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## **3 Alternative D Constrained Activity**

The activity analysis for Alternative D is described as “constrained” because, like Master Plan Alternatives A, B, and C, Alternative D facilities would not be designed to accommodate the unconstrained aviation demand forecast profile.<sup>1</sup> Specifically, the terminal frontage available in Alternative D to park aircraft side-by-side is less than the equivalent terminal frontage available in the No Action/No Project Alternative. The cargo warehouse space available in Alternative D is equal to the space available in the No Action/No Project Alternative. Summarized below is the activity analysis approach used by LAWA to determine the appropriate amount of equivalent contact gate space and cargo warehouse space needed to accommodate approximately the same passenger and cargo levels as in the No Action/No Project Alternative.

To develop activity profiles for each short-listed Master Plan alternative, design day flight schedules were developed for 2015 and an interim year of 2005. These schedules were used to complete the airside and landside analyses and to provide input data for the Draft EIS/EIR. The Alternative D activity profiles, described herein, were developed for these same years. In addition, activity profiles were developed for two additional interim years for Alternative D (2008 and 2013) in order to provide data for various technical tasks in the Supplement to the Draft EIS/EIR. This section discusses the development of the 2015 activity profile and design day schedule for Alternative D. Appendix D contains a discussion of the 2005, 2008, and 2013 interim year activity profiles for Alternative D.

### **3.1 ACTIVITY FORECASTS AND FACILITY CONSTRAINTS**

Airport proprietors commonly forecast air travel demand and study the effects of air service market tendencies on their airport and community. The forecasts assist airport proprietors in planning for and providing sufficient air transportation facilities in a timely manner to meet market needs. While air transportation is a federal priority, the federal government does not determine where and how to serve this demand; this critical element is left up to individual airlines. Similarly, the federal government does not determine the need for or

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<sup>1</sup> The “unconstrained aviation demand forecast profile” refers to both the volume and manner in which airline operations are conducted.

location of airport facilities to accommodate projected air traffic demand. Thus, airport facility planning is a local government function. Local agencies plan for efficient and compatible airports and surrounding land use in their communities with the least amount of external impacts on people and the environment.

The starting place for the facility design concept for Alternative D was to design basic airport and ground access facilities that enhance airport safety and security while retaining the ability to serve aviation activity equivalent to the projected No Action/No Project level while reducing the impacts associated with the No Action/No Project Alternative. This design approach was an iterative process that reapplied projected market forces to the constrained facilities to forecast the changes that would likely occur at LAX if this policy and the associated facilities were developed. Finally, the airport and ground access facilities were refined, as necessary, to best reflect the forecast for the constrained market changes.

The most constraining component of an airport defines the practical capacity<sup>2</sup> of the entire airport. An airport is a complex system made up of components through which passengers and aircraft flow in a sequential order. Aircraft arriving at the airport pass through the airspace, land on the runways, travel on the taxiways and proceed to the terminal gates to unload and reload passengers. Once loaded and ready for departure, the aircraft pass through these same components in reverse order.

Passengers move through the system in a similar set of sequential steps. Departing passengers travel on local roadways and on-airport roads, arrive at the terminal from the curbside, parking, or other shuttle facility, are processed in the terminal and proceed to the designated aircraft gate for boarding. Arriving passengers generally proceed through these steps in reverse order upon arrival at an airport. Exceptions for arriving passengers include domestic connecting passengers who board other flights, international arrivals who move through FIS facilities and baggage claim before they connect to other flights or use ground transportation facilities.

Each component of the airport system, the airfield, terminal passenger facilities and the curbside, has an operational or passenger capacity that is a function of the physical characteristics of the component. The annual passenger level served by the overall airport system is related to the hourly capacity of its weakest component. The relationship between hourly aircraft operations,

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<sup>2</sup> The "unconstrained aviation demand forecast profile" refers to both the volume and manner in which airline operations are conducted.

design day<sup>3</sup> operations and annual operations is based on fluctuations in passenger market service patterns throughout the design day and in seasonal market fluctuations throughout the year. These market fluctuations are driven by passenger travel needs and by airport facility limitations when these limitations are present in the system.

Each of the Master Plan alternatives has facility constraints that would limit its ability to accommodate the forecast of unconstrained passenger and cargo demand to varying degrees. Even Alternatives A and B that accommodate the forecast for both passengers and cargo nonetheless require adjustments in airline schedules to do so because of airfield limitations. When an airport system component is operating at capacity, it means that it is processing a maximum level of hourly operations given its characteristics and procedure. Increasing the capacity of other components does not increase the capacity of the system. For example, if a runway is operating at its throughput operational capacity and, by definition, accepting the maximum number of hourly arriving and/or departing flights without regard for delay, increasing the number of gates will not improve the airport's ability to accept more arriving flights. The runway system would have to be expanded to increase the throughput operational rate.

### **3.2 ANNUAL PASSENGERS/TONS AS A COMMON PERFORMANCE METRIC**

Top-down forecasts of unconstrained aviation demand, or forecasts based on macro-economic drivers, are expressed in terms of annual passengers and annual tons of cargo. Forecasts of aircraft operations to serve this demand must be derived through the application of historical and forecast market factors. These market factors include O&D and connecting passenger splits, aircraft fleet mix (in terms of seats per departure or tons per departure), load factor (passenger enplanements or cargo tons per departure), annual operations ratios (annual aircraft operations divided by design day aircraft operations) and annual passenger ratios (annual passengers divided by design day passengers). Conversely, these same factors can be applied to hourly airfield constraints expressed by aircraft operations to convert them to annual passengers or tons of cargo.

Each of the above-listed market factors varies widely from one airport to another and must be evaluated individually to create a complete

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<sup>3</sup> The "unconstrained aviation demand forecast profile" refers to both the volume and manner in which airline operations are conducted.

airport activity profile. It is reasonable to compare historical aviation activity statistics among several airports; however, it is of little value to compare forecast levels of passenger and cargo activity without knowing the above listed market factors for each airport in the comparison. An extensive historical record and forecasting effort to define each of these parameters and their application at LAX was undertaken as a part of the LAX Master Plan (see Chapter 3 of the Draft LAX Master Plan, January 2001). It is from this body of information that detailed design day forecasts have been developed for each of the LAX Master Plan alternatives.

A projected design day and annual performance measure of total passengers and total cargo has been computed for each Master Plan alternative. Alternative D has a passenger and cargo activity level that is determined by the ability of facilities in that alternative to serve the unconstrained market demand. Figure 1.2-1 summarizes the Master Plan alternatives and their corresponding activity levels. The No Action/No Project Alternative is limited by the capacity of the curbside in the CTA where passengers are dropped-off and picked-up in front of the existing terminals. The resulting annual passenger performance measure of this alternative is approximately 78.7 million. Alternatives A and B include a fifth runway and were designed to serve the 2015 passenger demand forecast. Alternative A and B would accommodate approximately 97.9 MAP.<sup>4</sup> Alternative C's projected annual passenger activity level served is limited by the capacity of the four-runway system and is forecast to be approximately 89.6 million. The constrained activity profiles for Master Plan Alternatives A, B, and C are discussed in Chapter V of the Draft LAX Master Plan in Section 3.3.2. Extensive analysis is included in that document, establishing the levels of passengers that each alternative is designed to accommodate. Alternative D was designed to accommodate approximately the same level of passenger activity as the No Action/No Project Alternative.

### **3.3 2015 ALTERNATIVE D ACTIVITY**

The following sections discuss the activity levels associated with Alternative D in 2015. The plans have been developed to provide gate facilities that would promote a regional solution to air travel for the Los Angeles region.

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<sup>4</sup> The "unconstrained aviation demand forecast profile" refers to both the volume and manner in which airline operations are conducted.

### **3.3.1 AIRCRAFT ACTIVITY**

Alternative D peak hour aircraft operations activity was projected based on the capacity of the existing four-runway system at LAX in visual operating conditions. Given that the airport was operating with high peak hour delays and a significant number of cancelled flights during poor weather conditions in 1996, peak hour operations in the 2015 activity scenario were projected not to exceed the 1996 levels. However, operations were projected to increase in other hours as warranted by market demand.

The resulting total daily aircraft operations are forecast to be the same as the No Action/No Project Alternative and less than Alternative C. This difference in total operations is due to the fact that Alternative D would not be designed to accommodate the same level of cargo activity as Alternative C (and the other build alternatives). It is also projected that design day cargo aircraft operations levels would be below the unconstrained forecast operations demand.

### **3.3.2 PASSENGER ACTIVITY**

As stated previously, Alternative D would be designed to accommodate the same design day aircraft operations as the No Action/No Project passenger level. The passenger activity that would be expected in 2015 with Alternative D was determined based on the design of the Alternative D gate facilities and the projected airline response to the constrained facilities. The following sections describe the steps taken to develop the Alternative D constrained design day forecast schedule.

A passenger capacity analysis was conducted to allow aircraft size (as measured by enplanements per departure) to increase beyond 1996 and 2000 levels without significantly exceeding the 2015 unconstrained forecast enplanements per departure for each air service region. This enabled the enplanements per departure ratios for the domestic and international fleet to grow to a level between the 2010 and 2015 Master Plan forecast. The average commuter fleet size (again measured by enplanements per departure) was able to grow to the 2015 unconstrained forecast level. On average, the proportion of air carrier and commuter operations results in an enplanements per departure ratio similar to the No Action/No Project Alternative. The ability to increase aircraft size, thereby increasing passenger levels, was limited by the number and type of gates available under the Alternative D terminal design. By comparison, Alternative C was designed to test the limit of the market to serve passenger and cargo demand within the constraint of a four-runway system at LAX. Gate space is provided in Alternative C as necessary to accommodate the projected increase in average fleet size that serves both the

international and domestic markets. As the projections in the following section indicate, the design of Alternative D would encourage airlines to choose the most efficient use of the gate facilities at LAX and supplement high-frequency domestic service at other airports in the region.

### **3.3.3 AIR SERVICE CHANGES**

Alternative D is projected to meet 87 percent of the unconstrained 2015 O&D passenger demand forecast and 82 percent of the 2015 international passenger demand forecast. **Figure 3.3-1, Figure 3.3-2, and Figure 3.3-3** present a comparison of forecast air service operations between the No Action/No Project, Alternative D, and unconstrained demand at LAX. The forecast of air service changes at LAX, as a reaction to the airport facilities available under Alternative D, is based on the following projections and expectations:

- ◆ High priority would be given by the airlines to accommodating O&D passengers. However, it would still be important to maintain a minimum level of connecting passengers to maintain LAX's role as a hub and an international gateway. Accommodating O&D passengers would be maximized to the extent possible within these guidelines; resulting in 87 percent of the 2015 unconstrained O&D demand forecast being accommodated in Alternative D. The projected number of Alternative D O&D passengers as a percent of total passengers would be similar to the forecast for Alternative C.
- ◆ Commuter operations would likely be reduced from 1996 levels, consistent with the forecasts for No Action/No Project Alternative and Alternative C, in order to maximize the number of passengers that could be served with a limited number of operations. It is also projected that some of the forecast commuter O&D demand would be served by domestic air carrier flights.
- ◆ Domestic air carrier connecting passengers would decrease from 2015 forecast levels to reflect the projected loss of connecting passengers from commuter flights.
- ◆ The domestic air carrier hourly profile would be de-peaked and service would be reduced from 2015 unconstrained forecast levels in the Central, Eastern, and Asia-Pacific regions to reflect the projected response from the airlines to the airfield constraints. The airlines would adjust their schedules to allow for more profitable and less flexible international operations to be scheduled at peak periods. Time zone and airport operating restrictions at international destinations in both Asia

and Europe place limitations on the arrival and departure times for flights to these world regions.

- ◆ The percentage of domestic and international air carrier O&D passengers would increase as the airlines attempt to serve the unconstrained forecast O&D demand with fewer operations. As a result the projected percentage of connecting passengers would decrease.
- ◆ The average aircraft size would increase from existing levels without significantly exceeding the unconstrained forecast seats per departure for each air service component. This is reflective of the already large fleet size serving LAX.
- ◆ Cargo operations would be equivalent to those forecast in the 2015 No Action/No Project Alternative.
- ◆ Total general aviation activity would remain at 1996 and 2000 levels and operations would move out of peak hours to avoid excessive arrival and departure delays.

**Table 3.3-1** contains a comparison of the resulting 2015 Alternative D aviation activity forecast, the actual 1996 and 2000 aviation activity, the unconstrained 2015 forecast and the forecasts for the other Master Plan alternatives. The corresponding aircraft operations and passenger activity profiles are contained in Appendix F.

### **3.3.4 CARGO ACTIVITY**

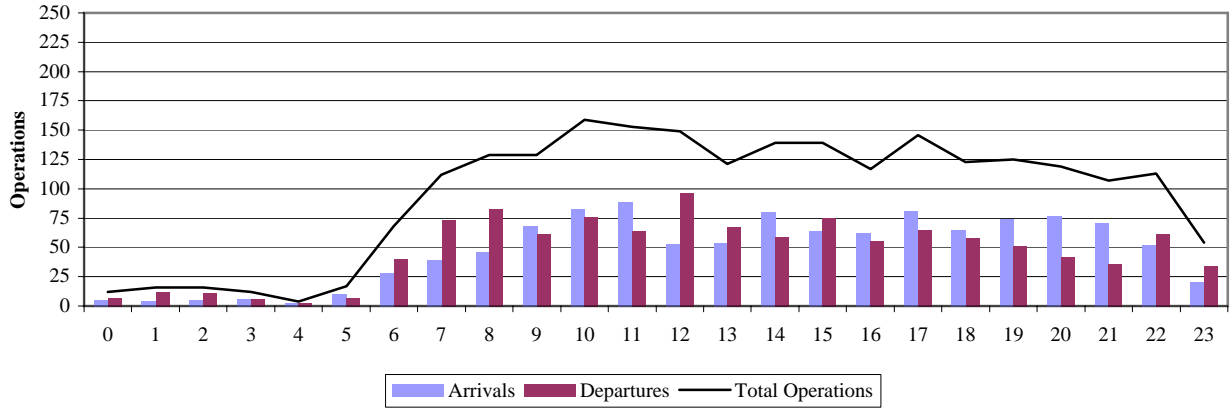
The Alternative D cargo activity is determined by the amount of cargo sort space available to process cargo tonnage. This sort space would be measured in square feet of cargo building space. The Alternative D cargo facilities would be sized to accommodate approximately 3.1 MAT, which is the total cargo volume forecast in the constrained No Action/No Project Alternative.

The effective constraint on cargo activity in Alternative D would be the lack of sufficient cargo building space to process the unconstrained cargo activity forecast. The most effective representation of this constraint is illustrated by the utilization rates, or tons per square foot, for the available warehouse space. A common benchmark in the industry is to process approximately 0.9 to 1.0 annual ton of cargo for each square foot of cargo warehouse space available. Higher space utilization rates, ranging from 1.1 to 1.42 annual tons per square foot, are expected for domestic and express cargo, with lower space utilization rates, ranging from 0.5 to 0.6 annual ton per square foot, expected for international freight due to the added time associated with customs clearing and fewer available flights.

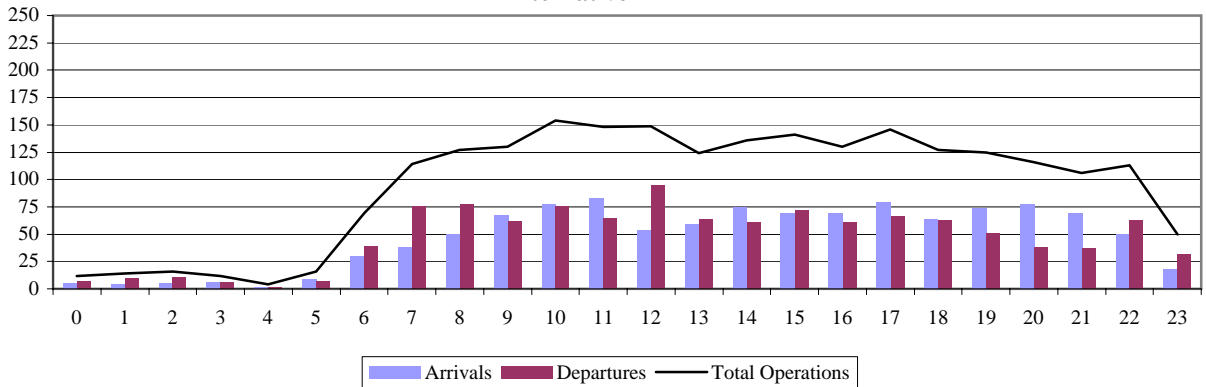
The space utilization rate (excluding air mail) calculated for Alternative D is 1.22 tons per square foot. This rate is based on 2.3 million square feet of cargo building space and approximately 3.1 MAT of cargo. It is the weighted average of the domestic and express cargo (approximately 2.09 tons per square foot) and international cargo (approximately 0.8 tons per square foot). Based on current cargo activity, the split is 32 percent domestic and 68 percent international.

The cargo space utilization rates for Alternative D exceed both the industry benchmark rates and the high utilization rates already experienced at LAX. Improvements in cargo technologies and building efficiencies would be needed to realize the future utilization rates projected for Alternative D. If regional air cargo demand forecasts are achieved, additional cargo demand pressure will be placed on other regional airports to process a greater proportion of the regional cargo activity closer to the source of the demand.

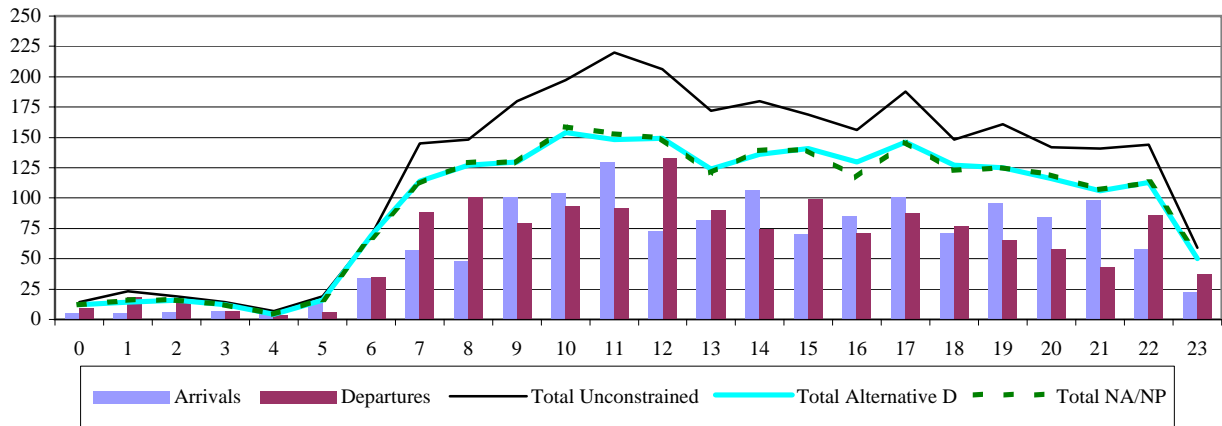
### No Action/No Project Alternative



### Alternative D

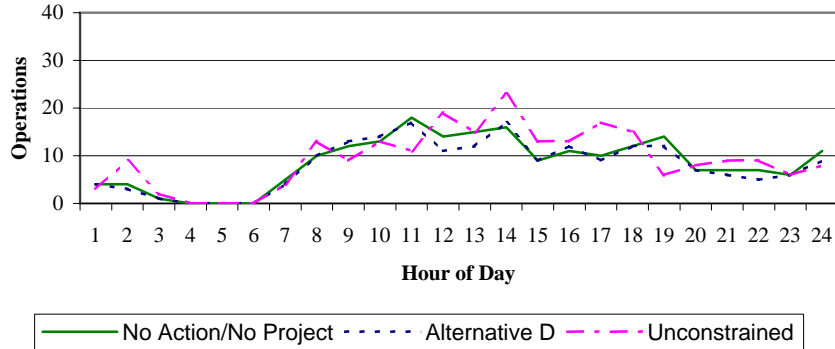


### Unconstrained

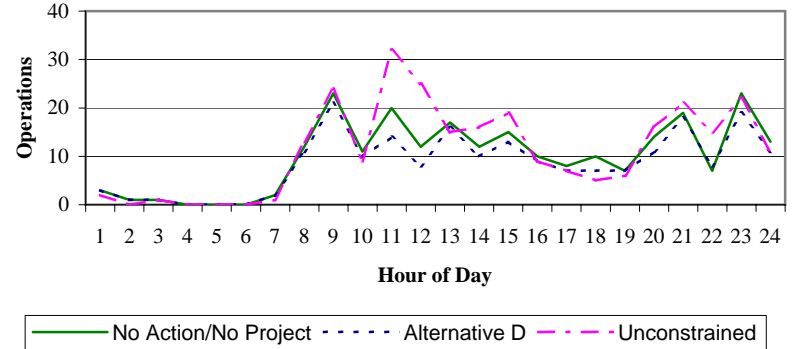


Prepared by: Landrum & Brown  
 Draft: April 21, 2003

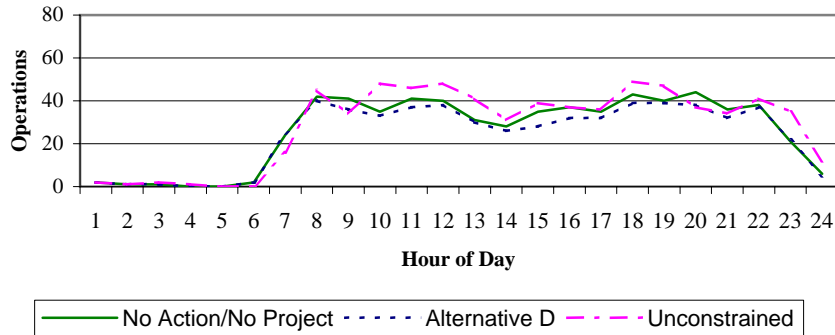
**U.S. Central Time Traffic**



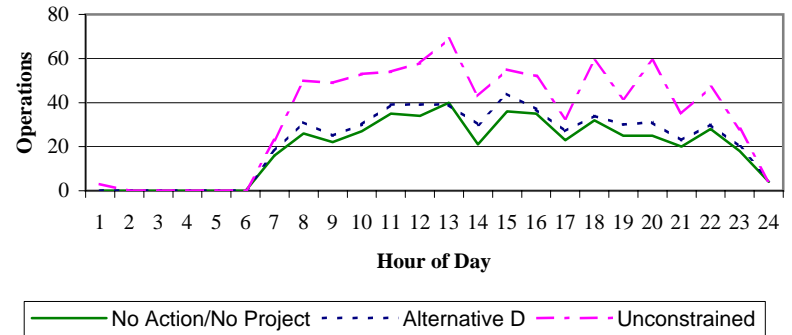
**U.S. Eastern Time Traffic**



**U.S. Pacific/Mountain Time Traffic**

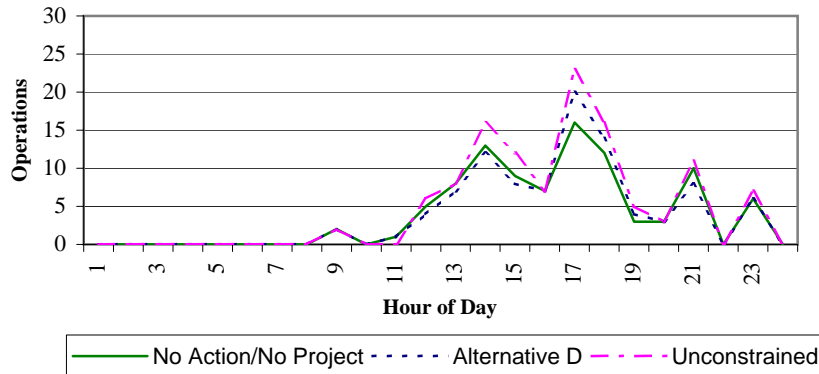


**Commuter Traffic**

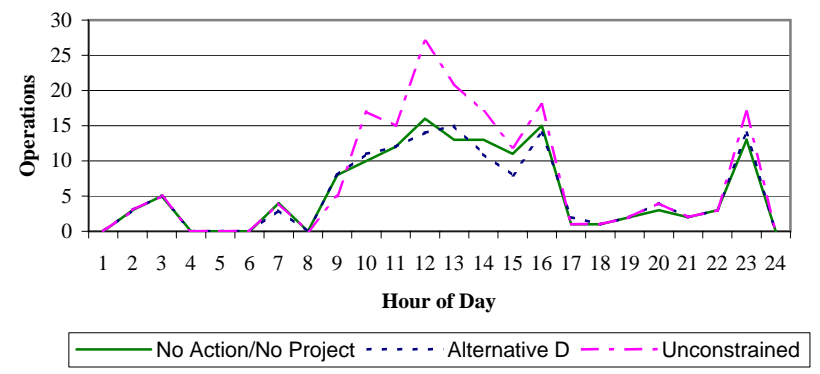


Prepared by: Landrum & Brown  
 Draft: May 3, 2002

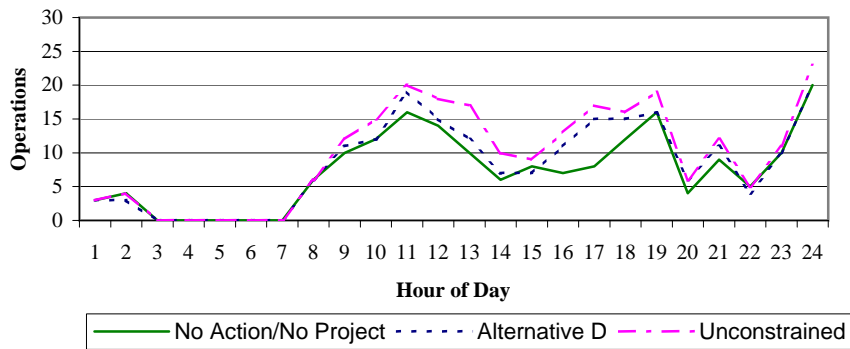
**European Traffic**



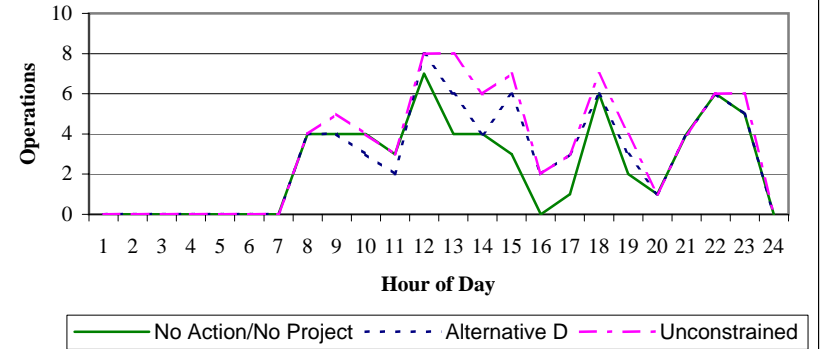
**Far East Traffic**



**Mexico and Latin America Traffic**



**Canada Traffic**



Prepared by: Landrum & Brown  
 Draft: May 3, 2002

# ALTERNATIVE D CONSTRAINED ACTIVITY

Table 3.3-1

**2015 Activity Comparison**

Commercial Passenger Operations									
Domestic									
	Air		Hawaii	Total	Int'l <sup>1</sup>	Total		GA & MI	Total
	Carrier	Commuter				Commercial	Cargo		
<b>Design Day Operation</b>	1,150	644	49	1,843	212	2,055	76	104	2,235
1996 Actual	1,227	474	52	1,753	301	2,054	117	104	2,279
2000 Actual	1,069	467	54	1,590	468	2,058	117	104	2,279
2015 No Action/No Project	1,206	584	58	1,848	604	2,452	157	110	2,719
2015 Alternatives A & B	1,120	317	57	1,494	564	2,058	157	104	2,319
2015 Alternative C	975	532	53	1,560	498	2,058	117	104	2,279
2015 Alternative D	1,176	816	58	2,050	604	2,654	157	110	2,921
2015 Unconstrained									
<b>Design Day Passengers</b>									
1996 Actual	127,417	7,595	12,516	147,528	38,984	186,512	n/a	n/a	n/a
2000 Actual	138,565	8,232	11,480	158,277	57,368	215,645	n/a	n/a	n/a
2015 No Action/No Project	141,332	10,147	14,423	165,902	92,427	262,329	n/a	n/a	n/a
2015 Alternatives A & B	172,977	13,287	16,283	202,547	123,782	326,329	n/a	n/a	n/a
2015 Alternative C	160,041	6,911	15,947	182,899	115,689	298,588	n/a	n/a	n/a
2015 Alternative D	134,982	11,937	14,702	161,621	101,137	262,758	n/a	n/a	n/a
2015 Unconstrained	167,914	18,319	16,320	202,553	123,827	326,380	n/a	n/a	n/a
<b>Design Day Enplanements per Departure</b>									
1996 Actual	110.80	11.79	255.43	80.05	183.89	90.76	n/a	n/a	n/a
2000 Actual	112.93	17.37	220.77	90.29	190.59	104.99	n/a	n/a	n/a
2015 No Action/No Project	132.21	21.73	267.09	104.34	206.04	127.47	n/a	n/a	n/a
2015 Alternatives A & B	143.43	22.75	280.74	109.60	204.94	133.09	n/a	n/a	n/a
2015 Alternative C	142.89	21.80	279.77	122.42	205.12	145.09	n/a	n/a	n/a
2015 Alternative D	138.44	22.44	277.40	103.60	203.09	127.68	n/a	n/a	n/a
2015 Unconstrained	142.72	22.45	281.38	98.81	205.01	122.98	n/a	n/a	n/a
<b>Annual Operations</b>									
1996 Actual	n/a	233,832	n/a	620,565	91,641	712,206	23,682	27,978	763,866
2000 Actual	n/a	172,770	n/a	609,758	101,033	710,791	37,270	19,412	767,473
2015 No Action/No Project	365,300	160,400	17,900	543,700	168,800	712,500	36,000	35,000	783,400
2015 Alternatives A & B	412,100	200,600	19,300	632,000	217,800	849,800	48,300	37,000	935,100
2015 Alternative C	382,700	108,900	18,900	510,600	203,400	714,000	48,300	35,000	797,200
2015 Alternative D	333,200	182,800	17,600	533,600	179,600	713,100	36,000	35,000	784,000
2015 Unconstrained	401,900	280,300	19,300	701,500	217,800	919,300	48,300	37,000	1,004,600
<b>Annual Passengers</b>									
1996 Actual	n/a	2,759,991	n/a	43,942,028	14,032,531	57,974,559	n/a	n/a	n/a
2000 Actual	n/a	2,918,282	n/a	49,926,815	17,376,367	67,303,182	n/a	n/a	n/a
2015 No Action/No Project	42,232,000	3,115,400	4,510,900	49,858,300	28,856,900	78,715,200	n/a	n/a	n/a
2015 Alternatives A & B	51,688,000	4,079,400	5,092,600	60,860,000	37,043,200	97,903,300	n/a	n/a	n/a
2015 Alternative C	47,822,500	2,121,800	4,987,500	54,931,800	34,621,300	89,553,200	n/a	n/a	n/a
2015 Alternative D	40,334,500	3,664,900	4,598,200	48,597,600	30,266,500	78,864,100	n/a	n/a	n/a
2015 Unconstrained	50,175,000	5,624,000	5,104,000	60,903,000	37,057,000	97,960,000	n/a	n/a	n/a
<b>Annual Enplanements per Departure<sup>2</sup></b>									
1996 Actual	n/a	11.80	n/a	70.81	153.13	81.40	n/a	n/a	n/a
2000 Actual	n/a	16.89	n/a	81.88	171.99	94.69	n/a	n/a	n/a
2015 No Action/No Project	115.61	19.42	251.40	91.70	170.98	110.48	n/a	n/a	n/a
2015 Alternatives A & B	125.42	20.33	264.25	96.29	170.07	115.20	n/a	n/a	n/a
2015 Alternative C	124.95	19.48	263.34	107.59	170.22	125.43	n/a	n/a	n/a
2015 Alternative D	121.06	20.05	261.10	91.08	168.53	110.59	n/a	n/a	n/a
2015 Unconstrained	124.86	20.06	264.85	86.82	170.13	106.56	n/a	n/a	n/a

<sup>1</sup> Canadian passengers and operations are included in the international totals.

<sup>2</sup> Annual Enplanements per Departure reflect the seasonal fluctuations in passenger demand throughout the year as compared to the peaking characteristic of the Design Day and the associated Design Day Enplanements per Departure. For reference, "Design Day" is defined as the average of the week day activity in the peak month of the year.

Source: Landrum & Brown, 2002.

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