than 1,000 feet and visibility is less than 3 miles. Each end of Runways 6R-24L and 6L-24R is equipped with Category I instrument landing systems. Runway 6R-24L is primarily used for departing aircraft and Runway 6L-24R is primarily used for arriving aircraft.

The south runway complex consists of Runways 7L-25R (12,091 feet long and 150 feet wide), and 7R-25L (11,095 feet long and 200 feet wide). The separation between these two runways is 800 feet. Each end of Runway 7L-25R and Runway 7R is equipped with Category I instrument landing systems. Runway 25L is equipped with a Category IIIB instrument landing system. Runway 7L-25R is used primarily for departing aircraft. Runway 7R-25L is used primarily for arriving aircraft.

The separation between the north inboard runway 6R-24L and south inboard runway 7L-25R is more than 4,500 feet, which allows for independent operations.

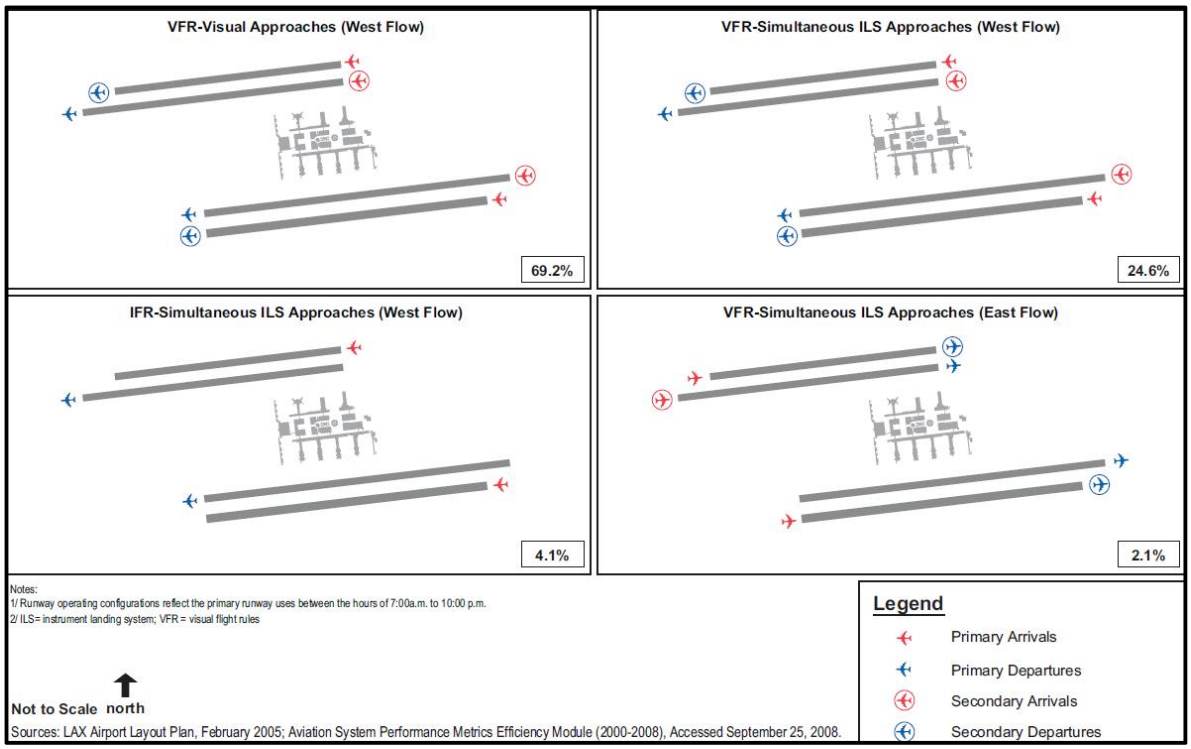
With reference to the SPAS, there are four basic runway operating configurations:

- Visual flight rules (VFR) with visual approaches – West Flow (occurs 69.2 percent of the time)
- VFR with simultaneous instrument landing (ILS) approaches – West Flow (occurs 24.6 percent of the time)
- Instrument meteorological conditions (IMC)/ Instrument flight rules (IFR) with instrument approaches – West Flow (occurs 4.1 percent of the time)

- VFR with simultaneous ILS approaches – East Flow (occurs 2.1 percent of the time)[5]

The four operating configurations are illustrated in **Figure 8**.

Figure 8: LAX Runway Configuration



Source: LAX SPAS Report, Appendix F-2, Figure 1, July 2012.

Peak Hour Throughput and Annual Service Volume (ASV)

FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay, provides the methodology for estimating airport capacities. FAA AC 150/5060-5 provides formulas to estimate annual service volume (ASV). ASV is a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, fleet mix, and other factors that would be encountered over a year's time. The capacity calculations for long-range planning as provided in Chapter 3 of FAA AC 150/5060-5 have been adopted for the airfield capacity analysis for LAX. Reference was also made to FAA Report No. FAA-RD-74-124, Techniques for Determining Airport Airside Capacity and Delay.

Definition of Terms

The key terms used in analyzing airport capacity and discussed in this section are defined below:

- **Aircraft Mix** - is the relative percentage of operations conducted by each of four classes of aircraft according to size (A, B, C and D). **Table 2** identifies the physical characteristics of the four aircraft size classifications and their relationship to terms used in wake turbulence standards. It should be noted that

[5] LAX SPAS Report, Appendix F-2, July 2012

since the FAA Air Traffic Control Handbook (FAA Order 7110.65) applies wake turbulence procedures to aircraft operating behind heavy jets and B757s, the B757 is considered a heavy aircraft for capacity planning purposes although its maximum certificated takeoff weight is less than 300,000 pounds.

Table 2: Aircraft Classifications

Aircraft Class	Maximum Certified Takeoff Weight MTOW (lbs)	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B	12,500 or less	Multi	Small (S)
C	12,500 – 300,000	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H) / B757

Source: FAA AC 150/5060-5, Airport Capacity and Delay.

- **Capacity** - (throughput capacity) is a measure of the maximum number of aircraft operations (takeoffs and landings) which can be accommodated on the airport or airport component in an hour. Since the capacity of an airport component is independent of the capacity of other components, it can be calculated separately. This analysis deals with the airfield component.

- **Mix Index** - is a mathematical expression. It is the percent of Class C aircraft plus three times the percent of Class D aircraft, and is written % (C+3D).

- **Percent Arrivals** (PA) - is the ratio of arrivals to total operations and is computed as follows:

$$PA = \frac{A + {}^{1}/_{2}\,(T\&G)}{A + DA + (T\&G)} \times 100$$

where:

A = number of arriving aircraft in the hour

DA = number of departing aircraft in the hour

T&G = number of touch and go's in the hour

- **Percent Touch and Go's (T&G)** - is the ratio of landings with an immediate take-off to total operations and is computed as follows:

$$T\&G = \frac{(T\&G)}{A + DA + (T\&G)} \times 100$$

where:

A = number of arriving aircraft in the hour

DA = number of departing aircraft in the hour

T&G = number of touch and go's in the hour

Touch-and-go operations are normally associated with training. The number of these operations usually decreases as the number of air carrier operations increase, as demand approaches runway capacity, or as weather conditions deteriorate.

Having established the definitions of terms used in the capacity analysis, the following subsections deal with the calculation of hourly runway capacities. Hourly capacity was calculated for VFR and IFR conditions.

Assumptions and Inputs for Airfield Capacity Analysis

Six sensitivity tests are conducted in the runway capacity analysis for LAX to account for the variation in assumptions.

Sensitivity Tests 1 through 3 – FAA AC 150/5050-5 Analytical Method

Following are the major assumptions and inputs applied to estimate the hourly capacity:

- **Runway Configuration**. The runway configuration is based on the description above and matched with the runway-use diagrams for VFR and IFR conditions in the AC. The appropriate runway-use diagram identified are diagram number 33, 35, and 42 with corresponding Figures 3-20, 3-21 and 2-26 in the AC for different VFR configurations; and diagram number 35 with Figure 3-58 in the AC for IFR conditions. During the VFR West Flow condition with visual approaches (occurs 69.2percent of the time), Runways 24R and 25L are mainly for arrivals and Runways 24L and 25R are mainly for departures. Mixed mode is only used occasionally. Since these two configurations reference different runway-use diagram in the AC, three sensitivity tests are assumed to split the 69.2 percent for the two configurations.

- **Mix Index**. Data for determining mix index was based on an analysis of the U.S. DOT T100 database for 2013. Based on this data set, aircraft operating on the runways between 12,500 and 300,000 pounds (excluding the B757) account for 73 percent of all operations on the runways. These are categorized as aircraft class C. Aircraft with maximum certificated takeoff weights of 300,000 pounds or more and B757 account for approximately 27 percent of operations. These are categorized as aircraft class D. The mix index is estimated to be approximately 154.

- **Percent Arrivals**. Percent of arrivals is estimated to be 50 percent of the total operations.

- **Percent Touch-and-Go's**. There is negligible touch-and-go operation at LAX. The touch-and-go factor (T) is 1 for both VFR and IFR operations.

- **Location of Exit Taxiways**. The distance from the threshold at the approach end of the runway to the exit taxiways are measured for each runway configuration. The exit factor (E) is determined from the figure identified for each runway configuration.

The hourly capacity base (C*) is determined from the figure identified for each runway configuration based on the mix index and percent arrivals. The hourly capacity is estimated as follows:

- $\text{Hourly Capacity of the Runway Component} = C^* \times T \times E$

The weighted hourly capacities (C_w) for Sensitivity Tests 1 through 3 are calculated by the percent of time each runway configuration is in use and the corresponding hourly capacities.

The annual service volume (ASV) is calculated using the daily (D) and hourly (H) demand ratios described above. The formula used to calculate ASV is:

- $ASV = C_w \times D \times H$

Sensitivity Test 4 – SPAS

The SPAS Final Report January 2013, includes airside simulation for four alternative airfield configurations using the 2025 design day flight schedule. All of the alternatives are based on the four-runway system. The all-weather average peak hour throughput is between 133 to 135 operations.[6] SIMMOD was used for the airside simulation analysis under the SPAS.

Sensitivity Test 5 – 2004 Master Plan

The peak hour throughput for four-runway system represented by Alternative D in the LAX Master Plan is 144 operations for VFR Visual West Flow, 135 operations for VFR ILS West Flow and VFR East Flow, 131 operations for IFR West Flow, 141 operations for all weather average by 2015.[7] These peak hour throughputs are the results of detailed airside simulations in the SIMMOD model carried out under the LAX Master Plan study.

Sensitivity Test 6 – FAA Airport Capacity Benchmark Report 2004

The FAA Airport Capacity Benchmark Report 2004 (CB Report) indicates that the capacity benchmark for LAX is 137 to 148 flights per hour in optimum weather for the current and most commonly used runway configuration. The benchmark rate decreases to 126 to 132 flights per hour in marginal conditions, and to 117 to 124 flights per hour in IFR conditions. Throughput may be less when ceiling and visibility are low, or if other runway configurations are used. These benchmark rates do not always represent balanced operations. It also mentions that planned technological improvements at LAX would increase the benchmark rate to 173 flights per hour for optimum and marginal conditions, and 128 flights per hour for IFR conditions. Planned technological improvements include: Cockpit Display of Traffic Information (CDTI) -Enhanced Flight Rules (CEFR), which allows suitably equipped aircraft to maintain visual separation from other aircraft and continue visual approaches even in marginal weather conditions; and advanced Traffic Management Advisor (TMA) / Area Navigation (RNAV) to improve delivery accuracy and help LAX consistently utilize their available capacity.[8] FAA indicated in the Airport Capacity Benchmark Report that their information should serve as a reference only and subject to detailed analysis.

Similarly, the weighted hourly capacities for Sensitivity Tests 4 to 6 are calculated by the percent of time each runway configuration is in use and the corresponding hourly capacities. The annual service volume (ASV) is calculated from the same daily (D) and hourly (H) demand ratios.

Table 3 summarizes the assumptions for the airfield capacity analysis, the weighted hourly capacity, and the ASV for the six sensitivity tests.

The estimated hourly capacity for LAX is approximately 135 to 149 operations.

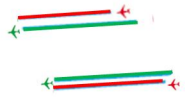
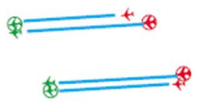
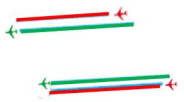
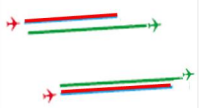
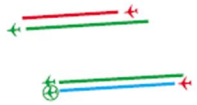
The ASV ranges from 724,200 to 802,500 operations per year.

[6] LAX Specific Planning Amendment Study Final Report, January 2013; Appendix F-2 Tables 10 and 12, Corrected Tables 14 and 16.

[7] LAX Master Plan, April 2004, Tables E-6 and E-7.

[8] Airport Capacity Benchmark Report 2004, FAA.

Table 3: Summary of Airfield Analysis for LAX – Estimated Hourly Capacity and ASV

Capacity Element		VFR VISUAL WEST FLOW		VFR ILS West FLOW		VFR ILS East Flow		IFR West FLOW
Arrival		Rwy 24R, 25L Arrivals Rwy 24L, 25R Departures	All Rwy mixed mode	Rwy 24R, 25L Arrivals Rwy 24L, 25R Departures	Rwy 24R, 25L Mixed Rwy 24L, 25R Departures	Rwy 6L, 7R Arrivals Rwy 6R, 7L Departures	Rwy 6L, 7R Mixed Rwy 6R, 7L Departures	Rwy 24R Arrivals Rwy 24L, 25R Departures Rwy 25L Mixed
Departure Mixed Denotes Occasional Use								
Configuration Utilization	Sensitivity Test 1	55.4%	13.8%	24.6%		2.1%		4.1%
	Sensitivity Test 2	62.3%	6.9%	24.6%		2.1%		4.1%
	Sensitivity Test 3	69.2%	0.0%	24.6%		2.1%		4.1%
	Sensitivity Tests 4, 5, & 6	69.2%		24.6%		2.1%		4.1%
Aircraft Mix Index (C+3D)		121 to 180						
Exit Range (feet)		5,500 to 7,500						
No. of Exits (N) within range		2	2	2	2	2	2	2
Exit Factor (E)		0.97	0.97	0.97	0.97	0.97	0.97	1
Arrival %		50%						
Hourly Capacity (FAA AC) Sensitivity Tests 1 to 3		145	184	145	145	145	145	120
Hourly Capacity (SPAS) Sensitivity Test 4		135		136		133		125
Hourly Capacity (2004 Master Plan) Sensitivity Test 5		144		135		135		131
Hourly Capacity (Airport Capacity Benchmark Report) Sensitivity Test 6		137 to 148		126 to 132		137 to 148		117 to 124
Weighted Hourly Capacity (Cw)	Sensitivity Test 1	149						
	Sensitivity Test 2	147						
	Sensitivity Test 3	144						
	Sensitivity Test 4 (SPAS)	135						
	Sensitivity Test 5 (2004 MP)	141						
	Sensitivity Test 6 (CB Rpt)	138						
		Estimated Hourly Capacity: 135 to 149						
Annual Service Volume (ASV)	Sensitivity Test 1	802,500						
	Sensitivity Test 2	788,000						
	Sensitivity Test 3	773,500						
	Sensitivity Test 4 (SPAS)	724,200						
	Sensitivity Test 5 (2004 MP)	757,900						
	Sensitivity Test 6 (CB Rpt)	742,900						
		Estimated ASV: 724,200 to 802,500						

Source: LAX Specific Planning Amendment Study Final Report, January 2013; LAX Master Plan, April 2004. Airport Capacity Benchmark Report 2004, FAA; and AECOM analysis.

Maximum Annual Passenger Volume

The annual passenger volume is estimated from the range of ASV as shown in **Table 4**. Three scenarios were considered:

- Scenario 1: The mix of operations for scheduled, commuter, and charter carriers assumes the historical annual pattern (see **Figure 6**). The average passengers per aircraft was based on the historical average seat capacity and load factor for each category of carriers (see **Table 1**).
- Scenario 2: The mix of operations for scheduled, commuter, and charter carriers follows the historical pattern in the peak month, July (see **Figure 7**). The average passengers per aircraft is the same as Scenario 1.
- Scenario 3: The mix of operations is the maximum of Scenarios 1 and 2. The load factor is increased to 85 percent. This represents the high scenario.

Table 4: Summary of Airfield Analysis for LAX – Estimated Annual Passenger Volume

		Scenario 1	Scenario 2	Scenario 3
Mix of Operations	Scheduled Carriers	77.9%	78.7%	78.7%
	Commuter Carriers	13.0%	12.9%	13.0%
	Charter Carriers	0.1%	0.04%	0.1%
	Total Commercial	91.0%	91.64%	91.8%
Average Passengers per Operations	Scheduled Carriers	142	142	147
	Commuter Carriers	29	29	35
	Charter Carriers	63	63	89
Estimated Annual Passenger Volume	SensitivityTest 1	91,839,000	92,697,000	96,579,000
	SensitivityTest 2	90,180,000	91,022,000	94,834,000
	SensitivityTest 3	88,520,000	89,348,000	93,089,000
	Sensitivity Test 4 (SPAS)	82,878,000	83,653,000	87,156,000
	Sensitivity Test 5 (2004 MP)	86,735,000	87,546,000	91,212,000
	Sensitivity Test 6 (CB Rpt)	85,018,000	85,813,000	89,407,000
Estimated Maximum Annual Passenger Volume		Estimated Airfield Capacity: 82.9 to 96.6 MAP		

Source: AECOM analysis.

It should be noted that these maximum passenger volumes are very dependent on 1) the size of aircraft (e.g. number of seats) and 2) load factors. Changes in these elements will have a direct impact on the estimated annual passenger volume for the airfield.

In summary, the maximum airfield capacity is estimated to be approximately **82.9 MAP**, which is based on Sensitivity Test 4 with SPAS assumptions, to **96.6 MAP** based on Sensitivity Test 1.

3.1.4 LAX Gate Capacity Analysis

The purpose of the gate capacity analysis is to investigate whether the capacity of the LAX terminal gates will be the constraint for the ultimate capacity of the airport. Recent studies, including the SCAG RTP and the LAX SPAS, are based on the limit of 153 gates at LAX due to the Settlement Agreement. However, this gate capacity analysis focuses on the physical and operational constraints instead of the legal constraint and includes a scenario with more than 153 gates.

The maximum number of operations (departures and arrivals) per gate for different Airplane Design Groups (ADGs) is summarized in **Table 5**.

Table 5: Number of operations per Gate at LAX

Item	ADG I/II	ADG III	ADG IV	ADG V	ADG VI
No. of Daily Operations per gate	16	16	12	10	10

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

The assumptions on average seat capacities for different ADGs are given in **Table 6**.

Table 6: Average Seat Capacities at LAX

Item	ADG I/II	ADG III	ADG IV	ADG V	ADG VI
Average Seat per Aircraft (Seat Capacity)	49	142	191	299	458

Source: U.S. DOT T-100 database 2013. AECOM analysis; and meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

The average load factor is estimated to be between 80 to 82 percent as noted in SPAS. The adopted load factor for this analysis was 81.3 percent.

The distribution of gates by terminal and ADG based on Alternatives 1 to 4 in the SPAS are summarized in Tables 7 to 12. Scenarios with and without multiple aircraft ramp system (MARS) are included.

Table 7: Distribution of Gates by Terminal and ADG at LAX – SPAS Alternatives 1 & 2 Layout (With MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Total Gates
Terminal 0		6	1			7
Terminal 1		9	3			12
Terminal 2			2	6		8
Terminal 3			2	6		8
Terminal 4		3	6	4		13
Terminal 5			11	2		13
Terminal 6			11	2		13
Terminal 7		3	6	3		12
Terminal 8	4	5				9
Commuter Positions	10					10
Midfield Satellite Concourse			20	7	2	29
TBIT		1	1	11	6	19
Total	**14**	**27**	**63**	**41**	**8**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

Table 8: Distribution of Gates by Terminal and ADG at LAX - SPAS Alternatives 1 & 2 Layout (Without MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Closed	Total Gates
Terminal 0		6	1				7
Terminal 1		9	3				12
Terminal 2			2	6			8
Terminal 3			2	6			8
Terminal 4		1	5	4		3	13
Terminal 5			10	2		1	13
Terminal 6			10	2		1	13
Terminal 7		1	6	4		1	12
Terminal 8	4	5					9
Commuter Positions	10						10
Midfield Satellite Concourse			1	19	2	7	29
TBIT		1	1	8	8	1	19
Total	**14**	**23**	**41**	**51**	**10**	**14**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

Table 9: Distribution of Gates by Terminal and ADG at LAX - SPAS Alternative 3 Layout (With MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Total Gates
Terminal 1						0
Terminal 2						0
Terminal 3						0
Terminal 4		3	6	4		13
Terminal 5			11	2		13
Terminal 6			11	2		13
Terminal 7		3	6	3		12
Terminal 8		8				8
Commuter Positions	23					23
Midfield Satellite Concourse		5	27	1		33
North Linear Terminal		5	15			20
TBIT		1	8	4	5	18
Total	**23**	**25**	**84**	**16**	**5**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

Table 10: Distribution of Gates by Terminal and ADG at LAX - SPAS Alternative 3 Layout (Without MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Closed	Total Gates
Terminal 1							0
Terminal 2							0
Terminal 3							0
Terminal 4		1	5	4		3	13
Terminal 5			10	2		1	13
Terminal 6			10	2		1	13
Terminal 7		1	6	4		1	12
Terminal 8		8					8
Commuter Positions	23						23
Midfield Satellite Concourse			2	18	2	11	33
North Linear Terminal			1	12		7	20
TBIT		1		5	8	4	18
Total	**23**	**11**	**34**	**47**	**10**	**28**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

Table 11: Distribution of Gates by Terminal and ADG at LAX - SPAS Alternative 4 Layout (With MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Total Gates
Terminal 1		11	3			14
Terminal 2		3	4	3		10
Terminal 3		7	3	2		12
Terminal 4		3	6	4		13
Terminal 5			11	2		13
Terminal 6			11	2		13
Terminal 7		3	6	3		12
Terminal 8	4	5				9
Commuter Positions	10					10
Midfield Satellite Concourse			19	8	2	29
TBIT		3		9	6	18
Total	**14**	**35**	**63**	**33**	**8**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

Table 12: Distribution of Gates by Terminal and ADG at LAX - SPAS Alternative 4 Layout (Without MARS Positions)

Terminals	ADG I/II	ADG III	ADG IV	ADG V	ADG VI	Closed	Total Gates
Terminal 1		11	3				14
Terminal 2			1	7		2	10
Terminal 3		5	2	3		2	12
Terminal 4		1	5	4		3	13
Terminal 5			10	2		1	13
Terminal 6			10	2		1	13
Terminal 7		1	6	4		1	12
Terminal 8	4	5					9
Commuter Positions	10						10
Midfield Satellite Concourse			1	20	2	6	29
TBIT		3		5	9	1	18
Total	**14**	**26**	**38**	**47**	**11**	**17**	**153**

Source: Meetings with Los Angeles World Airports (LAWA), October 2014 to January 2015.

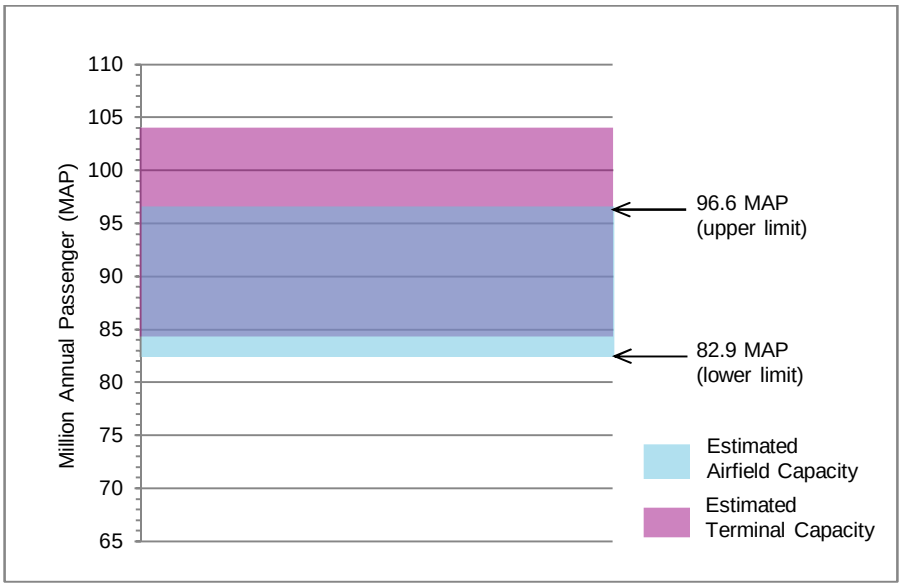
The maximum daily gate capacity is estimated from the different gate distributions (see **Tables 7 to 12**), maximum operations per gate, average seat capacities, and load factor. The daily capacity is converted to the annual capacity with the daily demand ratio 'D' described above.

In summary, the maximum gate capacity is approximately **85 to 104 MAP** ($\sum(Table\ 5\ \times Table\ 6\ \times Table\ 7) \times Load\ Factor\ \times D$) based on the SPAS Alternatives 1 and 2 with MARS positions.

3.1.5 LAX Overall Airport Capacity

The overall/ultimate airport capacity is obtained by combining the scenarios for the airfield and the gate arrangement. The overall capacity for LAX is approximately **82.9 to 96.6 MAP** with airfield capacity representing the constraining factors (**Figure 9**).

Figure 9: LAX Overall Airport Capacity



3.2 John Wayne Airport (SNA)

SNA is owned by the County of Orange and is operated as a self-supporting enterprise. SNA served over nine million passengers in 2014 and reaches more than 20 nonstop destinations in the United States, Mexico, and Canada. It is the only commercial airport in Orange County and one of the two airports in Orange County to accommodate general aviation. It is served by two fixed based operators and is home to more than 400 general aviation aircraft.

3.2.1 Background on the Settlement Agreement and the associated Capacity Limit

A Federal court settlement was signed in 1985 by the County of Orange, the City of Newport Beach, the Airport Working Group (AWG), and Stop Polluting Our Newport (SPON) to formalize the consensus reached between the County of Orange and the local communities on the nature and extent of airport improvements and defined operational and capacity limitations on those improvements. The 2003 Amendment of the 1985 Agreement allowed SNA to increase passenger levels to 10.3 MAP (through December 31, 2010) and then to 10.8 MAP (through December 31, 2015) with a maximum of 85 flights per day. In addition, the amendment allowed for the addition of new Jet bridges (not to exceed 20 total).[9]

Since early 2012, the four signatories of the 1985 Settlement Agreement have been discussing a second extension of the Settlement Agreement. The parties have reached agreement on the definition of a "Proposed Project" and project alternatives to be analyzed pursuant to the California Environmental Quality Act (CEQA). In order to ensure that the types of noise and access restrictions established by the 1985 Settlement Agreement remain grandfathered under the Airport Noise and Capacity Act of 1990, the Proposed Project included in the Draft Environmental Impact Report (DEIR), issued May 2014, contemplates an amendment to the 1985 Settlement Agreement that does not further “reduce or limit aircraft operations or affect aircraft safety.” According to the DEIR, the Proposed Project would extend the term of the Settlement Agreement through December 31, 2030. It would gradually increase the number of regulated Class A commercial Average Daily Departures (ADDs) [10] and the number of passenger departing and arriving annually. The maximum allowable is 12.5 MAP and 95 Class A ADDs in the 2026 through 2030, subject to conditions described in the DEIR.[11]

The Proposed Project under the DEIR also assumed no additional passenger loading bridges would be allowed through December 31, 2020.[12] Should additional gates or modifications to any airport facilities be proposed at a subsequent time, separate environmental study in compliance to relevant regulations and environmental statutory would be required.

The Final EIR and the Settlement Agreement Amendment were approved by the Orange County Board of Supervisors on September 30, 2014.

The legal constraints from the Settlement Agreement at SNA serve as reference information only for this capacity study. The capacity analysis described below focuses on the physically capability of SNA in accommodating the operation and passenger forecasts.

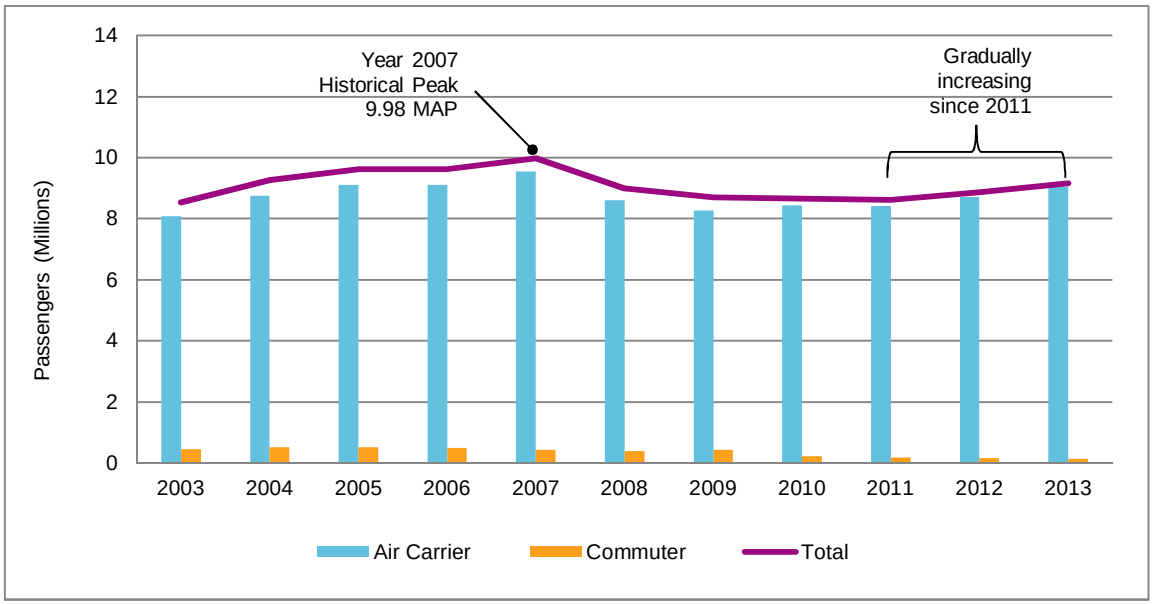
[9] Regional Transportation Plan 2012-2035, Aviation and Airport Ground Access, SCAG April 2012
[10] The ADDs at SNA were divided into three “classes” based on the noise characteristics of departing aircraft. The Class A flights are the noisiest. The next quietest class of ADDs was designated as Class AA. The quietest class is Class E. The Class E flights do not have a maximum number of flights allowed because they are below the regulatory noise levels established in EIR 508 (i.e., 86.0 dB SENEL).
[11] John Wayne Airport Settlement Agreement Amendment, Environmental Impact Report, Draft May 2014
[12] Ibid

3.2.2 Summary of SNA Historical Data

SNA Historical Passenger Volume

Total passengers through SNA peaked in 2007, at nearly 9.98 MAP. Since 2007, annual passenger volume tapered to 8.61 MAP in 2011, where it then increased to 9.23 MAP in 2013, and 9.39 MAP in 2014. Historical data is presented in **Figure 10**.

Figure 10: SNA Historical Annual Passengers

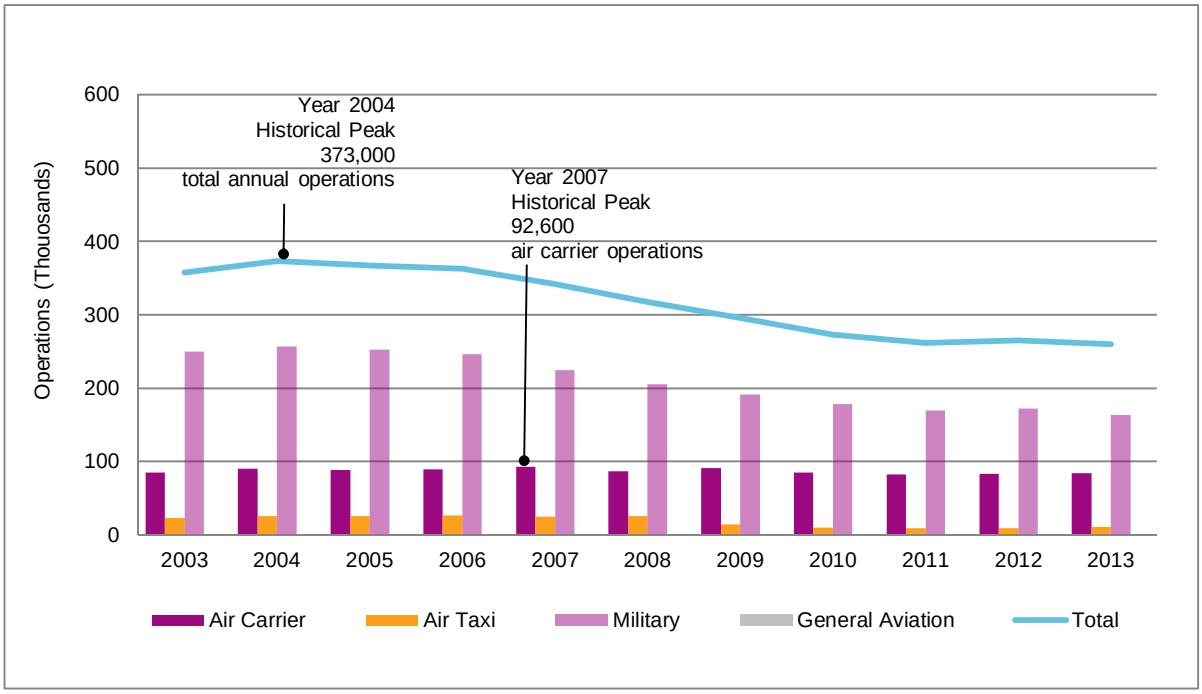


Source: John Wayne Airport Settlement Agreement Amendment EIR, April 2014.

SNA Historical Operations

Air carrier operations in SNA have fluctuated within an approximately 10,000 operation range since 2003, with the low experienced in 2011 (82,425 air carrier operations) and the high experienced in 2007 (92,601 air carrier operations). It is noted that 2013 passenger levels of 9.23 MAP is very close to the 2004 levels of 9.27 MAP; however, due to increased load factors and fleet mix size, air carrier operations are over 5,000 less in 2013 than in 2004. Commuter and general aviation operations have significantly declined at SNA in recent years. **Figure 11** presents the historical operations data for SNA.

Figure 11: SNA Historical Annual Aircraft Operations



Source: John Wayne Airport Settlement Agreement Amendment EIR, April 2014.

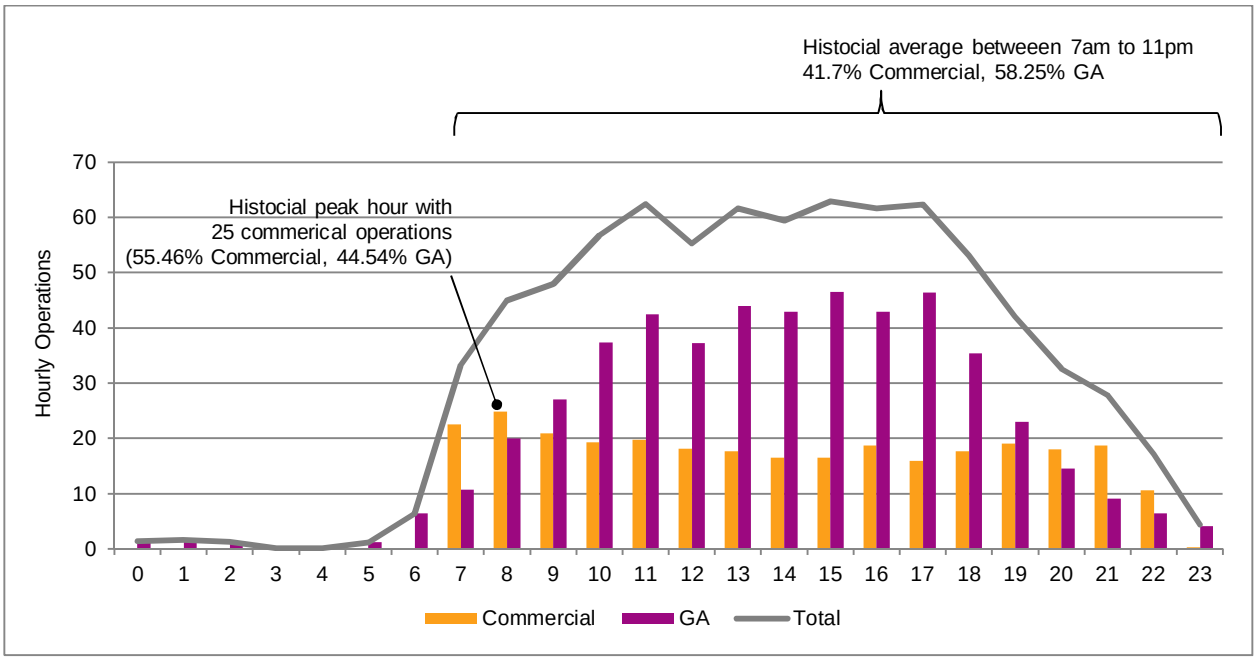
SNA Peak Month, Design Day and Peak Hour

August is historically the peak month for SNA. With reference to the Settlement Agreement Amendment EIR, the peak month passengers have ranged from 9.2 to 9.9 percent of the annual total and have averaged 9.4 percent of annual passengers over the past decade. The commercial operations in the peak month constitute approximately 8.7 percent of the total annual operations on average. In view of SNA's facilities and role in the regional aviation system, it is anticipated that the nature of the current traffic patterns (i.e. mix of short, medium, and long haul stage lengths) will be similar in future years and that historical data thus serves a reasonable guide to future years hourly passenger patterns.[13]

Historical hourly operation profile for the peak month in the historical highest MAP, i.e. August 2007, is analyzed. The average hourly commercial and general aviation operations are presented in **Figure 12**.

[13] John Wayne Airport Settlement Agreement Amendment, Environmental Impact Report, Draft May 2014.

Figure 12: SNA Historical Annual Aircraft Operations



Source: John Wayne Airport Settlement Agreement Amendment EIR, April 2014; and AECOM analysis.

Based on the historical data between 2009 and 2013, the following demand ratios were estimated for SNA:

- **Daily Demand Ratio (D)** - the ratio of annual demand (aircraft operations) to average daily demand during the peak month and for SNA. D is estimated to be approximately 357.

- **Hourly Demand Ratio (H)** - the ratio of average daily demand to average peak hour demand during the peak month and for SNA. H is estimated to be approximately 12.2.

SNA Fleet Mix, Load Factor, and Seat Capacity

The characteristics of the fleet mix, load factors, and average seat capacity for the airlines operating at SNA were analyzed and included in **Appendix A**. **Table 13** presents a summary according to different aircraft categories including passenger flights such as commercial carrier, commuter carrier, and other non-passenger flights.

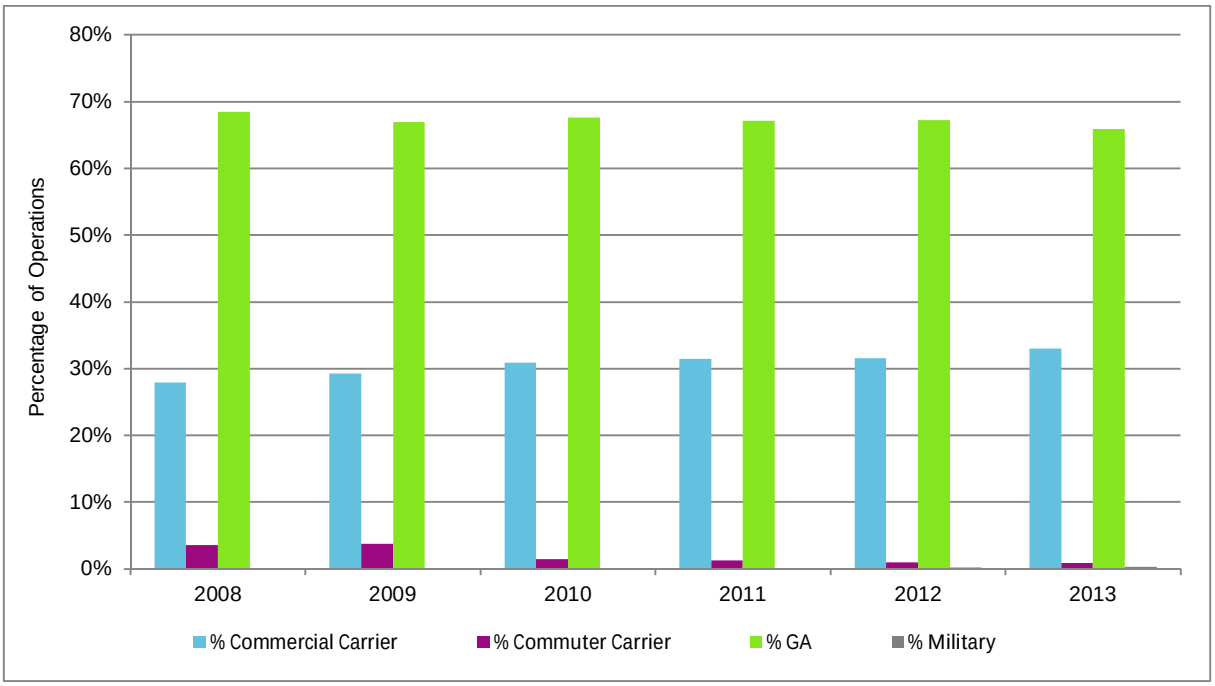
Table 13: SNA Load Factor and Seat Capacity by Categories, 2013

Aircraft Category	Load Factor	Average Seat Capacity	No. of Operations Recorded
Commercial Carriers	79.2%	143	80,776
Commuter Carriers	66.4%	43	2,174
Other non-passenger flights	N/A	N/A	716
Total (Commercial Operations)			**83,666**

Source: U.S. DOT T100 Database 2013; AECOM analysis.
Notes: 1. Commercial carriers include aircraft with passenger services and more than 70 seats.
2. Commuters are scheduled passenger services with less than or equal to 70 seats.
3. SNA specific definition refers to http://www.ocair.com/newsroom/news/airportstats.aspx.

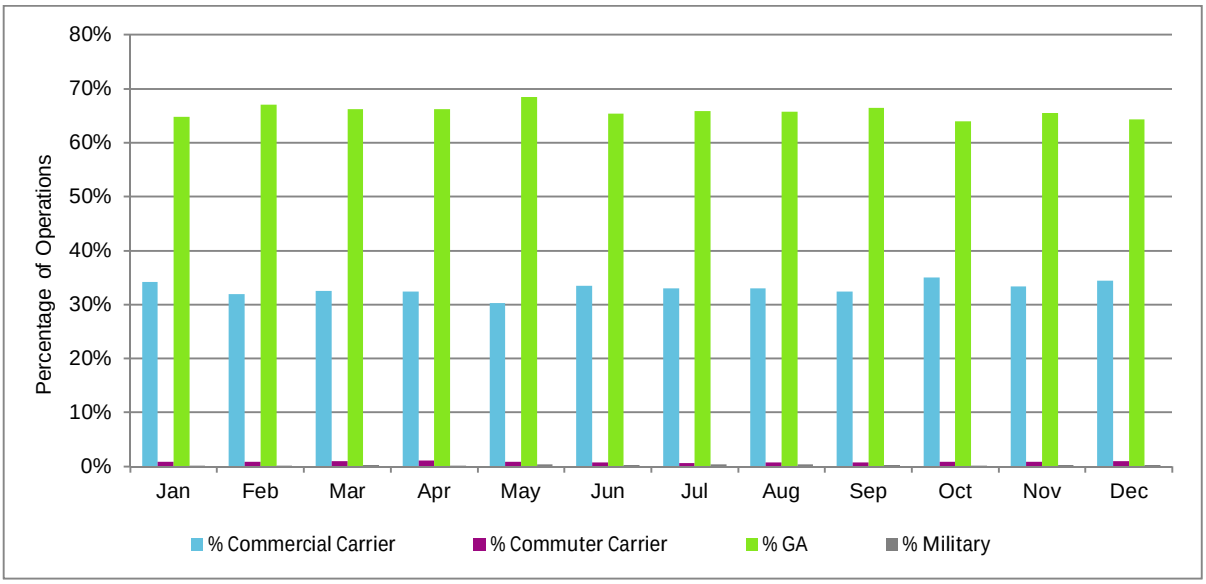
The historical proportion of commercial operations at SNA are presented in **Figures 13** and **14**. **Figure 13** summarizes the percentages from 2008 to 2013. **Figure 14** summarizes the monthly totals in 2013.

Figure 13: SNA Percentage of Operations (2008 to 2013)



Source: John Wayne Airport (http://www.ocair.com/newsroom/news/airportstats.aspx); and AECOM analysis.

Figure 14: SNA Percentage of Operations (Jan to Dec 2013)



Source: John Wayne Airport (http://www.ocair.com/newsroom/news/airportstats.aspx); and AECOM analysis.

3.2.3 SNA Airfield Capacity Analysis

Description of the Runway Operating Configurations

The existing runway system at SNA consists of two parallel runways: the primary Runway 2L/20R is 5,701 feet long while the secondary Runway 2R-20L is only 2,887 feet long. The secondary Runway is not equipped for instrument approach procedures. The centerlines of the runways are separated by 500 feet and does not allow for operation of simultaneous arrivals and departures under VFR. The short secondary runway offers some operational benefits for smaller aircraft that enhances capacity under VFR conditions. During periods of IFR, operations at SNA are basically limited to the primary runway on which the airlines operate.

Peak Hour Throughput and Annual Service Volume (ASV)

The hourly runway capacity during VFR and IFR conditions and ASV derived in accordance with the FAA AC 150/5060-5 and the methodology described previously is given in **Table 14**.

Three sensitivity tests are included in the analysis based on different percentages of VFR and IFR conditions. Sensitivity Test 1 assumes most of time (95 percent) is in VFR condition. Sensitivity Test 2 assumes 70 percent of time is in VFR condition. Sensitivity Test 3 is estimated from FAA Air Traffic Activity System (ATADS) data between 2003 and 2013, and assumes 52.8 percent of time in VFR condition.

Table 14: Summary of Airfield Analysis for SNA – Estimated Hourly Capacity and ASV

Capacity Element		VFR	IFR
		Separation between Runway 2L-20R and 1R-19L < 700 feet. No simultaneous operations	Single Runway 2L-20R
Configuration Utilization	SensitivityTest 1	95%	5%
	SensitivityTest 2	70%	30%
	SensitivityTest 3	52.8%	47.2%
Aircraft Mix Index (C+3D)		41	104
Touch-and-go Factor (T)		1.2	1
Exit Range (feet)		3,000 to 5,500	
No. of Exits (N) within range		1	1
Exit Factor (E)		0.84	0.86
Arrival %		50%	
Hourly Capacity (FAA AC)		66	45
Weighted Hourly Capacity (Cw)	SensitivityTest 1	64.95	Estimated Hourly Capacity: 56 to 65
	SensitivityTest 2	59.7	
	SensitivityTest 3	56.09	
Annual Service Volume (ASV)	SensitivityTest 1	283,000	Estimated ASV: 244,400 to 283,000
	SensitivityTest 2	260,100	
	SensitivityTest 3	244,400	

Source: John Wayne Airport Settlement Agreement Amendment EIR, April 2014; and AECOM analysis.

Maximum Annual Passenger Volume

The annual passenger volume is estimated from the range of ASV as shown in **Table 15**. Three scenarios were conducted:

- Scenario 1: The mix of operations for commercial and commuter carriers assumes the historical pattern in December 2013 (see Figure 14). The average passengers per aircraft was based on the historical average seat capacity and load factor for each category of carriers (see Table 13).
- Scenario 2: The mix of operations for commercial and commuter carriers follows the historical average between 7am and 11pm on an average day of the peak month given in the Settlement Agreement Amendment EIR (see Figure 12). The average passenger per aircraft is the same as Scenario 1.
- Scenario 3: The mix of operations for commercial and commuter carriers follows the historical record at the peak hour on an average day of the peak month given in the Settlement Agreement Amendment EIR (see Figure 12). The load factor was increased to 85 percent. This represents the high scenario.

Table 15: Summary of Airfield Analysis for SNA – Estimated Annual Passenger Volume

		Scenario 1	Scenario 2	Scenario 3
Mix of Operations	Commercial Carriers	34.39%	40.59%	53.99%
	Commuter Carriers	0.96%	1.11%	1.47%
	Total Commercial	35.35%	41.70%	55.46%
Average Passengers per Operations	Commercial Carriers	113	113	122
	Commuter Carriers	29	29	37
Estimated Maximum Annual Passengers	SensitivityTest 1	11,104,000	13,104,000	18,724,000
	SensitivityTest 2	10,206,000	12,044,000	17,209,000
	SensitivityTest 3	9,590,000	11,317,000	16,170,000
Estimated Maximum Annual Passenger Volume		Estimated Airfield Capacity: 9.6 to 18.7 MAP		

Source: AECOM analysis.

It should be noted that these maximum passenger volumes are very dependent on 1) the size of aircraft (e.g. number of seats) and 2) load factors. Changes in these elements will have a direct impact on the estimated annual passenger volume for the airfield.

In summary, the potential maximum airfield capacity for SNA is estimated to be approximately **9.6 to 18.7 MAP**. However, as noted above, in 2007, SNA accommodated almost 10 MAP, so the lower end of this range is not a plausible capacity limit.

3.2.4 SNA Gate Capacity Analysis

The existing SNA terminal includes twenty air carrier gates (Gates 2 to 21) with passenger loading bridges and six ground loading gates (Gates 1A, 1B, 1C, 22a, 22B and 22C) for commuter aircraft. For the twenty gates with passenger loading bridges, thirteen of them are ADG IV gates designed to accommodate the B757, and seven are ADG III gates. The existing terminal layout is shown in **Exhibit 1**.

Exhibit 1: SNA Existing Terminal Layout

Source: Google Earth, Imagery Date: April 2013

The maximum number of operations (departures and arrivals) per gate for different Airplane Design Groups (ADGs) is summarized in **Table 16**.

Table 16: Number of operations per Gate at SNA

Item	ADG I/II	ADG III	ADG IV
No. of Daily Operations per gate	16	16	10

Source: Meetings with SNA; AECOM analysis.

The assumptions on average seat capacities for different ADGs are given in **Table 17**. Seat capacity for ADG II is based on CRJ-700; ADG III is based on the new B737 MAX 8 dual class arrangement[14]; ADG IV is based on B757.

Table 17: Average Seat Capacities at SNA

Item	ADG I/II	ADG III	ADG IV
Average Seat per Aircraft (Seat Capacity)	66	162	185

Source: Meetings with SNA; AECOM analysis.

[14] Boeing Aircraft Compatibility Brochure – 737 MAX, March 2014.

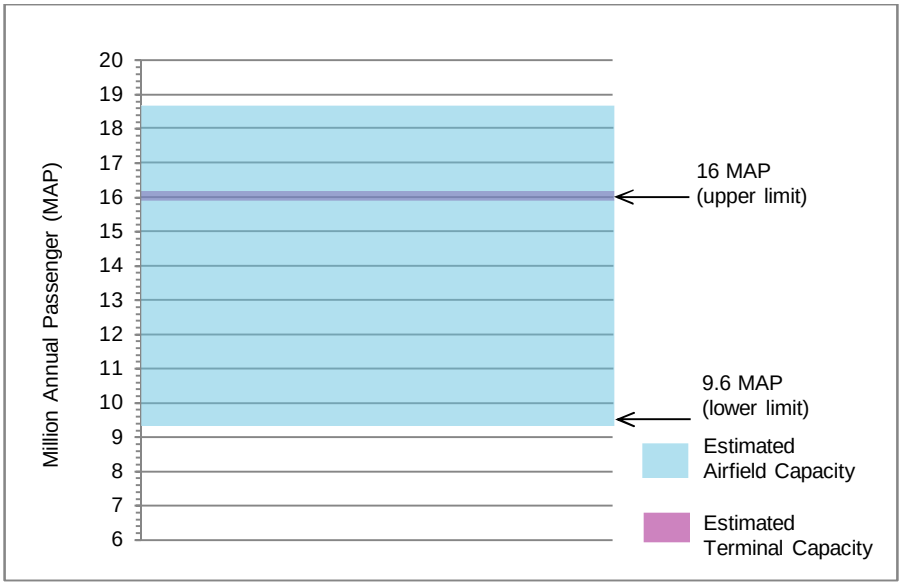
The average load factor is assumed to be 85 percent[15] in the gate analysis.

Based on these assumptions, the existing twenty passenger boarding bridge gates and six commuter ground loading gates would have a maximum throughput of approximately **16 MAP**
($\sum\ (Table\ 11\ \times Table\ 12\ \times Number\ of\ Gates\ for\ each\ ADG)\ \times Load\ Factor\ \times D$).

3.2.5 SNA Overall Airport Capacity

The overall/ultimate airport capacity is obtained by combining the scenarios for the airfield and the gate arrangement. The overall capacity for SNA is approximately **9.6 to 16 MAP** with the airfield capacity representing the constrained factor on the lower limit and terminal capacity representing the upper limit (**Figure 15**). However, as noted above, in 2007, SNA accommodated almost 10 MAP, so the lower end of this range is not a plausible capacity limit.

Figure 15: SNA Overall Airport Capacity



[15] FAA Aerospace Forecast 2014 to 2034 estimated the future load factor for domestic commercial air carrier to be 84.7 percent by 2034.

3.3 Burbank Bob Hope Airport (BUR)

BUR in Burbank is a very convenient airport for its local service area comprising the cities of Burbank, Glendale, and Pasadena, with good access to and from Los Angeles and the San Fernando Valley. Scheduled service is provided by Alaska Airlines, Delta Air Lines, jetBlue Airways, Southwest Airlines, United Airlines, SeaPort Airlines, and US Airways[16], with frequent schedules along the west coast and connecting flights across the entire country.

The airport was privately owned and operated as a commercial service airport until 1978, when it was purchased by the Burbank-Glendale-Pasadena Airport Authority (the Authority), a public agency.

In 2014, there were 118,500 total annual operations and 3.9 million total passengers.

3.3.1 Background on Development Agreement, Noise Protection, and the associated Capacity Limit

The Authority and the City of Burbank in February 2005 concluded an agreement aimed at charting a course for airport facilities and nighttime noise abatement efforts. As part of the original development agreement, the Authority agreed to not seek expansion of the existing airport terminal, add additional aircraft parking gates, or construct a new terminal. In exchange, the City of Burbank agreed to maintain existing City rules and regulations, including zoning and governing development at the airport.[17]

The development agreement, including the prohibition on expanding the existing terminal, was effective until June 2012. The prohibition against initiating any planning process for a new terminal extended until March 2015. There are ongoing discussions on exploring options when the development agreement expires and on ways to establish a consensus between the Authority and the City of Burbank for joint planning for the future of BUR and its surrounding area. [18]

The location of the existing terminal does not meet current FAA safety standards, and the FAA has strongly recommended that the BUR relocate the terminal to a location farther from the runways and taxiways. [19] Based on the information gathered in the meeting with BUR in October 2014, a potential replacement terminal would have the same number of gates (14) as the existing terminal and very likely to serve the same fleet. However, there has been considerable public opposition to the replacement terminal and the various parties involved in the issue are currently at a stalemate.

There is a voluntary nighttime curfew restricting scheduled airlines departures or arrivals between 10pm and 7am at BUR. This voluntary curfew does not apply to general aviation aircraft. In 2009, the FAA rejected the Airport's Part 161 application for a mandatory nighttime curfew.

The SCAG's 2001 RTP estimated the capacity for BUR at 9.4 MAP based on terminal gate capacity. The 2004 RTP increased BUR's physical capacity to 10.7 MAP based on the assumption of three new remote terminal gates. However, the terminal gate capacity was lowered to 9.4 MAP in the 2008 RTP since the BUR airport staff determined that the remote aircraft parking gates assumed in the 2004 RTP were no longer available for aviation uses.[20]

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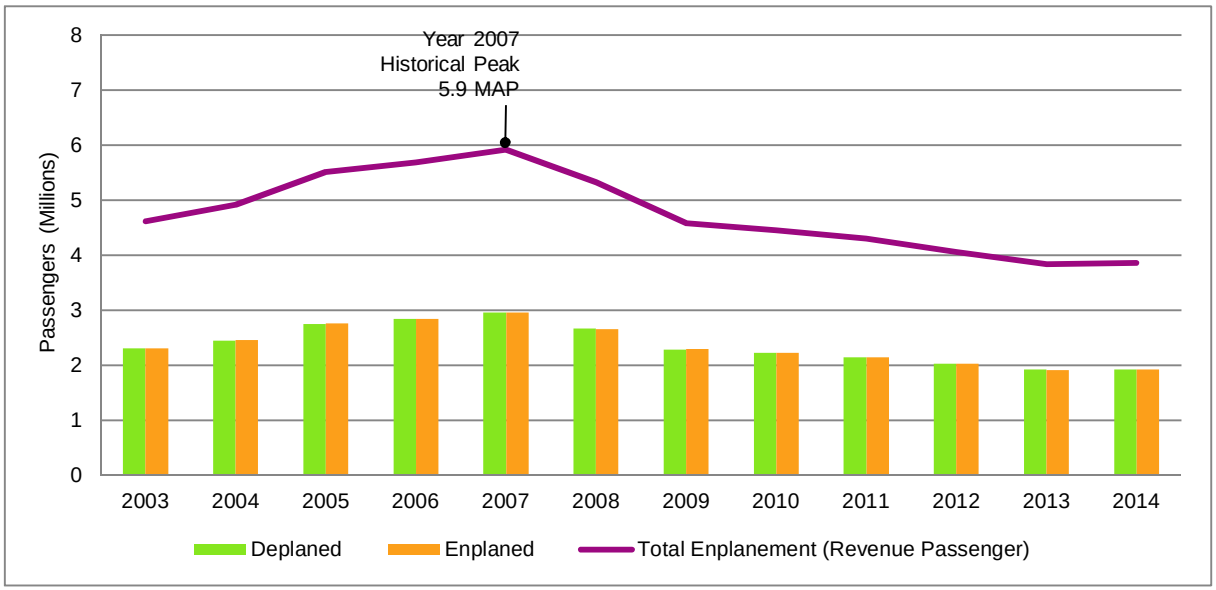
[16] Burbank Bob Hope Airport (http://www.burbankairport.com/airlinesflights/airlines.html), accessed April 2015.
[17] Burbank Bob Hope Airport (http://www.burbankairport.com/airportauthority/airport-authority/reports-a-meetings.html), accessed April 2015.
[18] Ibid.
[19] Ibid.
[20] 2008 Regional Transportation Plan: Aviation and Airport Ground Access Report, SCAG.

3.3.2 Summary of BUR Historical Data

BUR Historical Passenger Volume

Total passengers through BUR peaked in 2007, at over 5.9 MAP. Since 2007, annual passenger volume tapered to 3.84 MAP in 2013, where it then increased slightly to 3.86 MAP in 2014. **Figure 16** presents the annual passenger volumes from 2003 to 2014.

Figure 16: BUR Historical Annual Passengers

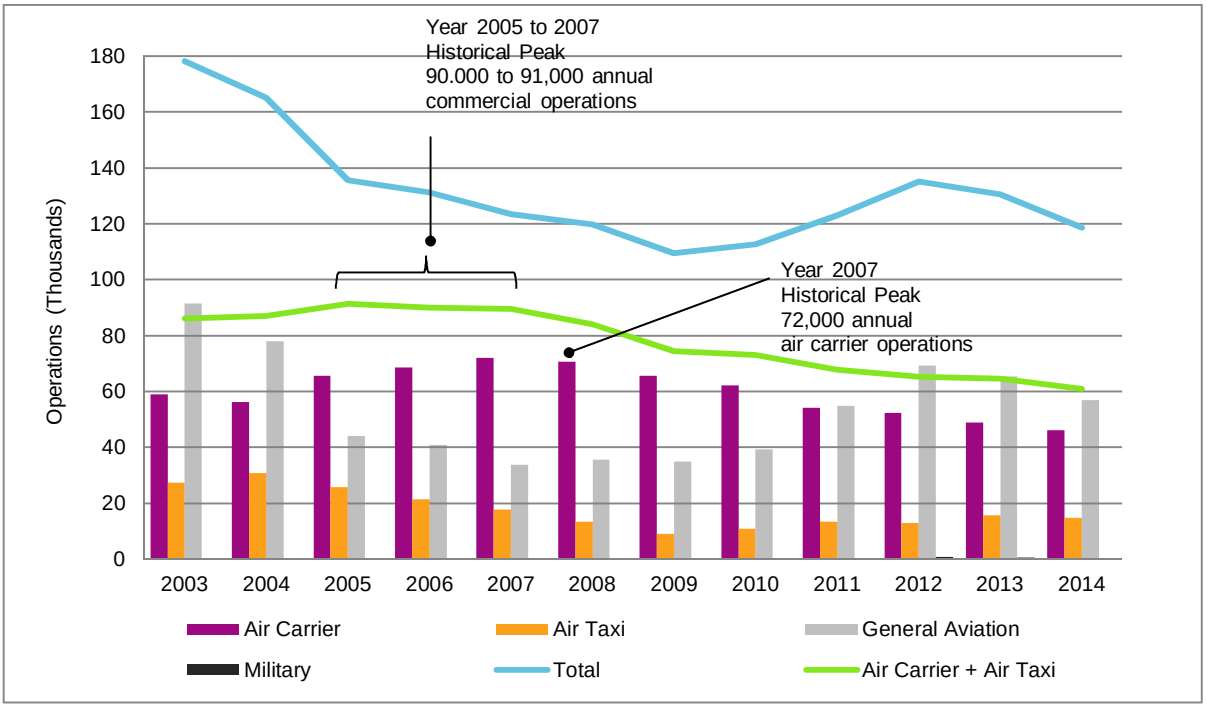


Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html.

BUR Historical Operations

Air carrier operations in BUR have decreased continuously from the peak 72,000 in 2007 to 46,000 in 2014. The combined air carrier and air taxi operations peaked during the period between 2005 and 2007 with 90,000 to 91,000 operations, and dropped to 61,000 in 2014. General aviation operations have significantly increased at BUR from 34,000 in 2007, to 69,000 in 2012. **Figure 17** presents the historical operations data for BUR.

Figure 17: BUR Historical Annual Aircraft Operations



Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html

BUR Peak Month, Design Day, and Peak Hour

The historically the peak month for BUR varies from year to year. The number of operations in the peak month was between 9,800 and 12,300 since 2007.

Based on the historical data from the FAA Aviation System Performance Metrics (ASPM) data between 2009 and 2013, the following demand ratios were estimated for BUR:

- **Daily Demand Ratio (D)** - the ratio of annual demand (aircraft operations) to average daily demand during the peak month and for BUR. D is estimated to be approximately 343.

- **Hourly Demand Ratio (H)** - the ratio of average daily demand to average peak hour demand during the peak month and for BUR. H is estimated to be approximately 11.4.

BUR Fleet Mix, Load Factor, and Seat Capacity

The characteristics of the fleet mix, load factors, and average seat capacity for the airlines operating at BUR were analyzed and included in **Appendix A**. **Table 18** presents summarized summary according to different aircraft categories including passenger flights such as air carriers, air taxi, and other non-passenger flights.

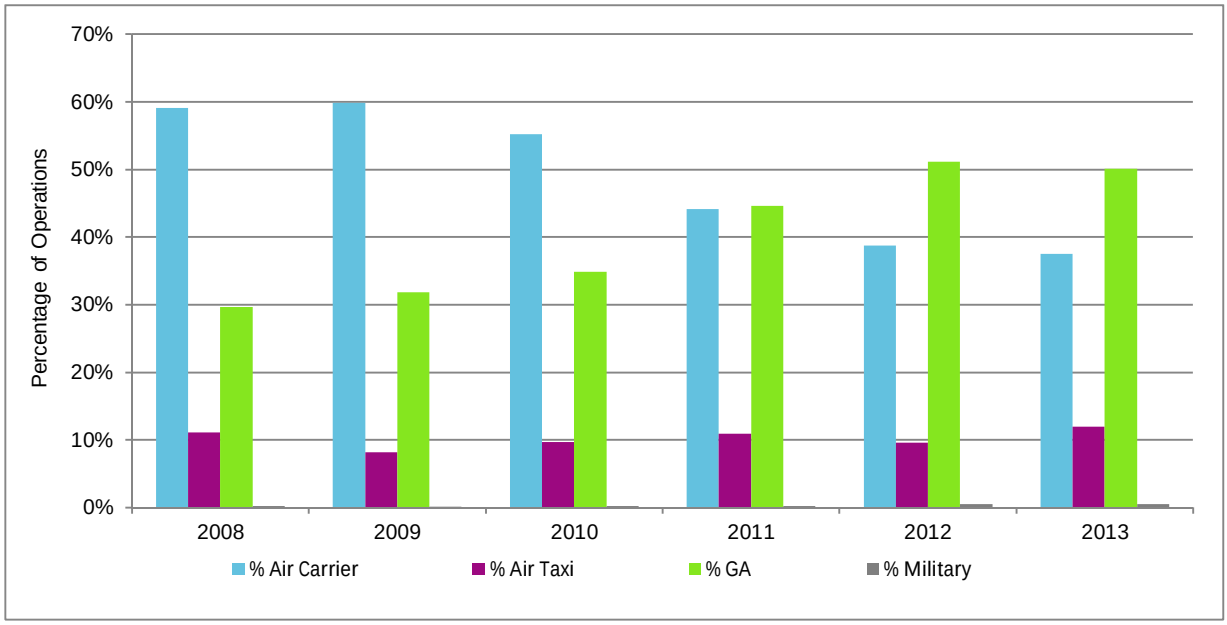
Table 18: BUR Load Factor and Seat Capacity by Categories, 2013

Aircraft Category	Load Factor	Average Seat Capacity	No. of operations recorded
Air Carriers	69.6%	137	37,589
Air Taxi	46.7%	20	11,693
Other non-passenger flights	N/A	N/A	2,035
Total (Commercial Operations)			**51,317**

Source: U.S. DOT T100 Database 2013; and AECOM Analysis.
Notes: 1. Air carriers include aircraft with passenger services and more than 60 seats.
2. Air taxi are passenger services with less than or equal to 60 seats.

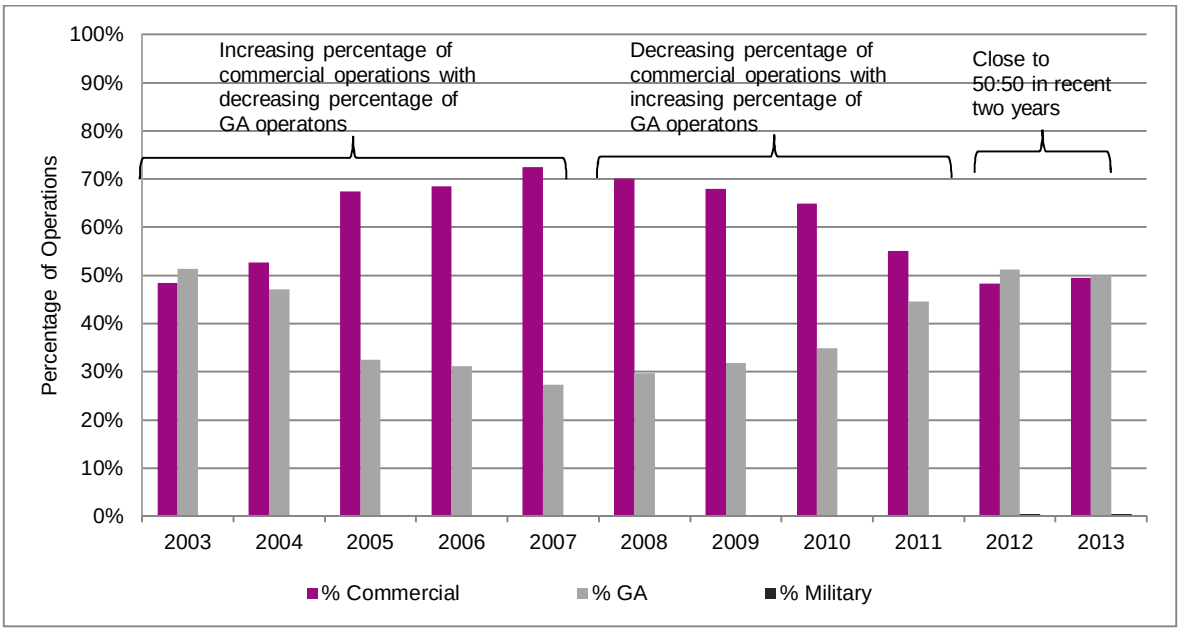
The historical proportion of commercial operations at BUR are presented in **Figures 18** and **20**. **Figures 18 and 19** summarize the percentages from 2008 to 2013 and from 2003 to 2013, respectively. **Figure 20** summarizes the monthly totals in 2013.

Figure 18: BUR Percentage of Operations (2008 to 2013)



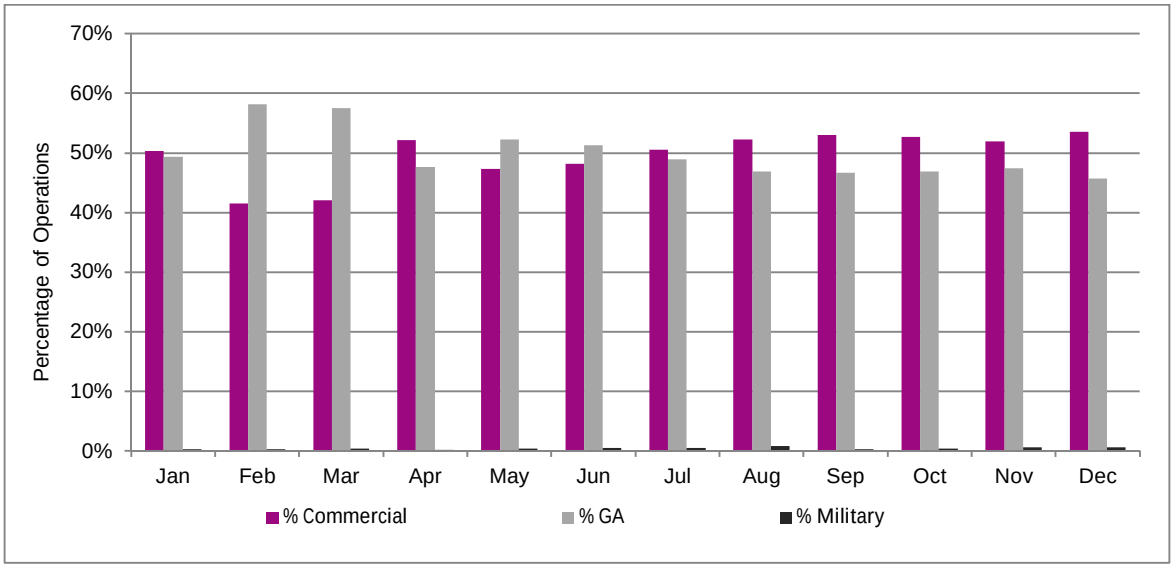
Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html; and AECOM analysis.

Figure 19: BUR Percentage of Commercial and GA Operations (2008 to 2013)



Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html; and AECOM analysis.

Figure 20: BUR Percentage of Operations (Jan to Dec 2013)



Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html; and AECOM analysis.

3.3.3 BUR Airfield Capacity Analysis

Description of the Runway Operating Configurations

BUR is served by two intersecting runways. The longer, primary runway, (15-33) is 6,885 feet long and 150 feet wide. The shorter, crosswind runway, (8-26) is 5,802 feet long and 150 feet wide. Each of the runways also has a parallel taxiway, and there are connecting taxiways to enable cross-field movement.

Peak Hour Throughput and Annual Service Volume (ASV)

An FAA study concluded that between 50 and 55 hourly operations can be conducted at BUR.[21] The ASV was estimated based on this range of hourly capacity and the above-mentioned demand ratios (D and H). The ASV for BUR is approximately 195,300 to 214,900.

Maximum Annual Passenger Volume

The annual passenger volume was estimated from the range of ASV as shown in **Table 19**. Three scenarios were considered:

- Scenario 1: The mix of operations for air carriers and air taxi assumes the historical annual pattern in 2013 (see Figures 16 and 17). i.e. 50 percent commercial operations. The average passenger per aircraft was based on the historical average seat capacity and load factor for each category of carriers (see Table 18).
- Scenario 2: The mix of operations for air carriers and air taxi carriers follows the highest monthly percentage for commercial operations (see Figure 18). i.e. 54 percent commercial operations. The average passenger per aircraft is the same as Scenario 1.
- Scenario 3: The mix of operations for commercial and commuter carriers adopts the 2032 forecast operations from the Airport Planning Forecast given in Appendix F of the BUR 14 CFR part 150 Study Noise Exposure Map Update, April 2013. i.e. 56 percent commercial operations. The load factor was increased to 85 percent. This represents the high scenario.

Table 19: Summary of Airfield Analysis for BUR – Estimated Annual Passenger Volume

		Scenario 1	Scenario 2	Scenario 3
Mix of Operations	Air Carrier	38.00%	40.50%	46.00%
	Air Taxi	12.00%	13.50%	10.00%
	Total Commercial	50.00%	54.00%	56.00%
Average Passengers per Operations	Air Carrier	95	95	116
	Air Taxi	9	9	17
Estimated Maximum Annual Passengers	FAA Study (50 operations per hour)	7,299,000	7,792,000	10,794,000
	FAA Study (55 operations per hour)	8,032,000	8,574,000	11,877,000
Estimated Maximum Annual Passenger Volume		Estimated Airfield Capacity: 7.3 to 11.9 MAP		

Source: Burbank Bob Hope Airport, http://www.burbankairport.com/home/about-airport/abouttheairport.html; Meeting with BUR, October 2014; and AECOM analysis.

[21] Meeting with BUR, October 2014.

It should be noted that these maximum passenger volumes are very dependent on 1) the size of aircraft (e.g. number of seats) and 2) load factors. Changes in these elements will have a direct impact on the estimated annual passenger volume for the airfield.

In summary, the potential maximum airfield capacity for BUR was estimated to be approximately **7.3 to 11.9 MAP**.

3.3.4 BUR Gate Capacity Analysis

The existing BUR terminal includes 14 air carrier gates: Gates A1 to A9 at Terminal A, and Gates B1 to B5 at Terminal B. All of the 14 gates are designated for ADG III aircraft. The existing terminal layout is shown in **Exhibit 2**.

Exhibit 2: BUR Existing Terminal Layout

Source: Google Earth, Imagery Date: April 2013.

The maximum number of operations (departures and arrivals) per gate is approximately 15 based on the discussion with the airport. [22]

The future ADG III aircraft fleet references B737 MAX. [23] The seat capacity for B737 MAX 8 is approximately 162 passengers for dual class to 175 passengers for single class configuration. B737 MAX 9 seats approximately 180 passengers in dual class and 204 passengers for single class configuration.[24] A seat capacity of 200 was assumed in the gate analysis for BUR.

The average load factor is assumed to be 85 percent [25] in the gate analysis.

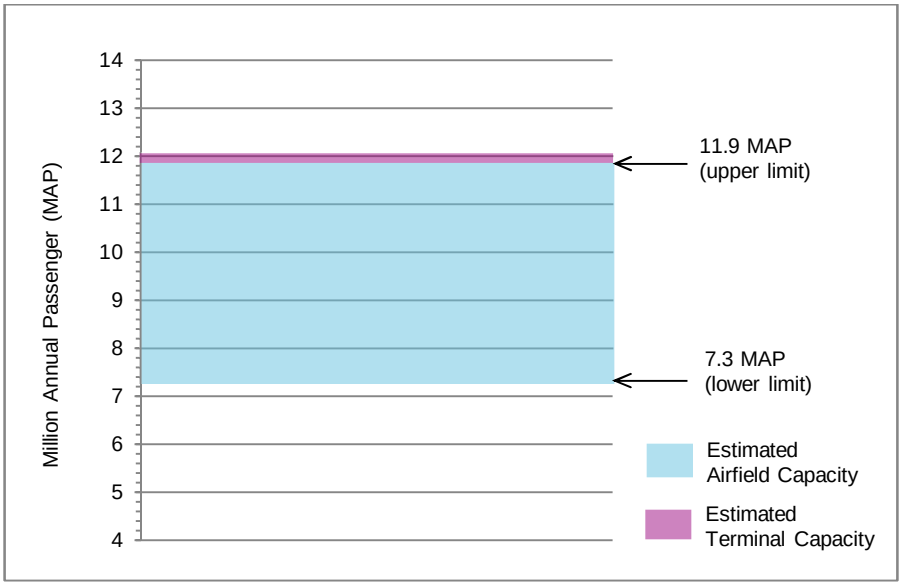
[22] Meeting with BUR, October 2014.
[23] Ibid.
[24] Boeing Aircraft Compatibility Brochure – 737 MAX, March 2014.
[25] FAA Aerospace Forecast 2014 to 2034 estimated the future load factor for domestic commercial air carrier to be 84.7 percent by 2034.

Based on these assumptions, the 14-gate terminal arrangement would have a maximum capacity of approximately **12 MAP** ($Number\ of\ operations\ per\ gate\ \times Number\ of\ gates\ \times Seat\ Capacity\ \times Load\ Facotr\ \times D$).

3.3.5 BUR Overall Airport Capacity

The overall/ultimate airport capacity is obtained by combining the scenarios for the airfield and the gate arrangement. The overall capacity for BUR is approximately **7.3 to 11.9 MAP** with the airfield capacity representing the constraining factor (**Figure 21**).

Figure 21: BUR Overall Airport Capacity



3.4 Long Beach Airport (LGB)

LGB is located in the City of Long Beach, Los Angeles County. LGB has five runways, including two sets of parallel runways forming a square and a diagonal runway. The longest runway is 10,000 feet, which is the only runway used for commercial operations.

The airport serves commercial carriers, general aviation, and air cargo operations. Total operations are approximately 275,500 in 2013, including a significant number of general aviation activities (241,500 operations). Total passenger volume was 3.2 million in 2012, and 2.94 million in 2013. Scheduled service is provided dominantly by jetBlue Airways (over 80 percent of enplaned passengers). US Airways, Delta Air Lines, and Alaska Airlines also provide some scheduled passenger services at LGB.[26]

3.4.1 Background on the Settlement Agreement, and the associated Capacity Limit

In the early 1980's, the City of Long Beach imposed a restriction of 15 air carrier operations/day at LGB, which was determined to be consistent with holding noise levels in impacted neighborhoods under the State-mandated 65 Community Noise Equivalent Level (CNEL) contour. A Federal judge subsequently ruled in favor of the airlines, lifting the cap incrementally to 41 air carrier departures/day. This constraint is still in force, by virtue of a 1995 Settlement Agreement between the city and the airlines that was prompted by a 1991 Federal circuit of appeals decision to reverse all previous major legal findings. The 41 departures/day cap (25 commuter additional flights are also allowed) equates to a range of potential passenger service, depending on the aircraft types, load factors, and number of cargo flights assumed (there currently are five all-cargo flights). The city's noise ordinance for the airport was grandfathered by ANCA, which precludes new local restrictions on Stage 3 aircraft.[27]

According to the SCAG's 2004 RTP, the flight restriction at LGB translates to 3.0 MAP, making conservative assumptions. These include assuming the existing air carrier fleet mix, a nominal 60 percent load factor, and that the 25 allowable commuter flights are divided between regional jets (10 flights at 70 passengers seats per aircraft) and smaller turbo props (15 flights at 25 seats per aircraft). The 3.0 MAP figure for LGB was used for the Constrained Variation in the 2004 RTP. Making more liberal assumptions increasing the forecast total for LGB to 3.8 MAP, which was used for the Preferred Aviation Plan. These include assuming a 70 percent overall load factor, and that all the 25 commuter flights would be regional jets in 2030.[28]

According to the LGB Terminal Improvement EIR, terminal area improvements are being designed to accommodate 41 airline flights and 25 commuter flights per day. This flight level was anticipated to result in approximately 4.2 MAP being served at the airport. There are provisions in the Airport Noise Compatibility Ordinance allowing the number of flights to be increased if the air carrier flights and commuter flights operate below their respective CNEL limits; however, the 4.2 MAP limit has been used in the growth forecasts.[29] The 2008 RTP and 2012 RTP adopt 4.2 MAP as the estimated capacity for LGB.

[26] Long Beach Airport, Monthly Airport Activity Report, December 2012, 2013 and September 2014.
[27] 2004 RTP Technical Appendix D-6 Aviation, SCAG.
[28] 2004 RTP Technical Appendix D-6 Aviation, SCAG.
[29] 2012 RTP Aviation and Airport Ground Access Appendix, SCAG, April 2012.

3.4.2 Summary of LGB Historical Data

LGB Historical Passenger Volume

Table 20 summarizes the enplaned passengers and total passengers at LGB since 2011, based on the available monthly airport activity report received from the airport.

Table 20: LGB Historical Passenger Volume

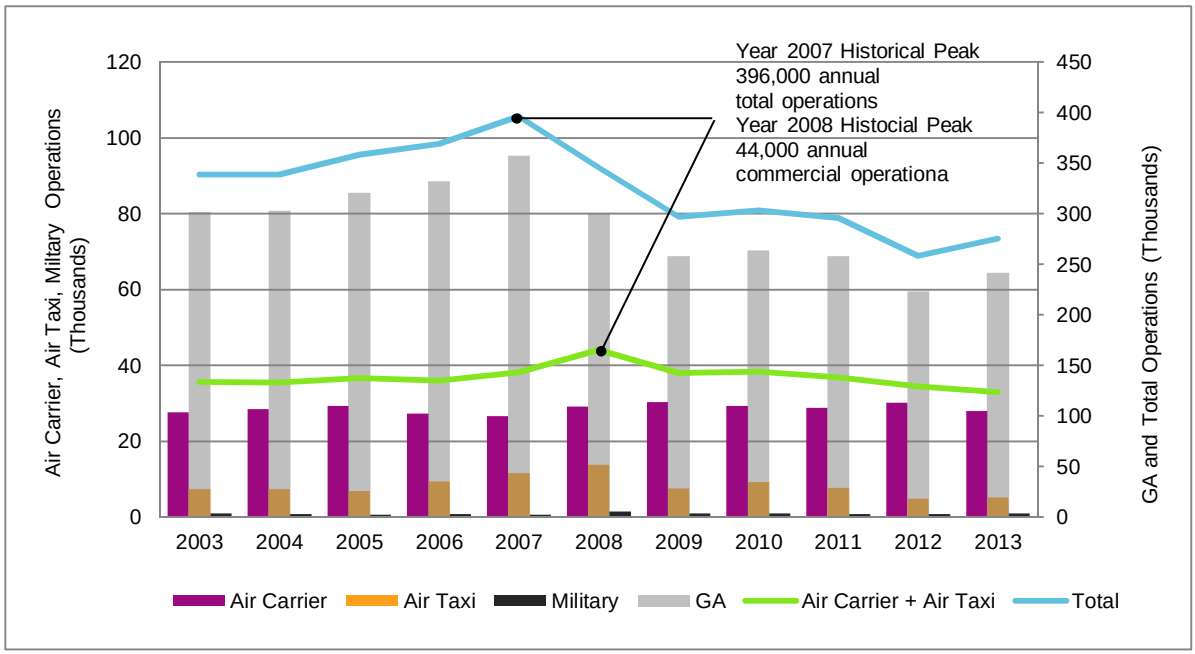
Year	Enplaned Passengers	Total Passengers
2011	1,549,744	3,115,433
2012	1,607,801	3,206,910
2013	1,474,334	2,942,873
2014 (Jan to Sep)	1,098,451	2,191,152

Source: Long Beach Airport, Monthly Airport Activity Report, December 2012, 2013, and September 2014.

LGB Historical Operations

Figure 22 presents the historical operations for LGB based on FAA Air Traffic Activity Data System (ATADS) data. Total operations peaked in 2007 at 396,000 operations, and decreased to 275,500 operations in 2013. General aviation activity is significant at LGB. General aviation operations also peaked in 2007 with 357,500 operations, and decreased to 241,500 operations in 2013. Commercial operations peaked in 2008 with 44,000 operations, and dropped to 33,000 operations in 2013.

Figure 22: LGB Historical Annual Aircraft Operations



Source: FAA ATADS; and AECOM analysis.

LGB Peak Month, Design Day, and Peak Hour

The historically the peak month for LGB normally occurs in the summer season between April and September. The average number of commercial operations (air carrier and air taxi) in the peak month is between 3,100 and 3,700 from 2003 and 2013, except in 2008, when 5,300 commercial operations were experienced.

Based on the historical data from the FAA ATADS data between 2009 and 2013, the following demand ratios were estimated for LGB:

- **Daily Demand Ratio (D)** - the ratio of annual demand (aircraft operations) to average daily demand during the peak month and for LGB. D is estimated to be approximately 339.

- **Hourly Demand Ratio (H)** - the ratio of average daily demand to average peak hour demand during the peak month and for LGB. H is estimated to be approximately 11.7.

LGB Fleet Mix, Load Factor, and Seat Capacity

The characteristics of the fleet mix, load factors, and average seat capacity for the airlines operating at LGB were analyzed and included in **Appendix A**. **Table 21** presents summarized summary according to different aircraft categories including passenger flights such as air carriers, air taxi, and other non-passenger flights.

Table 21: LGB Load Factor and Seat Capacity by Categories, 2013

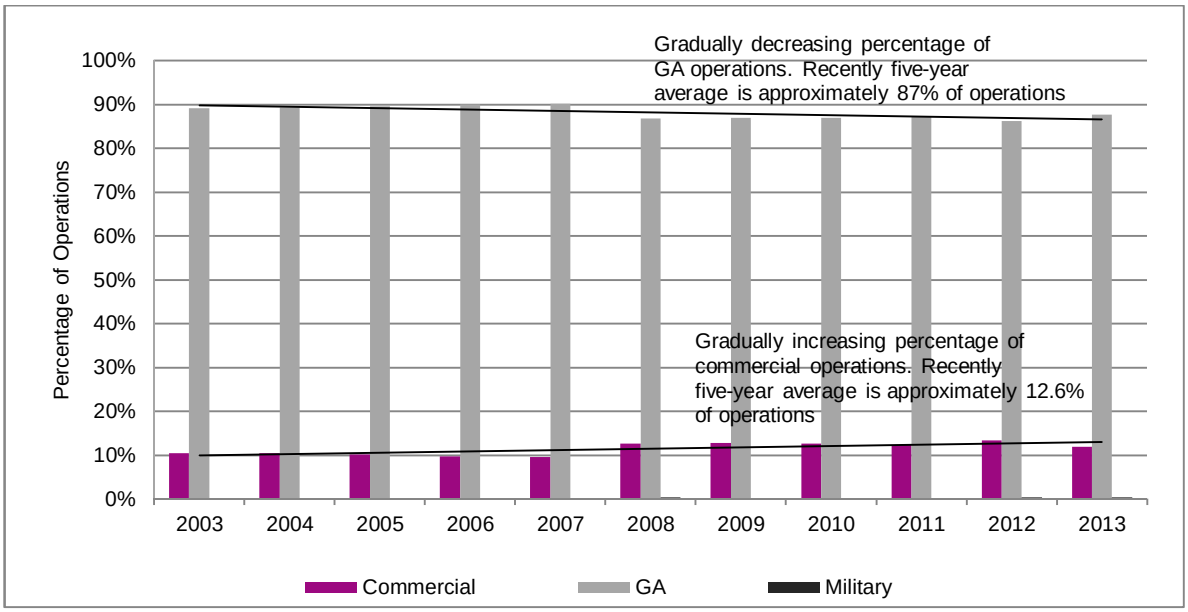
Aircraft Category	Load Factor	Average Seat Capacity	No. of operations recorded
Air Carriers	81.3%	136	23,062
Air Taxi (include commuters)	84.0%	57	3,946
Other non-passenger flights	N/A	N/A	826
Total (Commercial Operations)			**27,834**

Source: U.S. DOT T100 Database 2013; and AECOM analysis.
Notes: 1. Air carriers include aircraft with passenger services and more than 60 seats.
2. Air taxi are passenger services with less than or equal to 60 seats.

The historical proportion of commercial operations at LGB from 2003 through 2013 are presented in **Figure 23**. The percentage of general aviation operations in the recent five years was approximately 87 percent. The percentage of commercial operations was approximately 12.6 percent during the same period.

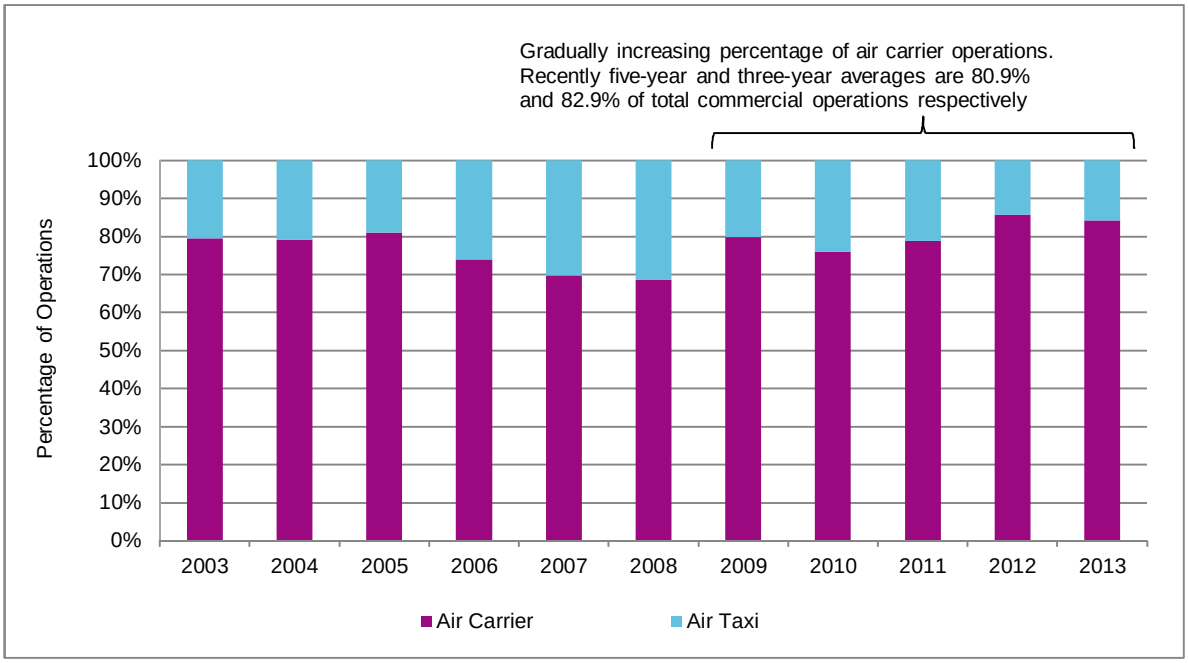
Figure 24 presents the split between air carrier and air taxi (including commuter) within commercial operations. The recent five-year and three-year average percentages of air carrier were estimated to be 80.9 percent and 82.9 percent of total commercial operations respectively. Commercial commercials mainly operate from the longest runway (12/30). Commercial operations will use Runway 7L/25R only when Runway 12/30 is closed.

Figure 23: LGB Percentage of Operations (2003 to 2013)



Source: FAA ATADS; and AECOM analysis.

Figure 24: LGB Percentage of Commercial Operations (2003 to 2013)



Source: FAA ATADS; and AECOM analysis.

3.4.3 LGB Airfield Capacity Analysis

Description of the Runway Operating Configurations

LGB is served by two sets of parallel runways forming a square and a diagonal runway. The 5-runway system is described below:

- Runway 7L/25R – 6,191 feet long by 150 feet wide
- Runway 7R/25L – 5,421 feet long by 150 feet wide
- Runway 12/30 – 10,003 feet long by 200 feet wide
- Runway 16L/34R – 3,330 feet long by 75 feet wide
- Runway 16R/34L – 4,470 feet long by 75 feet wide

Only one runway (12/30) is used for commercial operations. Runway 7L/25R is used for commercial operations only when Runway 12/30 is closed. Therefore the estimation of airfield capacity in terms of annual passenger volume was based on a one-runway system for commercial operations.

Peak Hour Throughput and Annual Service Volume (ASV)

The hourly capacity for Runway 12/30 during VFR and IFR conditions and ASV derived in accordance with the FAA AC 150/5060-5 and the methodology described previously is given in **Table 22**.

Approximately 90 percent of the operations are in north flow direction using Runway 30. Ten percent of operations are in south flow direction using Runway 12.

Three Sensitivity Tests were included in the analysis based on different percentages of VFR and IFR conditions. Sensitivity Test 1 assumed most of time (94 percent) is in VFR condition. Sensitivity Test 2 assumed 88 percent of time is in VFR condition. Sensitivity Test 3 assumed 82 percent of time is in VFR condition.

As shown in **Table 22**, the hourly capacity of Runway 12/30 was estimated to be between 53 and 54 operations. The ASV was estimated based on this range of hourly capacity and the above-mentioned demand ratios (D and H). The ASV for Runway 12/30 is approximately 211,200 to 215,100 annual operations.

Table 22: Summary of Airfield Analysis for LGB Runway 12/30 – Estimated Hourly Capacity and ASV

Capacity Element		North Flow		South Flow	
		Operations on Runway 30		Operations on Runway 12	
VFR / IFR		VFR	IFR	VFR	IFR
Configur	SensitivityTest 1	85%	5%	9%	1%
	SensitivityTest 2	80%	10%	8%	2%
	SensitivityTest 3	75%	15%	7%	3%
Aircraft Mix Index (C+3D)		81 to 120			
Touch-and-go Factor (T)		1.1	1	1.1	1
Exit Range (feet)		5,500 to 6,500			
No. of Exits (N) within range		2	2	1	1
Exit Factor (E)		0.94	0.92	0.88	0.86
Arrival %		50%			
Hourly Capacity (FAA AC)		55	47	52	44
Weighted Hourly Capacity (Cw)	SensitivityTest 1	54.22		Estimated Hourly Capacity: 53 to 54	
	SensitivityTest 2	53.74			
	SensitivityTest 3	53.26			
Annual Service Volume (ASV)	SensitivityTest 1	215,100		Estimated ASV: 211,200 to 215,100	
	SensitivityTest 2	213,100			
	SensitivityTest 3	211,200			

Maximum Annual Passenger Volume

The annual passenger volume was estimated from the range of ASV as shown in **Table 23**. Three scenarios were considered:

- Scenario 1: The mix of operations for commercial and non-commercial assumes 20/80 on Runway 12/30; and the split between air carriers and commuters assumes the historical average for the recent 5-year (see Figures 21). i.e. 80.9 percent of the 20 percent commercial operations would be air carriers. The average passenger per aircraft was based on the historical average seat capacity and load factor for each category of carriers (see Table 21).
- Scenario 2: The mix of operations for commercial and non-commercial assumes 30/70 on Runway 12/30; and the split between air carriers and commuters assumes the historical average for the recent 3-year (see Figures 21). i.e. 82.9 percent of the 30 percent commercial operations would be air carriers. The average passenger per aircraft was the same as Scenario 1.
- Scenario 3: The mix of operations for commercial and non-commercial assumes 40/60 on Runway 12/30; and the split between air carriers and commuters assumes the historical average for the recent 3-year (see Figures 21). i.e. 82.9 percent of the 40 percent commercial operations would be air carriers. The load factor was increased to 88 percent. This represents the high scenario.

Table 23: Summary of Airfield Analysis for LGB – Estimated Annual Passenger Volume

		Scenario 1	Scenario 2	Scenario 3
Mix of Operations	Air Carrier Commuter	16.18% 3.82%	24.87% 5.13%	33.16% 6.84%
	Total Commercial use on Runway 12/30	20%	30%	40%
Average Passengers per Operations	Air Carrier Commuter	111 48	111 48	120 50
Estimated Maximum Annual Passengers	SensitivityTest 1 SensitivityTest 2 SensitivityTest 3	4,242,000 4,202,000 4,165,000	6,443,000 6,383,000 6,326,000	9,274,000 9,188,000 9,106,000
Estimated Maximum Annual Passenger Volume		Estimated Airfield Capacity: 4.2 to 9.3 MAP		

Source: FAA ATADS; and AECOM analysis.

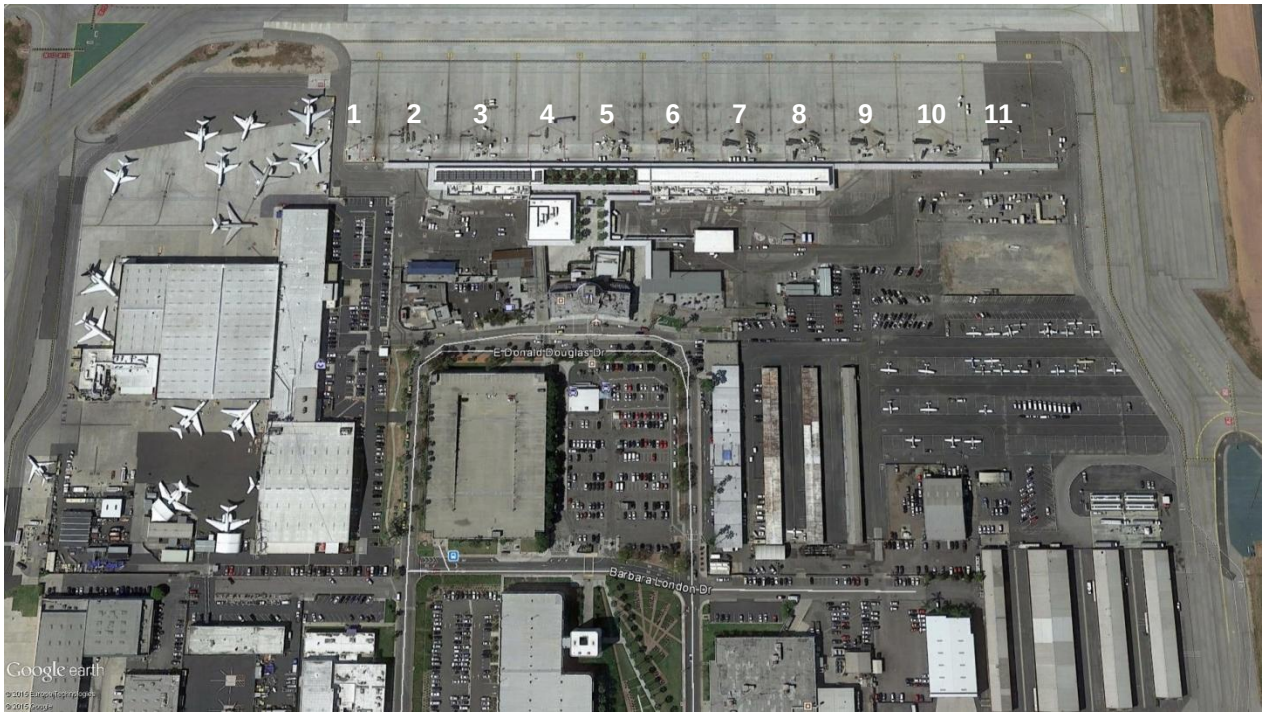
It should be noted that these maximum passenger volumes are very dependent on 1) the size of aircraft (e.g. number of seats) and 2) load factors. Changes in these elements will have a direct impact on the estimated annual passenger volume for the airfield.

In summary, the potential maximum airfield capacity for LGB was estimated to be a range between approximately **4.2** and **9.3 MAP,** which depends on the percentage of commercial use on Runway 12/30.

3.4.4 LGB Gate Capacity Analysis

The existing LGB terminal includes 11 gates: Gates 1 to 11. All 11 gates are designated for ADG III aircraft.[30] The existing terminal layout is shown in **Exhibit 3**.

Exhibit 3: LGB Existing Terminal Layout



Source: Google Earth, Imagery Date: April 2014.

The maximum number of operations (departures and arrivals) per gate is approximately 10 based on ground loading, one hour turn time, [31] and 15 hours of operation (6:30am to 9:30pm).

The future ADG III aircraft fleet assumes the B737 MAX. A seat capacity of 200 was assumed in the gate analysis for LGB.

The average load factor was assumed to be 88 percent in the gate analysis.[32]

Based on these assumptions, the 11-gate terminal arrangement would have a maximum capacity of approximately **6.6 MAP** ($Number\ of\ operations\ per\ gate\ \times Number\ of\ gates\ \times Seat\ Capacity\ \times Load\ Facotr\ \times D$).

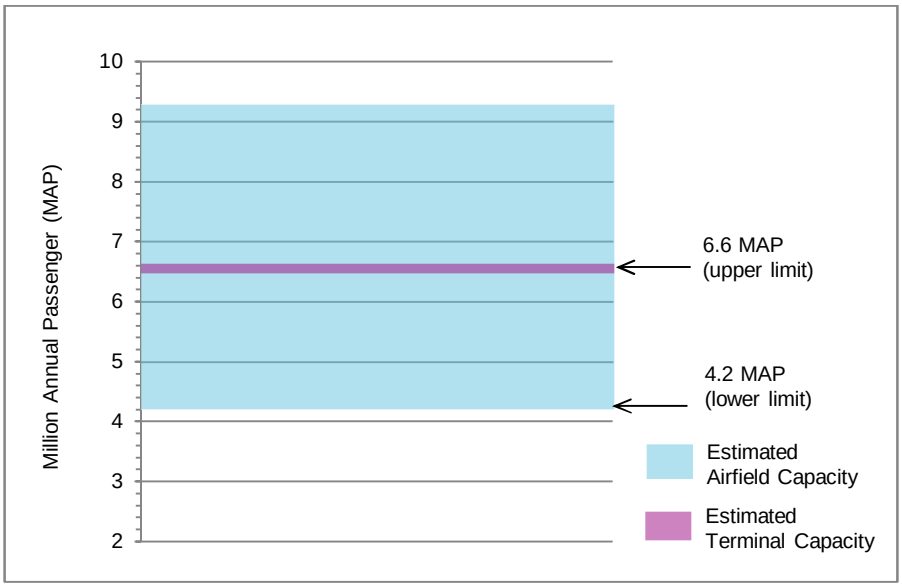
3.4.5 LGB Overall Airport Capacity

The overall/ultimate airport capacity was obtained by combining the scenarios for the airfield and the gate arrangement. The overall capacity for LGB is approximately **4.2 to 6.6 MAP** with the lower limit constrained by the

[30] Meeting with LGB, October 2014.
[31] Ibid
[32] Ibid

airfield component and the upper limit constrained by terminal gate capacity (**Figure 25**). This range does not take into account the City of Long Beach noise ordinance.

Figure 25: LGB Overall Airport Capacity



4. Grand Summary

Table 24 summarizes the capacity analysis of the four airports LAX, SNA, BUR, and LGB.

Table 24: Summary of Capacity Analysis

Airport	Airport Capacity Lower Limit	Constrained Element Lower Limit	Airport Capacity Upper Limit	Constrained Element Upper Limit
LAX	82.9 MAP	Airfield	96.6 MAP	Airfield
SNA	9.6 MAP[1]	Airfield	16 MAP	Terminal Gates
BUR	7.3 MAP	Airfield	11.9 MAP	Airfield
LGB	4.2 MAP[2]	Airfield	6.6 MAP[2]	Terminal Gates

Notes: 1. In 2007, SNA accommodated almost 10 MAP, so the lower end of SNA's range is not a plausible capacity limit.
2. This range does not take into account the City of Long Beach noise ordinance.

Appendix A (Fleet Mix, Load Factor, and Seat Capacity by Airlines)

Table A- 1: LAX Fleet Mix, Load Factor, and Seat Capacity by Airlines, 2013

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
ABX Air, Inc.	**N/A**	**N/A**	**1,910**
Boeing 767-200/ER/EM	N/A	N/A	1,910
Acropolis Aviation Ltd.	**26.32%**	**19**	**8**
Airbus A319	26.32%	19	8
Aeroflot Russian Airlines	**77.30%**	**259**	**580**
Airbus A330-300	82.49%	241	556
Airbus A330-200	64.85%	302	24
Aerolitoral	**59.26%**	**68**	**1,000**
Embraer 190	46.18%	99	222
Embraer-145	66.98%	50	778
AeroLogic GmbH	**N/A**	**N/A**	**205**
Boeing B777-F	N/A	N/A	205
Aeromexico	**76.28%**	**143**	**4,844**
Boeing 737-700/700LR	76.50%	125	2,989
Boeing 737-800	76.05%	162	1,855
Aerotransportes Mas De Crga	**N/A**	**N/A**	**1,011**
Boeing 767-300/300ER	N/A	N/A	1,011
Aerounion Aerotransporte	**N/A**	**N/A**	**1,165**
Airbus A300B/C/F-100/200	N/A	N/A	1,165
Air Alsie A/S	**38.46%**	**13**	**2**
Dassault Falcon 7X	38.46%	13	2
Air Berlin PLC and CO	**81.06%**	**295**	**448**
Airbus A330-200	81.06%	295	448
Air Canada	**76.07%**	**130**	**8,921**
Airbus A319	68.74%	108	1,776
Airbus A320-100/200	79.32%	146	2,256
Airbus A321	82.01%	174	751
Airbus A330-200	93.40%	265	16
Boeing 767-300/300ER	86.25%	214	242
Boeing 777-300/300ER/333ER	72.35%	349	6
Embraer 190	83.43%	97	3,874
Air China	**83.62%**	**304**	**1,537**
Boeing 747-200/300	N/A	N/A	170
Boeing 777-200ER/200LR/233LR	83.62%	304	1,367
Air Georgian	**77.78%**	**9**	**2**
Cessna CE-680 Citation Sovereign	77.78%	9	2
Air New Zealand	**82.23%**	**299**	**2,312**
Boeing 767-300/300ER	76.11%	230	104
Boeing 777-200ER/200LR/233LR	80.39%	304	156
Boeing 777-300/300ER/333ER	86.21%	331	2,052
Air Pacific Ltd.	**80.50%**	**389**	**502**
Airbus A330-200	84.21%	271	188
Boeing 747-400	78.48%	454	314
Air Tahiti Nui	**77.96%**	**280**	**1,757**
Airbus A340-300	77.96%	280	1,757
Air Transport International	**N/A**	**N/A**	**312**
Boeing 757-200	N/A	N/A	312
AirTran Airways Corporation	**92.30%**	**137**	**1,675**
Boeing 737-700/700LR	92.30%	137	1,675
Alaska Airlines Inc.	**86.94%**	**154**	**21,351**
Boeing 737-400	89.21%	144	5,060
Boeing 737-700/700LR	89.03%	124	2,272
Boeing 737-800	86.20%	157	8,401
Boeing 737-900	85.09%	174	5,618
Albinati Aeronautics SA	**21.67%**	**12**	**5**

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Bombardier BD-700 Global Express	21.67%	12	5
All Nippon Airways Co.	**82.79%**	**239**	**1,460**
Boeing 777-200ER/200LR/233LR	82.79%	239	1,460
Allegiant Air	**87.35%**	**167**	**1,335**
Airbus A319	86.22%	156	42
Boeing 757-200	72.50%	223	44
McDonnell Douglas DC9 Super 80/MD81/82/83/88	88.71%	166	1,246
McDonnell Douglas DC9 Super 87	39.49%	130	3
American Airlines Inc.	**83.01%**	**176**	**65,696**
Airbus A319	68.00%	128	26
Boeing 737-800	81.86%	150	32,543
Boeing 757-200	83.00%	183	15,725
Boeing 767-200/ER/EM	86.94%	168	6,467
Boeing 767-300/300ER	85.02%	218	2,868
Boeing 777-200ER/200LR/233LR	84.04%	246	3,348
Boeing 777-300/300ER/333ER	82.07%	310	412
McDonnell Douglas DC9 Super 80/MD81/82/83/88	81.49%	137	4,307
Ameristar Air Cargo	**43.03%**	**104**	**13**
Boeing 737-100/200	56.70%	56	4
McDonnell Douglas DC9 Super 80/MD81/82/83/88	32.11%	152	5
McDonnell Douglas DC-9-15F	N/A	N/A	4
Asiana Airlines Inc.	**82.85%**	**341**	**2,058**
Boeing 747-400	81.33%	374	722
Boeing 747-400F	N/A	N/A	612
Boeing 777-200ER/200LR/233LR	84.37%	307	724
Atlas Air Inc.	**46.99%**	**335**	**318**
Boeing 747-400	45.51%	470	284
Boeing 747-400F	N/A	N/A	17
Boeing 767-300/300ER	49.40%	132	13
Boeing B747-8	N/A	N/A	4
Avjet Corporation	**27.99%**	**11**	**137**
1124A Westwind II	39.29%	7	4
Boeing 737-700/700LR	36.72%	16	8
Bombardier BD-700 Global Express	15.38%	13	6
Gulfstream Aerospace G-III/G-IV	30.18%	13	49
Gulfstream G150	17.28%	9	10
Gulfstream G200	23.44%	8	16
Gulfstream G450	20.10%	13	12
Gulfstream III/V/ G-V Exec/ G-5/550	16.33%	14	7
McDonnell Douglas DC-9-40	42.31%	13	2
Raytheon Beechcraft Hawker 800XP	38.82%	8	23
British Airways Plc	**89.26%**	**327**	**1,867**
Airbus A380-800	86.41%	469	130
Boeing 747-200/300	90.58%	291	160
Boeing 747-400	90.04%	321	1,575
Boeing 777-200ER/200LR/233LR	73.09%	275	2
Cargolux Airlines International S.A	**N/A**	**N/A**	**815**
Boeing 747-400F	N/A	N/A	815
Cargolux Italia SpA	**N/A**	**N/A**	**16**
Boeing 747-400F	N/A	N/A	16
Casino Express	**85.07%**	**150**	**5**
Boeing 737-400	85.07%	150	5
CAT Aviation	**25.00%**	**13**	**4**
Dassault Falcon 7X	25.00%	13	4
Cathay Pacific Airways Ltd.	**88.13%**	**289**	**2,728**
Airbus A340-200	93.82%	275	2
Boeing 747-400F	N/A	N/A	366
Boeing 777-300/300ER/333ER	87.72%	290	2,050
Boeing B747-8	N/A	N/A	310
Centurion Cargo Inc.	**N/A**	**N/A**	**56**
McDonnell Douglas MD-11	N/A	N/A	56
Chartright Air Inc.	**36.21%**	**9**	**14**

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Bombardier BD-100-1A10 Challenger 300	34.17%	10	10
Gulfstream G150	39.29%	7	4
China Airlines Ltd.	**82.05%**	**377**	**2,492**
Boeing 747-400	82.05%	377	1,376
Boeing 747-400F	N/A	N/A	1,116
China Cargo Airline	**N/A**	**N/A**	**828**
Boeing B777-F	N/A	N/A	828
China Eastern Airlines	**90.10%**	**320**	**720**
Airbus A340-600	90.10%	320	720
China Southern Airlines	**85.89%**	**490**	**1,318**
Airbus A380-800	85.89%	490	730
Boeing 747-400F	N/A	N/A	588
Compagnia Aerea Italiana	**84.60%**	**293**	**298**
Boeing 777-200ER/200LR/233LR	84.60%	293	298
Compagnie Natl Air France	**85.64%**	**365**	**1,608**
Airbus A380-800	88.86%	516	712
Boeing 777-200ER/200LR/233LR	83.69%	301	868
Boeing 777-300/300ER/333ER	86.46%	298	28
Compania Panamena (Copa)	**80.86%**	**153**	**2,072**
Boeing 737-700/700LR	88.51%	124	4
Boeing 737-800	79.58%	158	2,068
Compass Airlines	**77.12%**	**76**	**3,501**
Embraer ERJ-175	77.12%	76	3,501
Concesionaria Vuela Compania	**77.87%**	**157**	**3,709**
Airbus A319	80.94%	143	2,232
Airbus A320-100/200	73.98%	174	1,477
DCA	**12.50%**	**16**	**2**
Gulfstream III/V/ G-V Exec/ G-5/550	12.50%	16	2
Delta Air Lines Inc.	**81.14%**	**170**	**47,738**
Airbus A330-300	76.52%	297	27
Airbus A319	80.75%	91	5,441
Airbus A320-100/200	81.24%	150	3,367
Airbus A330-200	79.14%	239	330
Boeing 737-800	79.37%	160	8,091
Boeing 737-900	85.82%	180	419
Boeing 747-400	81.56%	376	6
Boeing 757-200	80.88%	179	17,351
Boeing 757-300	84.11%	224	2,384
Boeing 767-300/300ER	81.64%	240	8,137
Boeing 767-400/ER	96.37%	246	10
Boeing 777-200ER/200LR/233LR	88.97%	269	2,165
McDonnell Douglas DC9 Super 80/MD81/82/83/88	N/A	N/A	0
McDonnell Douglas MD-90	54.18%	160	10
El Al Israel Airlines Ltd.	**84.65%**	**278**	**402**
Boeing 777-200ER/200LR/233LR	84.65%	278	402
Emirates	**89.83%**	**326**	**730**
Airbus A380-800	90.54%	486	60
Boeing 777-200ER/200LR/233LR	96.80%	266	2
Boeing 777-300/300ER/333ER	89.19%	317	668
Envoy Air	**71.69%**	**64**	**12,680**
Canadair RJ-700	71.69%	64	12,680
Eva Airways Corporation	**85.62%**	**317**	**2,257**
Boeing 747-400F	N/A	N/A	68
Boeing 777-200ER/200LR/233LR	85.62%	317	1,675
McDonnell Douglas MD-11	N/A	N/A	514
ExpressJet Airlines Inc.	**64.54%**	**50**	**133**
Embraer-145	64.54%	50	133
Falcon Air Express	**79.49%**	**156**	**4**
McDonnell Douglas DC9 Super 80/MD81/82/83/88	79.49%	156	4
Federal Express Corporation	**N/A**	**N/A**	**7,844**
Airbus A300-600/R/CF/RCF	N/A	N/A	1,392
Airbus A310-200C/F	N/A	N/A	34

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Boeing 757-200	N/A	N/A	111
Boeing B777-F	N/A	N/A	15
McDonnell Douglas DC-10-10	N/A	N/A	1,804
McDonnell Douglas DC-10-30	N/A	N/A	766
McDonnell Douglas MD-11	N/A	N/A	3,722
Flair Airlines Ltd.	**30.38%**	**158**	**1**
Boeing 737-400	30.38%	158	1
Frontier Airlines Inc.	**89.91%**	**150**	**2,919**
Airbus A-318	97.29%	120	6
Airbus A319	86.71%	138	1,977
Airbus A320-100/200	92.49%	168	936
G5 Executive Ag	**25.00%**	**16**	**1**
Gulfstream III/V/ G-V Exec/ G-5/550	25.00%	16	1
Great Lakes Airlines	**33.01%**	**19**	**3,714**
Beech 1900 A/B/C/D	33.01%	19	3,714
Gulf And Caribbean Cargo	**N/A**	**N/A**	**426**
Convair CV-580	N/A	N/A	426
Hawaiian Airlines Inc.	**86.98%**	**275**	**2,447**
Airbus A330-200	90.14%	294	1,758
Boeing 767-300/300ER	84.75%	262	689
Horizon Air	**77.34%**	**76**	**6,250**
De Havilland DHC8-400 Dash-8	77.34%	76	6,250
Iberia Air Lines Of Spain	**78.47%**	**281**	**202**
Airbus A340-200	81.22%	258	196
Airbus A340-500	71.15%	342	6
Japan Air Lines Co. Ltd.	**82.85%**	**244**	**730**
Boeing 777-200ER/200LR/233LR	82.85%	244	730
Jet Aviation Business Jets AG	**21.25%**	**11**	**8**
Bombardier BD-700 Global Express	30.00%	10	1
Dassault Falcon 7X	28.00%	12	5
Gulfstream III/V/ G-V Exec/ G-5/550	N/A	N/A	2
JetBlue Airways	**87.41%**	**150**	**6,722**
Airbus A320-100/200	87.41%	150	6,722
KaiserAir, Inc.	**78.33%**	**60**	**1**
Boeing 737-700/700LR	78.33%	60	1
Kalitta Air LLC	**N/A**	**N/A**	**522**
Boeing 747-200/300	N/A	N/A	522
Kalitta Charters II	**N/A**	**N/A**	**3**
Boeing 727-200/231A	N/A	N/A	3
Klm Royal Dutch Airlines	**91.56%**	**328**	**850**
Boeing 747-400	91.21%	332	802
McDonnell Douglas MD-11	95.43%	285	48
Korean Air Lines Co. Ltd.	**73.38%**	**318**	**3,710**
Airbus A330-200	60.28%	222	172
Airbus A380-800	77.94%	407	892
Boeing 747-400	81.59%	333	607
Boeing 777-200ER/200LR/233LR	84.99%	255	12
Boeing 777-300/300ER/333ER	69.39%	291	1,002
Boeing B747-8	N/A	N/A	1,022
Boeing B777-F	N/A	N/A	3
Lacsa	**87.08%**	**146**	**970**
Airbus A319	91.01%	120	145
Airbus A320-100/200	84.61%	150	701
Airbus A321	91.85%	194	124
Lan Peru Airlines	**83.03%**	**233**	**628**
Boeing 767-300/300ER	83.03%	233	628
Lan-Chile Airlines	**83.93%**	**220**	**816**
B787-800 Dreamliner	82.93%	239	170
Boeing 767-300/300ER	84.15%	215	644
Boeing B777-F	N/A	N/A	2
London Air Services Limited	**44.07%**	**10**	**25**
Bombardier Challenger 604/605	39.58%	12	4

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Learjet45	45.06%	9	21
Lufthansa German Airlines	**88.75%**	**338**	**1,726**
Airbus A340-300	97.17%	234	6
Airbus A340-600	85.79%	313	598
Boeing 747-400	90.15%	341	298
Boeing 777-200ER/200LR/233LR	N/A	N/A	10
Boeing B747-8	89.07%	386	699
McDonnell Douglas MD-11	N/A	N/A	115
Lynden Air Cargo Airlines	**N/A**	**N/A**	**5**
Lockheed L100-30/L-382E	N/A	N/A	5
Malaysian Airline System	**79.06%**	**282**	**416**
Boeing 777-200ER/200LR/233LR	79.06%	282	416
Miami Air International	**24.53%**	**157**	**28**
Boeing 737-400	21.00%	149	19
Boeing 737-800	31.20%	170	9
Nippon Cargo Airlines	**N/A**	**N/A**	**737**
Boeing 747-400F	N/A	N/A	737
North American Airlines	**44.84%**	**252**	**4**
Boeing 767-300/300ER	44.84%	252	4
Omni Air Express	**30.57%**	**277**	**4**
Boeing 767-300/300ER	30.57%	277	4
Philippine Airlines Inc.	**75.26%**	**348**	**994**
Airbus A340-200	67.19%	263	240
Airbus A340-300	77.90%	254	48
Boeing 747-400	80.49%	424	706
Polar Air Cargo Airways	**N/A**	**N/A**	**670**
Boeing 747-400	N/A	N/A	503
Boeing 747-400F	N/A	N/A	165
Boeing B747-8	N/A	N/A	2
Qantas Airways Ltd.	**77.05%**	**410**	**3,677**
Airbus A380-800	79.79%	477	1,428
Boeing 747-400	75.07%	362	2,106
Boeing 747-400F	N/A	N/A	143
Republic Airlines	**94.44%**	**99**	**2**
Embraer 190	94.44%	99	2
Singapore Airlines Ltd.	**77.75%**	**295**	**1,464**
Airbus A340-500	70.16%	100	402
Airbus A380-800	84.08%	458	729
Boeing 747-400F	N/A	N/A	333
SkyWest Airlines Inc.	**75.09%**	**56**	**124,974**
Canadair CRJ 900	73.84%	76	13,131
Canadair RJ-200ER /RJ-440	79.37%	50	46,367
Canadair RJ-700	79.00%	66	31,667
Embraer EMB-120 Brasilia	59.19%	30	33,809
Southern Air Inc.	**N/A**	**N/A**	**575**
Boeing 747-400	N/A	N/A	426
Boeing B777-F	N/A	N/A	149
Southwest Airlines Co.	**76.96%**	**147**	**73,662**
Boeing 737-300	76.18%	139	18,342
Boeing 737-500	71.74%	122	49
Boeing 737-700/700LR	78.56%	143	49,081
Boeing 737-800	75.40%	175	6,190
Spirit Air Lines	**87.53%**	**155**	**4,532**
Airbus A319	88.13%	145	3,674
Airbus A320-100/200	86.14%	178	858
Sun Country Airlines d/b/a MN Airlines	**65.76%**	**151**	**1,161**
Boeing 737-700/700LR	70.58%	129	710
Boeing 737-800	63.40%	163	451
Swift Air, LLC	**62.39%**	**82**	**24**
Boeing 737-400	68.79%	73	18
Boeing 767-200/ER/EM	46.41%	102	6
Swiss International Airlines	**92.60%**	**219**	**692**

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Airbus A340-200	92.60%	219	692
Taca International Airlines	**81.69%**	**151**	**2,151**
Airbus A319	83.32%	120	280
Airbus A320-100/200	85.60%	150	1,240
Airbus A321	86.72%	194	627
Embraer 190	5.73%	96	4
TAG Aviation (UK) Ltd.	**29.68%**	**13**	**12**
Canadair CL-600 Challenger	30.00%	10	2
Dassault Falcon 7X	21.43%	14	8
Dassault Falcon 900	50.00%	12	2
Thai Airways International Ltd.	**69.66%**	**348**	**418**
Boeing 777-300/300ER/333ER	69.66%	348	418
Transaero Airlines	**73.62%**	**315**	**84**
Boeing 747-400	72.35%	375	13
Boeing 767-300/300ER	65.25%	265	9
Boeing 777-200ER/200LR/233LR	75.55%	313	62
Transportes Aereos Mercantiles	**N/A**	**N/A**	**8**
Boeing 767-200/ER/EM	N/A	N/A	8
TUI Airlines Nederland B.V.	**34.45%**	**283**	**88**
Boeing 767-300/300ER	34.45%	283	88
Turk Hava Yollari A.O.	**85.82%**	**337**	**670**
Boeing 777-300/300ER/333ER	85.82%	337	670
Tyrolean Jet Service	**29.73%**	**12**	**6**
Airbus A-318	44.74%	19	2
Gulfstream G200	22.22%	9	4
Unijet	**16.67%**	**12**	**2**
Dassault Falcon 7X	16.67%	12	2
United Air Lines Inc.	**82.95%**	**168**	**70,936**
Airbus A319	86.44%	120	4,278
Airbus A320-100/200	83.04%	142	10,669
B787-800 Dreamliner	85.36%	219	1,019
Boeing 737-700/700LR	86.08%	118	1,809
Boeing 737-800	80.67%	154	14,009
Boeing 737-900	81.18%	168	8,419
Boeing 747-400	77.92%	373	713
Boeing 757-200	85.21%	176	19,945
Boeing 757-300	83.61%	213	7,937
Boeing 767-200/ER/EM	83.99%	174	223
Boeing 767-300/300ER	84.43%	193	48
Boeing 767-400/ER	75.73%	243	145
Boeing 777-200ER/200LR/233LR	78.95%	272	1,722
United Parcel Service	**N/A**	**N/A**	**944**
Airbus A300-600/R/CF/RCF	N/A	N/A	59
Boeing 757-200	N/A	N/A	9
Boeing 767-300/300ER	N/A	N/A	876
US Airways Inc.	**87.49%**	**166**	**12,469**
Airbus A319	81.81%	124	721
Airbus A320-100/200	90.66%	150	2,004
Airbus A321	89.06%	186	9,627
Boeing 757-200	82.00%	188	117
USA Jet Airlines Inc.	**N/A**	**N/A**	**10**
Dassault-Breguet Mystere-Falcon	N/A	N/A	4
McDonnell Douglas DC-9-15F	N/A	N/A	2
McDonnell Douglas DC-9-30	N/A	N/A	4
Virgin America	**76.47%**	**138**	**28,622**
Airbus A319	75.10%	119	5,289
Airbus A320-100/200	77.18%	147	23,333
Virgin Atlantic Airways	**85.94%**	**322**	**1,286**
Airbus A340-300	90.00%	240	4
Airbus A340-600	81.56%	308	964
Boeing 747-400	91.88%	367	318
Virgin Blue International Airlines t/a V Australia	**79.26%**	**361**	**1,440**

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Boeing 777-200ER/200LR/233LR	79.26%	361	1,440
VistaJet Luftfahrtunternehmen GmbH	**50.00%**	**14**	**6**
Bombardier BD-700 Global Express	50.00%	14	6
Volga-Dnepr Airlines	**N/A**	**N/A**	**5**
Antonov 124	N/A	N/A	5
Westjet	**79.08%**	**149**	**3,519**
Boeing 737-600	81.57%	119	10
Boeing 737-700/700LR	80.26%	136	2,543
Boeing 737-800	76.82%	174	966
World Airways Inc.	**43.73%**	**355**	**8**
McDonnell Douglas MD-11	43.73%	355	8
Yangtze River Express Airlines Company	**N/A**	**N/A**	**132**
Boeing 747-400F	N/A	N/A	132
Grand Total (Commercial Operations)			**583,513**

Source: U.S. DOT T100 Database 2013; and AECOM analysis.

Notes: N/A denotes not applicable, which represents cargo only flights, etc.

Table A- 2: SNA Fleet Mix, Load Factor, and Seat Capacity by Airlines, 2013

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
AirTran Airways Corporation	**65.29%**	**137**	**2,921**
Boeing 737-700/700LR	65.29%	137	2,921
Alaska Airlines Inc.	**82.97%**	130	**6,906**
Boeing 737-400	79.74%	144	88
Boeing 737-700/700LR	88.28%	124	5,641
Boeing 737-800	79.28%	157	1,177
American Airlines Inc.	**82.08%**	**150**	**8,648**
Boeing 737-800	82.08%	150	8,648
Avjet Corporation	**21.00%**	**10**	**71**
Gulfstream Aerospace G-III/G-IV	22.53%	13	20
Gulfstream G200	19.57%	8	26
Gulfstream G450	8.79%	13	6
McDonnell Douglas DC-8-72	12.50%	8	2
Raytheon Beechcraft Hawker 800XP	26.47%	8	17
Chartright Air Inc.	**71.43%**	**4**	**2**
Gulfstream I	71.43%	4	2
Delta Air Lines Inc.	**69.93%**	148	**5,600**
Airbus A319	90.05%	126	3,319
Airbus A320-100/200	75.96%	150	46
Boeing 737-700/700LR	94.69%	124	11
Boeing 737-800	49.69%	160	14
Boeing 757-200	53.78%	182	2,210
Federal Express Corporation	**N/A**	**N/A**	**416**
Airbus A300-600/R/CF/RCF	N/A	N/A	414
Airbus A310-200C/F	N/A	N/A	2
Frontier Airlines Inc.	**92.27%**	**138**	**2,292**
Airbus A-318	89.21%	120	17
Airbus A319	92.93%	138	2,275
London Air Services Limited	**42.13%**	**7**	**9**
Bombardier Challenger 604/605	41.67%	12	1
Learjet45	42.22%	7	8
SkyWest Airlines Inc.	**81.84%**	**71**	**4,156**
Canadair CRJ 900	88.18%	76	2,034
Canadair RJ-200ER /RJ-440	52.67%	50	6
Canadair RJ-700	83.01%	66	2,114
Embraer EMB-120 Brasilia	45.00%	30	2
Southwest Airlines Co.	**76.14%**	**143**	**32,662**
Boeing 737-300	42.70%	137	2
Boeing 737-700/700LR	77.85%	143	32,266
Boeing 737-800	67.74%	175	394
Tyrolean Jet Service	**22.22%**	**9**	**2**
Gulfstream G200	22.22%	9	2

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
United Air Lines Inc.	**83.12%**	**137**	**13,327**
Airbus A319	86.99%	120	2,408
Airbus A320-100/200	81.14%	142	4,256
Boeing 737-700/700LR	87.45%	118	3,815
Boeing 737-800	76.62%	155	1,303
Boeing 757-200	82.61%	182	1,545
United Parcel Service	**N/A**	**N/A**	**241**
Boeing 757-200	N/A	N/A	241
US Airways Inc.	**76.57%**	**145**	**3,775**
Airbus A319	83.07%	124	2,013
Airbus A320-100/200	75.96%	150	900
Airbus A321	77.67%	187	840
Boeing 757-200	56.06%	190	22
Westjet	**81.14%**	**136**	**730**
Boeing 737-600	82.35%	119	2
Boeing 737-700/700LR	81.03%	136	728
ABC Aerolineas SA de CV dba Interjet	**64.87%**	**150**	**1,490**
Airbus A320-100/200	64.87%	150	1,490
ACM AIR CHARTER GmbH	**80.00%**	**10**	**2**
Dassault Falcon 2000EX	80.00%	10	2
Mesa Airlines Inc.	**67.78%**	**81**	**416**
Canadair CRJ 900	67.78%	81	416
Grand Total (Commercial Operations)			**83,666**

Source: U.S. DOT T100 Database 2013; and AECOM analysis.

Notes: N/A denotes not applicable, which represents cargo only flights, etc.

Table A- 3: BUR Fleet Mix, Load Factor, and Seat Capacity by Airlines, 2013

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
AirTran Airways Corporation	**100.00%**	**137**	**1**
Boeing 737-700/700LR	100.00%	137	1
Alaska Airlines Inc.	**81.74%**	**134**	**2,107**
Boeing 737-400	77.07%	144	24
Boeing 737-700/700LR	89.89%	124	1,491
Boeing 737-800	77.33%	157	584
Boeing 737-900	79.74%	174	8
Avjet Corporation	**37.42%**	**10**	**1,215**
Boeing 737-700/700LR	43.75%	16	28
Bombardier Challenger 604/605	11.11%	9	2
Gulfstream Aerospace G-III/G-IV	40.25%	13	333
Gulfstream G200	33.20%	8	247
Gulfstream G450	27.80%	13	104
McDonnell Douglas DC-8-72	57.81%	8	17
Raytheon Beechcraft Hawker 800XP	35.44%	8	245
1124A Westwind II	44.53%	7	105
Gulfstream G150	43.61%	9	97
Gulfstream III/V/ G-V Exec/ G-5/550	29.59%	14	23
Bombardier BD-700 Global Express	29.49%	13	12
McDonnell Douglas DC-9-40	N/A	N/A	2
Delta Air Lines Inc.	**69.29%**	**184**	**4**
Boeing 757-200	69.29%	184	4
Federal Express Corporation	N/A	N/A	**737**
Airbus A300-600/R/CF/RCF	N/A	N/A	736
Airbus A310-200C/F	N/A	N/A	1
Frontier Airlines Inc.	**82.14%**	**168**	**2**
Airbus A320-100/200	82.14%	168	2
London Air Services Limited	**11.11%**	**5**	**2**
Learjet45	11.11%	5	2
SkyWest Airlines Inc.	**81.23%**	**56**	**9,994**
Canadair CRJ 900	66.23%	76	10
Canadair RJ-200ER /RJ-440	83.38%	50	6,812
Canadair RJ-700	78.56%	69	3,172
Southwest Airlines Co.	**64.70%**	**143**	**31,898**

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Boeing 737-300	64.88%	139	1,262
Boeing 737-700/700LR	65.50%	143	30,589
Boeing 737-800	56.68%	175	23
Boeing 737-500	61.27%	122	24
United Air Lines Inc.	**87.34%**	**154**	**2**
Boeing 737-800	87.34%	154	2
United Parcel Service	N/A	N/A	**832**
Airbus A300-600/R/CF/RCF	N/A	N/A	812
Boeing 757-200	N/A	N/A	20
US Airways Inc.	**58.77%**	**166**	**7**
Airbus A320-100/200	36.00%	150	4
Airbus A321	89.13%	187	3
Mesa Airlines Inc.	**72.24%**	**80**	**2,861**
Canadair CRJ 900	71.51%	80	2,770
Canadair RJ-700	80.96%	70	91
Republic Airlines	**74.13%**	**99**	**34**
Embraer 190	74.13%	99	34
Ameristar Air Cargo	**63.82%**	**76**	**4**
McDonnell Douglas DC9 Super 80/MD81/82/83/88	63.82%	152	2
McDonnell Douglas DC-9-15F	N/A	N/A	2
JetBlue Airways	**86.77%**	**150**	**753**
Airbus A320-100/200	86.77%	150	753
Miami Air International	**54.41%**	**68**	**2**
Boeing 737-400	54.41%	68	2
Unijet	**12.50%**	**8**	**2**
Dassault Falcon 900	12.50%	8	2
KaiserAir, Inc.	**70.00%**	**60**	**1**
Boeing 737-700/700LR	70.00%	60	1
Allegiant Air	**41.27%**	**166**	**2**
McDonnell Douglas DC9 Super 80/MD81/82/83/88	41.27%	166	2
G5 Executive Ag	**37.50%**	**16**	**2**
Gulfstream III/V/ G-V Exec/ G-5/550	37.50%	16	2
Asiana Airlines Inc.	N/A	N/A	**28**
Boeing 747-400F	N/A	N/A	28
Horizon Air	**61.84%**	**76**	**1**
De Havilland DHC8-400 Dash-8	61.84%	76	1
SeaPort Airlines, Inc. d/b/a Wings of Alaska	**20.20%**	**9**	**826**
Cessna 208 Caravan	20.20%	9	826
Grand Total (Commercial Operations)			**51,317**

Source: U.S. DOT T100 Database 2013; and AECOM analysis.

Notes: N/A denotes not applicable, which represents cargo only flights, etc.

Table A- 4: LGB Fleet Mix, Load Factor, and Seat Capacity by Airlines, 2013

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Alaska Airlines Inc.	**57.01%**	**141**	**4**
Boeing 737-700/700LR	63.71%	124	2
Boeing 737-800	50.32%	157	2
Avjet Corporation	**25.46%**	**12**	**11**
Gulfstream Aerospace G-III/G-IV	35.71%	14	2
Gulfstream G200	25.00%	8	4
Gulfstream G450	19.23%	13	3
Gulfstream III/V/ G-V Exec/ G-5/550	28.57%	14	2
Delta Air Lines Inc.	**72.50%**	**137**	**167**
Airbus A320-100/200	71.86%	150	108
Boeing 737-800	36.25%	160	2
Airbus A319	76.15%	120	53
Boeing 767-300/300ER	68.66%	235	4
Federal Express Corporation	**N/A**	**N/A**	**268**
Airbus A300-600/R/CF/RCF	N/A	N/A	170
Airbus A310-200C/F	N/A	N/A	98
SkyWest Airlines Inc.	**89.80%**	**64**	**5,273**
Canadair CRJ 900	87.57%	76	1,387

Airline and Fleet Mix	Average Load Factor	Average Seat Capacity	No. of Operations
Canadair RJ-200ER /RJ-440	90.81%	50	426
Canadair RJ-700	89.97%	68	3,460
United Air Lines Inc.	**38.21%**	**155**	**5**
Boeing 737-800	38.21%	155	5
United Parcel Service	**N/A**	**N/A**	**537**
Airbus A300-600/R/CF/RCF	N/A	N/A	33
Boeing 757-200	N/A	N/A	2
Boeing 767-300/300ER	N/A	N/A	502
US Airways Inc.	**81.51%**	**132**	**657**
Airbus A320-100/200	87.00%	150	4
Airbus A321	37.43%	187	2
Airbus A319	84.52%	124	651
Mesa Airlines Inc.	**84.73%**	**80**	**2,529**
Canadair CRJ 900	84.18%	80	2,492
Canadair RJ-700	98.49%	70	37
Republic Airlines	**76.05%**	**99**	**55**
Embraer 190	76.05%	99	55
Ameristar Air Cargo	**57.14%**	**56**	**3**
McDonnell Douglas DC-9-15F	N/A	N/A	1
Boeing 737-100/200	57.14%	56	2
JetBlue Airways	**83.47%**	**150**	**18,287**
Airbus A320-100/200	83.47%	150	18,287
Miami Air International	**98.84%**	**173**	**4**
Boeing 737-800	98.84%	173	4
KaiserAir, Inc.	**47.50%**	**60**	**2**
Boeing 737-700/700LR	47.50%	60	2
Allegiant Air	**65.06%**	**166**	**1**
McDonnell Douglas DC9 Super 80/MD81/82/83/88	65.06%	166	1
DCA	**31.25%**	**16**	**1**
Gulfstream III/V/ G-V Exec/ G-5/550	31.25%	16	1
Kalitta Charters II	**N/A**	**N/A**	**2**
Boeing 727-200/231A	N/A	N/A	2
Air Canada	**56.71%**	**81**	**9**
Airbus A319	56.71%	81	9
Swift Air, LLC	**65.69%**	**79**	**6**
Boeing 737-400	77.21%	68	4
Boeing 767-200/ER/EM	42.65%	102	2
USA Jet Airlines Inc.	**N/A**	**N/A**	**2**
McDonnell Douglas DC-9-15F	N/A	N/A	2
Atlas Air Inc.	**51.76%**	**102**	**6**
Boeing 767-300/300ER	51.76%	102	6
TAG Aviation S.A.	**33.33%**	**15**	**4**
Bombardier BD-700 Global Express	33.33%	15	4
World Airways Inc.	**92.39%**	**355**	**1**
McDonnell Douglas MD-11	92.39%	355	1
Grand Total (Commercial Operations)			**27,834**

Source: U.S. DOT T100 Database 2013; and AECOM analysis.

Notes: N/A denotes not applicable, which represents cargo only flights, etc.