Technical Report
LAX Master Plan EIS/EIR

5. Economic Impacts of Los Angeles International Airport and the LAX Master Plan Alternatives on the Los Angeles Regional Economy

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1. EXECUTIVE SUMMARY

Regional airports play an essential role in supporting the growth of a metropolitan economy like that of the five-county Southern California region.[1] They directly employ thousands of workers and produce millions of dollars per year in taxes and other revenues for the host jurisdiction. More generally, they support the growth of the regional economy by facilitating the efficient movement of people, goods and services that originate in, or are transported through, the region in response to its amenities and market opportunities. Airports and related aviation facilities create competitive advantages for a region that become structurally integrated into its economy by enabling industries that either depend on, or learn to take advantage of, efficient air transportation to access domestic and international markets. Los Angeles International Airport (LAX) plays this growth-facilitating role in Southern California.

The scale of current and future economic activity associated with a regionally significant airport like LAX -- expressed in numbers of jobs and dollars of economic output -- can be measured by tracing the relationships between sectors of the economy that depend on air transportation and the number of air passenger enplanements and deplanements and tons of air cargo loaded and unloaded at the airport. **Figure 1**, illustrates the analytic framework used to estimate the direct economic impacts of passenger and cargo activity at LAX in the Southern California regional economy, today and in the future, under four alternative growth concepts being considered by City of Los Angeles decision makers.

These relationships change over time in response to changes in the structure of the economy, the nature of the industries in it and the costs of doing business. In order to account for the dynamic character of these relationships over the 20-year planning horizon of the LAX Master Plan, the economic impacts of the Master Plan alternatives were estimated using an econometric forecasting model of the Southern California region developed by Regional Econometric Models, Inc. (REMI). REMI models have been used extensively around the nation to test the economic effects of alternative policy options on particular regions. Locally, the REMI model is also used regularly to estimate the economic effects of the Air Quality Management Plans prepared every few years by the South Coast Air Quality Management District.

The analysis of LAX's contribution to the regional economy that is presented in this Report differs from previous LAX impact studies in several ways:

- **Dynamic Modeling to Support the Alternatives Development and Evaluation Processes.** The purpose of this LAX economic impact analysis differs fundamentally from the one-time "snapshot" of LAX's impact on the regional economy that has been prepared in the past, and from similar analyses performed for other airports around the nation. A future-oriented impact analysis capable of testing different LAX development scenarios calls for a very different modeling approach. Specifically, a dynamic econometric modeling approach is required instead of the more conventional static input-output approach, in order to account for the complexities of the economic interactions between LAX and the regional economy over time. An econometric model forecasts employment, wages, output, relative costs, and other variables for industries in a region as the relationships among them, and the costs of production, change over time.
- **Accounting for the Network Economics Characteristics of Regional Airports.** Traditionally, airport economic impact analyses have concerned themselves with inbound and outbound passenger and freight cargo. In most cases, they have examined the impact of connecting traffic of both types only to the extent that connecting passengers contribute to retail sales at the airport, and hence local sales tax receipts, and to the extent that cargo value was assumed inherently to have some multiplier affect in the region, even if it were merely moving through the airport without being used in the region. Likewise, the analysis of the impacts of connecting passengers is often limited to measuring the sales tax they contribute to the local jurisdiction. These approaches underestimate the total economic impact of an airport like LAX that facilitates a substantial amount of connecting passenger and cargo traffic. The large volume of connecting traffic routed through LAX is what enables the airport to serve efficiently as a major hub. Two broad types of benefits are provided by hub airports to their regions: (a) lower ticket prices for inbound and outbound passengers; and (b) greater frequency of flights into and out of the airport.
- **Explicitly Accounting for Productivity Changes Over Time.** All forecasts of the future of the region's economy indicate that there will be an erosion in the base year number of jobs due to productivity improvements. The region will produce more with fewer people, through technological

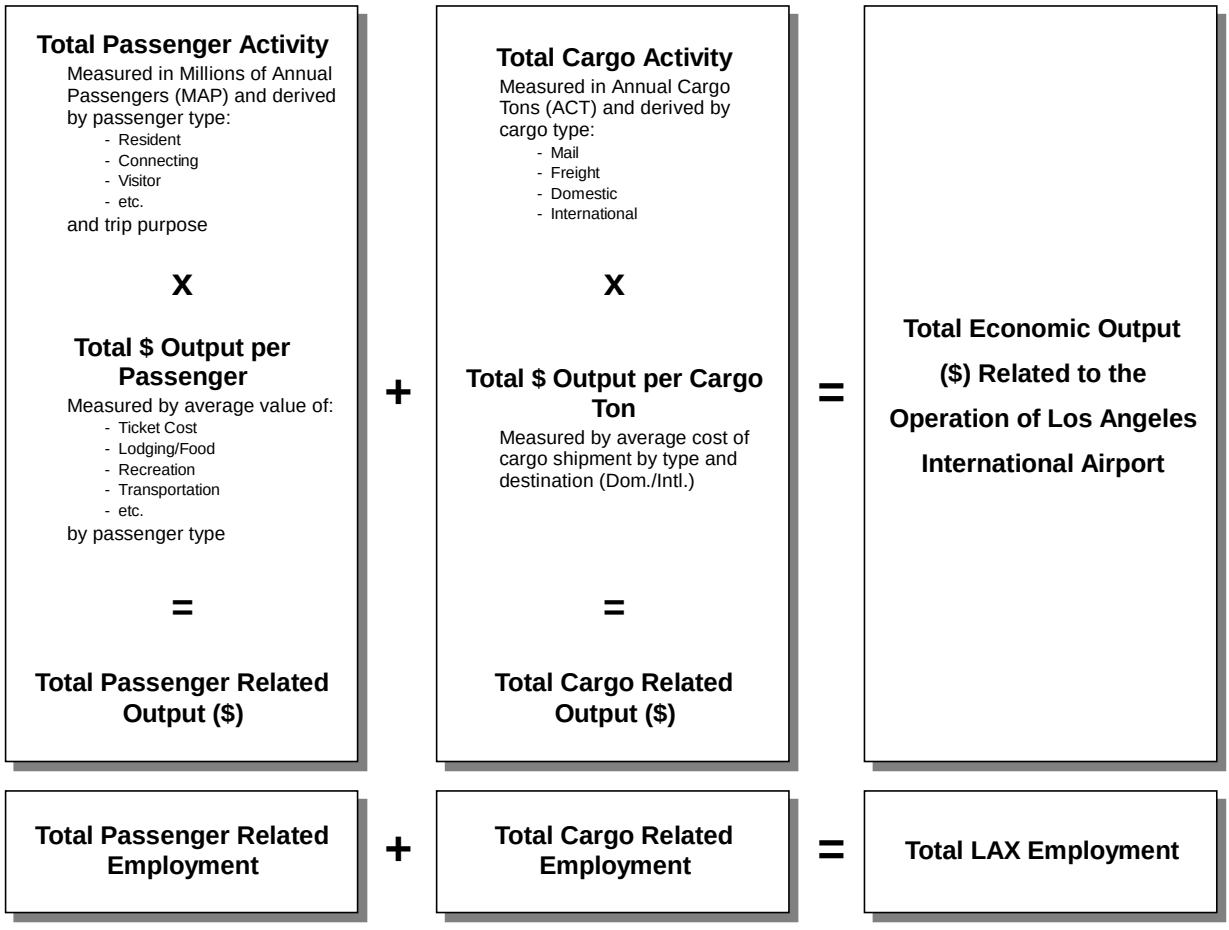
[1] For purposes of this analysis, the five-county Southern California region includes the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura.

and other changes in production, particularly in the manufacturing sectors. HR&A's modeling work was designed to account explicitly for these effects. In the No-Build Alternative, for example, productivity-related job losses overwhelm that alternative's low level of incremental new employment, producing fewer total LAX-related jobs in the region in 2015 than existed in 1996. Each of the other "build" EIS/EIR alternatives, on the other hand, supports a rate of regional economic growth that results in a net jobs increase between 1996 and 2015.

Analysis using the REMI model was supplemented with a wide range of data to establish the statistical relationships between changes in the regional economy and the principal variables that define alternative LAX Master Plan concepts – volume of air transportation services, passenger volumes, by type of passenger, and cargo tonnage, by type of cargo. These data were assembled from historical records, surveys of passengers and interviews with a wide range of businesses in the region, which depend on air transportation services. Special efforts were made to also understand the geographic distribution of the economic impacts of LAX Master Plan alternatives within the five-county region, particularly within the City and County of Los Angeles.

Figure 1

Economic Impact Accounting Framework for LAX Master Plan EIS/EIR Alternatives



Based on the above accounting framework, it is estimated that LAX was directly linked to about 408,000 jobs in the regional economy in 1996. About 48,700 (12%) of these jobs are in the air transportation and

airport government sectors. An additional 109,500 (27%) jobs are in the various passenger spending sectors. The remaining 249,500 (61%) jobs are in the manufacturing sectors which rely heavily on LAX in order to move manufactured goods into and out of the regional economy. Of the total, about 59,000 (14%) are Airport jobs, and are found at, or in the area immediately surrounding, LAX. If LAX could expand operations to fully accommodate the projected future growth of the regional economy by the year 2015, it would be associated with about 448,000 jobs throughout the region, a 10 percent increase. But, full accommodation of this demand is not being contemplated. Instead, LAWA is proposing three less extensive "build" alternatives for the future of LAX as well as a "no-project" alternative. In brief, these Alternatives are:

- **No-Project Alternative.** This alternative assumes that no new improvements would be implemented during the next 20 years at LAX, with the exception of currently planned and programmed projects at the airport and related regional transportation infrastructure. The airlines can be expected to change the air service provided at the airport as a result of the capacity limitations which would result. The fleet of aircraft would include a larger share of wide-body aircraft up to the capacity of the terminals. Congestion, delays, and passenger inconvenience would be common all year, not just during peak holiday periods. This Alternative assumes that annual air passenger volumes would continue to increase to 71.2 MAP by 2005, from 57.97 MAP in 1996. But, as a result of capacity constraints, future annual passenger growth beyond 2005 would slow considerably, so that it reaches 78.7 MAP by 2015, or roughly 80% of forecasted demand. This Alternative also assumes that cargo volumes would increases to 3.1 ACT in 2005, from 1.9 ACT in 1996, but that no further ACT growth would occur between 2005 and 2015, due to operating constraints at LAX.
- **Build Alternative A - Five Runways-North Airfield.** This alternative adds a new 6,700-foot Runway 24R on the north airfield approximately 400 feet north of the existing Runway 24R location. The existing Runways 24C and 24L would be relocated to be roughly 800 and 1,600, respectively, from Runway 24R. Runway 24L would also be extended to 12,000 feet. The terminal facilities would be expanded to the west with a new western entrance and landside terminal facilities. A people mover would provide passenger access from the new west short-term parking garage and the west terminal to the new concourses west of the Tom Bradley International Terminal (TBIT) and to the Central Terminal Area (CTA). Cargo facilities would be expanded in the southeast corner of the airport. Additional land would be acquired in that area to provide additional area for the cargo facility expansion. Construction of the improvements included in Alternative A would enable LAX to accommodate 71.2 MAP by 2005. By 2015, completion of the Alternative A improvements would enable LAX to accommodate 97.9 MAP, or nearly all of forecasted demand. These improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons (ACT) in 2005 and 4.2 ACT by 2015, which is 100 percent of forecasted cargo demand for that year.
- **Build Alternative B - Five Runways-South Airfield.** This alternative adds a new 6,700-foot runway on the southside in the existing cargo area. The existing south runways would be relocated north so that the lateral spacing between the south inboard runway and the new runway would be 2,500 feet. This separation would provide for staggered approach capability on the south complex with Category 1 weather minimums (200-foot ceilings and 1-mile visibility). The terminal improvements are similar to the other Alternatives, except that the south CTA terminals would be reconfigured as the north terminal area is reconfigured in Alternative A. A people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The cargo facilities would be relocated to the area north of Century Boulevard in the Manchester Square community and in the Continental City/Imperial East area. The annual passenger volume growth assumptions for Alternative B are identical to Alternative A (i.e., 71.2 MAP in 2005 and 97.9 MAP in 2015), and so are the assumptions about growth in airfreight cargo tonnage (i.e., 3.1 ACT in 2005 and 4.2 ACT in 2015).
- **Build Alternative C – Four Runways.** This alternative maintains the existing four runway system with modifications to the two north airfield runways and to one runway in the south airfield. In the north airfield, Runways 24R and 24L would be relocated, widened, and extended. In the south airfield, Runway 25L would be relocated, and Taxiways B and C would be realigned and widened. Terminal facilities would be expanded to the west, and a people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The road system for moving air cargo would be improved with the construction of a continuous air cargo circulator roadway along the airport property boundary. Alternative C improvements would enable LAX to accommodate 71.2 MAP by 2005, and 89.6 MAP by 2015, or roughly 91% of forecasted demand. These

improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons in 2005 and 4.2 ACT by 2015, or 100 percent of forecasted airfreight cargo demand, just as in Alternatives A and B.

The economic impacts of the LAX Master Plan EIS/EIR Alternatives were derived by applying the impact accounting framework to the annual passenger volume and cargo tonnage values for each Alternative, as developed by Landrum & Brown. HR&A estimated the amount of direct economic output and the number of jobs associated with each Alternative, the incremental increase in direct output and jobs during the 1996-2015 period, and the impacts of capital expenditure to construct each Alternative. The results for Alternatives A and B do not differ substantially from the 2015 demand forecast, because the passenger volume and cargo tonnage values associated with these Alternatives are only marginally different from those associated with the demand forecast. Alternative C, however, does result in noticeably lesser economic impacts due to its having lower passenger volume after the year 2005.

In 1996, the base year for the analysis reported here, LAX was directly related to over $60 billion[2] in total economic output and about 408,000 jobs, or one out of every 20 jobs in the regional economy. The total includes about 59,000 jobs at LAX, with the balance in a wide range of passenger spending-related jobs and airfreight cargo-related manufacturing jobs in other locations. When the multiplier effect of these direct impacts is taken into account, LAX's impact in the region swells to $110 billion and 932,000 jobs. Most of this impact occurs in the City and County of Los Angeles, and more particularly, within a 20-mile radius around LAX.

For the 1996-2015 period, HR&A's estimates reflect the implications of productivity improvements over time, due to technology, process and management improvements, as estimated by the REMI model. This means that there are likely to be decreases in the number of jobs in some LAX-related sectors over the 1996-2015 period -- particularly in the manufacturing sectors associated with LAX cargo activity -- even with the employment growth associated with the build-oriented LAX Master Plan Alternatives. This is why the total number of direct jobs in 2015 that is associated with each Alternative is less than the sum of the 1996 base and the incremental jobs produced over the 1996-2015 period.

Table 1, Total Direct Economic and Employment Impacts of the LAX Master Plan in the Southern Californian Region by EIS Alternative 1996, 2005, and 2015, summarizes the estimated economic output and number of jobs in the five-county region that would be directly linked to construction and operation of LAX under each of the LAX Master Plan EIS/EIR alternatives.

The economic output and total number of direct jobs in 2015 and the incremental jobs over the 1996-2015 project implementation period, for each LAX Master Plan EIS/EIR Alternative, were also distributed within the five-county region by census tract. HR&A's employment distribution model assumes that jobs in each of the industry sectors affected by the LAX Master Plan will be distributed geographically in the same proportions that all jobs in those industry sectors were distributed in 1990, according to the U.S. Census. Interviews with several well known labor economists and geographers indicate that, although some intraregional industry locational shifts will undoubtedly occur between now and 2015, the 1990 distribution of jobs by industry remains the most reasonable basis for making estimates about the future distribution of LAX-related jobs in 2015.

Distributing the output and jobs by census tract makes it possible to provide estimates of total and incremental jobs at the county and city levels, as well as at the City Council District and Community Plan Area within the City of Los Angeles. About three-quarters (78%) of the total and incremental direct jobs will be located within 20 miles of LAX. The largest concentration of jobs is within the City of Los Angeles, but other concentrations occur in the cities immediately adjacent to or near LAX (e.g., Torrance) and a few cities further afield (e.g., Burbank, Long Beach and Anaheim), where there are concentrations of industries that depend on efficient international air transportation services. Los Angeles City Council District 6 (Galanter), where LAX is located, will capture the largest share (roughly 33%-40%) of incremental jobs (17,000-23,000) and total jobs (69,000-75,000) under the three "build" alternatives. All of the other Council Districts will experience employment growth, ranging between 1,250 and 7,500 incremental jobs. When the results of the estimates are sorted by City of Los Angeles Community Plan Area (CPA), the Western area, including the Westchester CPA around LAX, will capture just under half of all incremental jobs (24,000-31,000, or 44%-47%) and total jobs (89,000-96,000, or 49%-50%) under the three "build" alternatives. The CPAs in the Metro-Southern area, particularly the Wilshire, Hollywood and Central City CPAs, have the next highest concentration, with just under one-third of the jobs (about 17,500-21,000 incremental and 55,000-59,000 total). The balance of the jobs (about 13,000-14,000 incremental and 36,000-38,000 total, or 20%-24%) will be located in the San Fernando Valley CPAs.

[2] All dollar amounts are expressed in constant 1996 dollars.

Table 1

Total Direct Economic and Employment Impacts of the LAX Master Plan in the Southern California Region, by EIS/EIR Alternative, 1996, 2005 and 2015 (dollar amounts in millions of 1996 $)

Base Year	No Project		Alt. A -- New No. Runway		Alt. B -- New So. Runway		Alt. C -- Existing Runways	
1996	2005	2015	2005	2015	2005	2015	2005	2015
CUMULATIVE CONSTRUCTION IMPACTS (Economic Output and Jobs, not including impacts of land acquisition)								
NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA
ANNUAL OPERATIONS IMPACTS (Economic Output and Jobs)								
$60,439	$73,210	$63,697	$73,210	$83,726	$73,210	$83,726	$73,210	$82,175
407,670	424,968	350,110	424,968	448,083	424,968	448,083	424,968	425,369

Source: Hamilton, Rabinovitz & Alschuler, Inc.

Though decisions about which, if any, of the LAX Master Plan EIS/EIR alternatives should be adopted must result from a thorough review of many policy, environmental, revenue production and other considerations, this analysis makes clear what the scale of benefits, and potential costs to the region's future economic health could be , under each of the alternatives now under review.

2. PURPOSE AND SCOPE OF THE ANALYSIS

2.1 Introduction

This Report presents estimates of the economic impacts of the current and future operation of Los Angeles International Airport (LAX) on the economy of Southern California, particularly Los Angeles County and its political subdivisions, including the City of Los Angeles ("City"). Future operation of LAX will depend on the development plan selected by the Los Angeles City Council from among several alternatives – some involving little or no new construction and others involving a significant expansion of airport-related and other facilities. The estimates presented here are intended to assist the City Council, the staff and governing board of Los Angeles World Airports (LAWA), the operator of LAX, and the general public, in the process of assessing the relative merits of the LAX development alternatives.

This Report was prepared by Hamilton, Rabinovitz & Alschuler, Inc., under a subcontract to Landrum & Brown, Inc., the principal airport Master Plan consultant to LAWA.

2.2 Overview of Los Angeles International Airport

2.2.1 The Southern California Regional Airport System

The Southern California commercial airport system is different than other metropolitan airport systems in the United States.[3] Its unique character is largely due to the geographical size of the region and widespread distribution of population and employment. The five-county region encompasses 34,000 square miles, making it similar in size to the state of Ohio.[4] Over 14 million people reside in the region, making it the second largest population center in the U.S. after the New York City area. The sheer

[3] For a detailed description of the regional airport system, see Landrum & Brown, *LAX Master Plan, Chapter III, Forecasts of Aviation Demand*, Final Draft, February 26, 1996.

[4] Throughout this Report, the "Southern California region" means the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura.

geographic size and economic diversity of the region has caused the evolution of a multi-airport system that is found in only a few large metropolitan areas. Other regions with multi-airport system include New York, Chicago, Washington D.C., and the San Francisco Bay area. The Southern California region's six commercial jet service airports currently serve over 45 million domestic origin and destination passengers annually, which is more demand than that handled in any of the other five most populous U.S. metropolitan regions.

In addition to the region's six commercial jet service airports and the two regional (commuter) service airport (see **Figure 2,** Major Southern California Airports), there are 48 general aviation airports, 15 of which are designated by the FAA as "relievers" of corporate and general aviation traffic from the region's air carrier airports. There are also eight military bases in the region, several of which may be converted to civilian or joint military-civilian use during the LAX Master Plan planning period.

The region's airport system supports an unparalleled level of air service compared to that available in other metropolitan areas of the U.S. In 1994, there were approximately 390,000 scheduled air carrier departures to destinations outside of the region, with approximately 47 million seats. The majority of this air service (67 percent as measured by available seats) was accommodated at LAX.

Based on the type of air service, the region's eight principal commercial airports -- i.e., those with jet and commuter aircraft scheduled passenger service -- can be divided into four tiers as follows:

Tier 1 (LAX) – A major domestic and international gateway airport, LAX accommodates two-thirds of the region's domestic air service and virtually all of the international service. It had over 259,000 aircraft departures in 1994, with over 31 million available passenger seats. Airside facilities at LAX consist of four runways, which function as two sets of "dependent parallels." The current airfield configuration has an annual service volume (ASV) of 690,000 to 720,000 operations. There are 10 terminal buildings and additional remote passenger transfer areas which provide 133 total aircraft gates, as well as segregated arrival and departure curb-front access. Ample short- and long-term parking is available on and off the airport. Regional freeways and city streets provide ground access to the Airport via private automobiles and common carrier bus lines. The future expansion potential of this facility will be determined by the LAX Master Plan after consideration of four development alternatives now undergoing environmental review (hereinafter, "Alternatives").

Tier 2 (Ontario, Burbank, John Wayne) – Combined, these major domestic airports support approximately 30 percent of the region's air service to the rest of the U.S. Each airport had between 33,000 and 44,000 aircraft departures in 1994, with between three million and six million available departing domestic passenger seats. Ontario and John Wayne provide service in certain long haul markets and offer commuter feed service to LAX. Ontario Airport, which is also owned and managed by LAWA, currently operates under a California Air Resources Board policy restriction which caps air carrier operations at 125,000 per year. LAWA has petitioned for a 44 percent increase in this cap, to 180,000 annual air carrier operations. No specific policy limits or constraints on expansion of the Burbank-Glendale-Pasadena Airport currently exist, but disagreements among the three municipalities involved in joint ownership/operation of the facility have prevented the airport from meeting the demand for air service there. The potential for expansion at John Wayne airport is limited by both physical and policy constraints. The airport is limited to 8.4 million annual passengers as a result of a negotiated settlement in Federal court which lasts through 2005. In addition, there is a limit on the average number of daily air carrier departures to 73.

Tier 3 (Palm Springs, Long Beach) – These airports have limited air service out of the region. Both airports serve three short haul markets, with Palm Springs also having limited service in the medium and long haul ranges. In 1994, these airports had between 3,000 and 10,000 annual departures to destinations outside the region. In addition, Palm Springs Airport provides substantial commuter feed service to LAX (approximately 11,000 flights in 1994). Palm Springs has future development potential on currently undeveloped land immediately adjacent to the airport. The rather specialized and limited market at this location may not require major expansion, however. The physical expansion potential for Long Beach Airport is limited. In addition, there is a current policy limit of 41 air carrier operations per day, set by city ordinance. Cargo operations at the airport are also limited based on the total cargo tonnage. These restrictions have resulted in a substantial decrease in commercial passenger operations over the past six years. Today, Long Beach primarily serves general aviation operations.

Tier 4 (Oxnard and Palmdale) – These airports serve primarily as commuter feed airports to one or more other regional airports. In 1994, both airports served between 2,000 to 5,000 commuter flights to LAX. Since neither Oxnard (OXR) nor Pt. Mugu has ever provided extensive commercial passenger service,

terminal, parking and public access infrastructure do not currently exist. If either airport were to serve potential future growth in demand, additional facilities will be necessary. Palmdale's passenger terminal facilities are extremely limited with only a temporary facility at present. Public access to this interim facility is indirect and not conducive to passenger operations. This, and other passenger facility issues, will need to be addressed before significant commercial operations could take place at Palmdale. The City of Los owns approximately 17,500 acres of land adjacent to the existing facility which could, however, be developed into a major commercial airport if warranted by future aviation demand.

2.2.2 Current Operating Characteristics of LAX

LAX is served by more commercial airlines than any other airport in the Western U.S. These carriers include a diverse base of U.S. and foreign flag passenger and all-cargo airlines. As of December 1994, LAX was served by 84 scheduled commercial airlines, including all nine "major" U.S. passenger air carriers, various "National" and "Regional" U.S. passenger airlines, numerous foreign flag passenger carriers, and 16 U.S. and foreign flag scheduled all-cargo airlines.[5] Of the 84 total scheduled airline companies serving LAX, 31 are U.S. owned and 53 operate under foreign ownership. On an average day, more than 965 commercial flights are scheduled into Los Angeles International Airport. In addition, non-scheduled, charter, military and general aviation operations routinely occur.

LAX is the dominant West Coast gateway airport in terms of scheduled commercial airline service, with nearly twice the number of scheduled flights as the next busiest airport. In August 1995, there were 31,830 scheduled departing passenger flights from LAX, compared to 17,313 at San Francisco

International and 16,669 at Seattle/Tacoma. Portland and San Diego each serve approximately 9,000 scheduled departures. In addition, LAX had significantly more service to all regions outside of North America than any other West Coast gateway airport.

Ten carriers have handled approximately 75 percent of the passenger demand at LAX over the past five years. Within this group, United, Delta, Southwest and Alaska have increased their market share during this time period. Due to elimination of most of its intra-California service during this period, USAir experienced the largest decrease in both market share and absolute passenger volume among the largest airlines. Mexicana, Korean and Qantas are the largest foreign flag airlines at LAX in terms of total scheduled passengers.

2.2.2.1 Passenger Activity

Between 1965 and 1994, total passenger activity at LAX increased at an average annual compound growth rate of 4.9 percent. Total air passengers at the airport nearly doubled in the ten-year period from 1965 to 1975, and doubled again in the twenty-year period from 1975 to 1994. Total domestic passenger volumes increased from 12.1 million in 1965 to 38.4 million in 1994, an average annual compound growth rate of 4.0 percent. International air passenger traffic increased dramatically during the last 30 years as international trade and travel became more commonplace. Total international passenger volumes increased from 0.4 million in 1965 to 12.7 million in 1994, for an average annual compound growth rate of 12.2 percent. This dramatic growth of international air traffic is reflected in the shift of the share of international passengers to 25 percent of the total LAX volume in 1994, from less than four percent of total LAX passenger traffic in 1965.

In 1994, 27.2 million domestic passengers originated or terminated air travel at LAX. The top 25 city-pair markets included 13 long-haul markets (greater than 1,500 miles), seven medium-haul markets (600 to 1,500 miles), and five short-haul markets (less than 600 miles). These top 25 markets accounted for 71 percent of all LAX domestic origin and destination (O&D) passengers in 1994.

During 1993, 5.1 million international air passengers, representing 13.3 percent of the U.S. total, departed from the United States through Los Angeles International Airport for destinations outside of North America. Of U.S. airports, only New York's J.F. Kennedy and Miami International handled more international passengers than LAX in 1993. The number of air passengers departing the U.S. for each major world region through LAX more than doubled during the ten year period. During this period LAX also increased its share of the total U.S. market to each of its largest four world regions. LAX handled almost one quarter of all passengers departing the U.S. for the Far East and Central America/Mexico

[5] The U.S. Dept. of Transportation groups U.S. airports by class (Major, National, Large Regional, and Medium Regional), based on annual operating revenues. Current guidelines are as follows: Majors, greater than $1 billion; Nationals, between $100 million and $1 billion; Large Regionals, between $10 and $100 million; and Medium Regionals, under $10 million.

regions. For the Oceanic region (mainly to Australia and New Zealand), LAX served over 50 percent of all U.S. departures.

Of the 51.1 million air passengers who utilized LAX in 1994, the domestic market accounted for 38.4 million annual passengers in the following categories:

- Domestic O&D 27.3 million
- Domestic Connections 7.0 million
- Domestic to International Connections 4.1 million

Of total 1994 passengers, then, 53.4 percent were domestic O&D versus 50.7 percent in 1970. LAX handled 59.9 percent of the region's domestic O&D passenger activity in 1994, down significantly from the 91.1 percent share realized in 1970. The most dramatic growth at LAX over the past 20 years has been international passenger demand, which has increased from approximately 2.0 million in 1970 to 16.8 million in 1994, a 9.3 percent annual rate of growth. The breakdown by international passenger category is as follows:

- International O&D 7.6 million
- International to International Connecting 1.0 million
- International Portion of International to Domestic Connections 4.1 million

International passengers increased from under 10 percent of total LAX activity in 1970 to approximately 33 percent in 1994. International connections increased from 8.0 percent of total international passenger demand in 1985 to 18.0 percent in 1994.

2.2.2.2 Cargo Activity

Total air cargo shipments at LAX increased from 261,766 tons in 1965 to 1.9 million tons in 1996, an average annual compound growth rate of 6.6 percent. Air cargo consists of three primary segments: air express, traditional airfreight, and mail.

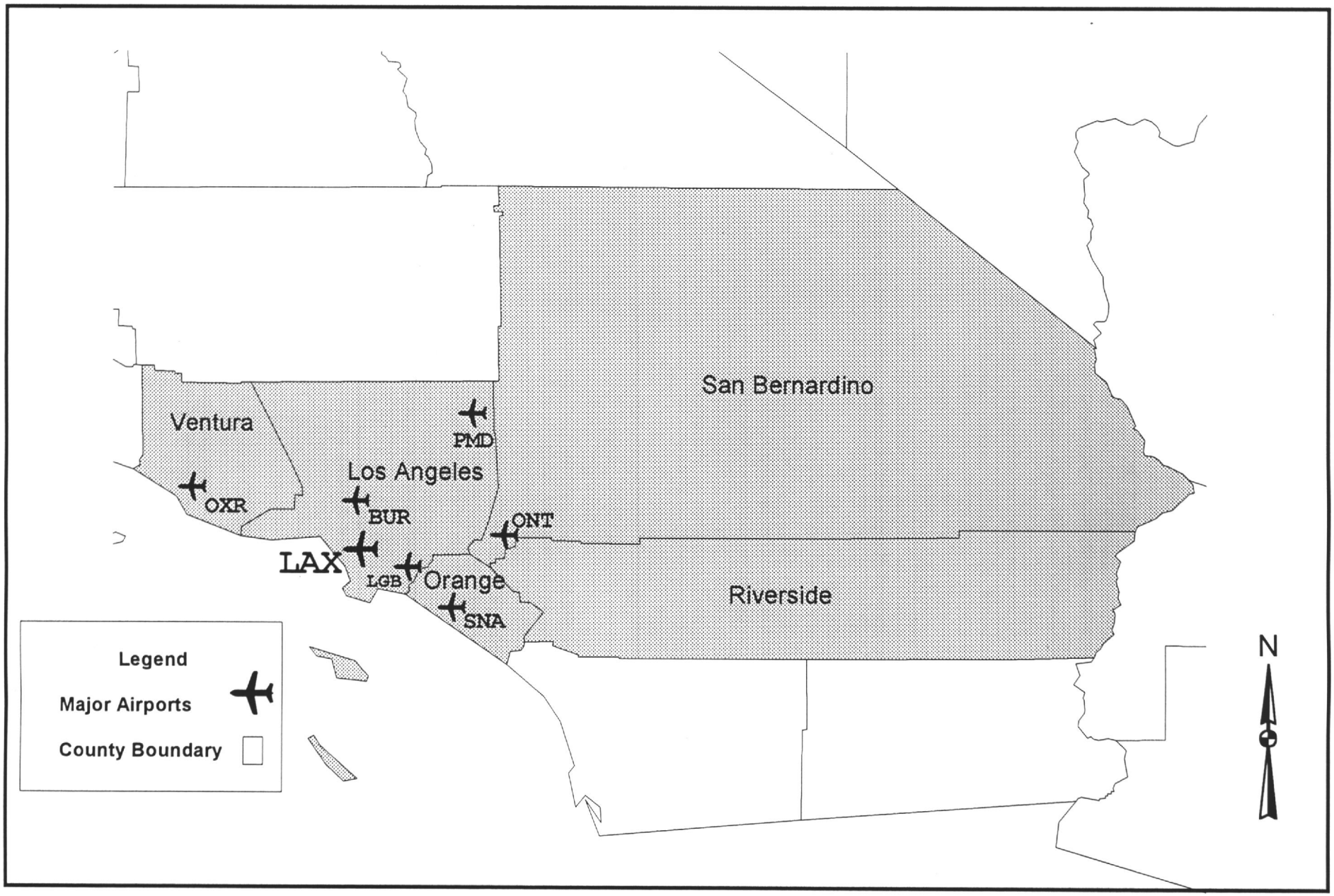
In the 1965 to 1996 period, airfreight increased at a much faster rate than mail, growing at an average rate of 7.2 percent per year, versus 3.8 percent annually for mail. An explosion of U.S. domestic air cargo volume has occurred in recent years, caused by the growth of Federal Express (FedEx), United Parcel Service (UPS) and other overnight express services. The LAX air cargo statistics show a remarkable, but relatively steady growth in cargo tonnage over the 30-year period. Recent increases in tonnage carried by airlines, such as FedEx and Emery Worldwide, reflect a shift toward this segment of the market at LAX.

Historically, slightly more cargo has been enplaned (loaded) at LAX than deplaned (unloaded). Data is not available to demonstrate what percentage of the cargo deplaned at LAX remains in the region, versus what percentage is reshipped to other locales either by truck or air.

The split between enplaned and deplaned air cargo at LAX has remained relatively constant over time. In most regional air trade areas, either enplaned or deplaned cargo represents a dominant share of the total tonnage, but at LAX the amounts are balanced. This appears to reflect the fact that much of the air cargo arriving at LAX is re-shipped by air to other destinations, and that the amount of goods produced for air shipment from the region is comparable to the volume of goods shipped in for local use.

International air cargo had grown to 41 percent of the total tonnage in 1996, from only six percent of the total tonnage at LAX in 1970. The growth of international air cargo during this period represents an average annual increase of 13.4 percent. During the same period, domestic air cargo tonnage increased 3.2 percent per year, on average.

In 1996, FedEx was the largest air cargo operator at LAX by a wide margin; and it has generally been expanding its share over the last five years. During the most recent five years, all-cargo airlines have been increasing their share of both domestic and international air cargo at LAX.



Los Angeles International Airport
Master Plan

Major Southern California Airports

Figure 2

2.2.2.3 Aircraft Operations

Total aircraft operations at LAX increased to 689,888 in 1994, from 544,073 in 1970, an average annual compound growth rate of 1.0 percent per year. Air carriers and air taxi (commuter) operations exhibit an erratic growth pattern over the last 25 years, but the general trend is clearly a significant increase in air taxi operations. General aviation (GA) and military operations accounted for approximately eight percent of total aircraft operations in 1994.

Domestic scheduled air carriers represented 84 percent of the commercial aircraft operations in 1994. In the most recent six year period, both domestic and international scheduled aircraft operations have trended upward, while all-cargo and charter aircraft operations totals evidence somewhat erratic trends. United was the largest carrier in terms of passengers at LAX in each of the last five years, but only in the last two years was United highest in number of aircraft operations. Delta had the highest level of aircraft operations in 1990 and 1991, while Delta affiliate Skywest had the most operations in 1992. During the most recent five-year period, Southwest has shown the greatest increase in operations and USAir the largest decrease.

2.2.3 Forecast of Future LAX Operations

Numerous factors influence the level and character of aviation demand at LAX. These factors are a result of global, national and regional trends encompassing social, economic, political, environmental, technical, and industry events and circumstances. While all domestic aviation demand generated in the region does not exclusively use LAX, unconstrained LAX domestic passenger activity forecasts were prepared by first forecasting total region aviation demand and then determining LAX's potential share of that demand under several future scenarios.[6]

Regional demographic and economic factors are generally acknowledged to be the primary influences on the local demand for aviation service. The economic/demographic strength of the geographic region to generate and/or attract air passengers and cargo influences the character of the LAX aviation market and ultimately all qualitative decisions that are a part of forecasting unconstrained O&D traffic for Los Angeles International Airport.

The region accounts for nearly 50 percent of California's population. Historically, Southern California has been one of the fastest growing regions in the U.S., but this population growth has slowed in recent years. During the next 20 years, California's population is forecasted to continue growing faster than the U.S., but Southern California is expected to grow at a slightly slower rate. If these trends occur as projected, the region's population will shrink slightly as a percentage of the state population during the LAX Master Plan time frame. Published forecasts for population growth in the region to the year 2015 vary from 0.7 percent to 1.5 percent per year, or from 17.3 million to 21.4 million residents in 2015.

Employment is a key indicator of the region's economic vitality and its ability to support air service. Published projections vary from average annual employment growth of 0.5 percent to 1.5 percent per year, or from 9.5 million to 10.6 million jobs in the region in 2015.

In addition to population and employment, per capita personal income (PCPI) is another indication of regional economic strength to support air service. Published projections range from average annual growth rates of 0.8 percent to 1.9 percent per year, or $22,000 to $26,550 per capita in 2015.

Other factors also influence the region's demand for air transportation. The Southern California region is the largest center for manufacturing in the United States; the headquarters for some large corporations; one of the world's key centers of trade, finance and commerce (particularly with the Pacific Rim); and an important worldwide tourist destination. While manufacturing and finance are two economic sectors that have declined significantly in employment since 1989, these sectors remain large. The affluence and cultural diversity of the region's population also creates a high propensity for air travel by its residents. However, it is the strength of the businesses in the region that creates the principal demand for air service. The world's entertainment and movie industries are centered in the region, as well as many businesses associated with aerospace manufacturing. Even with reduced defense spending, aerospace industries remain a significant sector of the regional economy.

The year-round mild climate and many tourist attractions make Southern California one of the largest tourist destinations for both U.S. and world travelers. The region's beaches, theme parks and attractions, such as Disneyland and Universal Studios Hollywood, act as year-round magnets for visitors.

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[6] For the details of the forecast, see *LAX Master Plan, Chapter III, Forecasts of Aviation Demand*, *op. cit*.

The cultural diversity of its population also makes the region more likely to see future increases in international air travel. Immigrants have settled in Los Angeles from around the world, thereby making it one of the most diverse regions in ethnic composition. Visits to and visitors from former homelands further increase the level of air travel.

The cumulative result of these factors is a very high demand for air travel and trade to and from the region.[7] Thus, the level of local population, demand from regional businesses and constant flow of tourists establishes Southern California in general, and Los Angeles in particular, as a key world destination for air transportation.

The forecast of aviation demand for Los Angeles International Airport is based on three sub-forecasts:

- **Annual Air Passengers** comprise three components:
  - *Domestic Origin and Destination* (referred to as O&D). This traditional designation is for passengers whose trips begin or end at LAX.
  - *Domestic Connecting.* These passengers connect at LAX, but their trips originate and end at another U.S. airport.
  - *International*. This category includes O&D connecting passengers.
- **Annual Air Cargo Tonnage** divides into international and domestic categories. Volume then subdivides between airfreight and airmail, and freight between air express and traditional airfreight.
- **Annual Aircraft Operations** comprise domestic and international passenger aircraft operations, all-cargo, general aviation, and military. Domestic passenger operations are further categorized into air carrier and commuter activities.

2.2.3.1 Passenger Forecast to 2015

The passenger forecast for the next 20 years predicts that total passenger activity will increase an average of 3.2 percent annually (compared with 4.03 percent in the 1970 to 1996 period). Total demand of 98 million annual passengers is expected in 2015. The actual level of future demand for the next 20 years will depend on the realization of numerous market factors, as well as the availability of adequate airport facilities at LAX to handle increases in aviation activity.

A 2.1 percent average annual growth rate is foreseen for LAX **domestic O&D passenger** demand in the period 1994 to 2015, compared with the 4.0 percent growth rate experienced from 1970 to 1994. This trend assumes that LAX continues to attract a decreasing portion of the region's domestic O&D activity. By 2015, the LAX share of total regional domestic O&D passenger activity is forecast to decline to 50 percent, compared with the 59.9 percent share realized in 1994.

The **domestic connecting passenger** activity at LAX has dropped from approximately 40 percent of total passengers in 1970 to 13.8 percent in 1994. Domestic connecting passenger activity is expected to decline slightly as a percentage of total LAX domestic activity over the planning period, as increasing air service at other regional and West Coast airports attract a growing volume of domestic connecting passengers.

As recorded by LAWA, the domestic portion of **international connections** (4.1 million) is included in the domestic passenger demand. However, these passengers contribute to international travel, and therefore, they have been included in the international passenger demand forecast here.

Over the years, LAX has evolved into a major international gateway, capturing a substantial share of the U.S. air traffic to major world regions, such as Asia/Far East and Europe. This strong growth is expected to continue through the 2015 planning horizon at a 5.3 percent average annual rate, compared with 9.3 percent in the 1970 to 1994 period. By 2015, international passenger activity is forecasted to total 49.2 million, approximately 50.2 percent of all LAX passenger activity.

Forecasts of air travel between the U.S. and each world region prepared by the Boeing Aircraft Company were used for each world region. The Boeing forecasts were, in turn, validated by the latest FAA and other industry forecast sources that have projected similar levels of international activity. Future international passenger activity at LAX was forecast using the "share of market" technique in which it was assumed that LAX will maintain its current share of the U.S. international demand to each world region.

[7] Other non-regional factors that will also affect future demand for air transportation in the region, including perceptions of flight safety, fuel costs, environmental issues (e.g., noise and engine emissions), the overall health of the world economy and the changing structure of the airline industry, are discussed in Landrum & Brown's detailed demand forecast.

This assumption was used, despite LAX's market share increase over the past ten years, to offset any potential optimism in the Boeing market forecasts.

2.2.3.2 Cargo Forecast to 2015

Air cargo has become an increasingly important growth industry worldwide in response to the globalization of manufacturing and other business activity. This trend is particularly true in Southern California, one of the most industrialized regions in the world. Because of the many high technology and multimedia industries that export time-sensitive goods, air shipment is essential to the region's economic health.

Trend and time series regressions based on actual changes in air cargo volumes at LAX were utilized to predict future activity levels. Because of marked differences in historical activity profiles of air express, traditional airfreight, and mail, each segment of air cargo activity at LAX was projected separately.

The LAX air cargo forecast projects a continuation of rapid growth. The average annual growth rate over the next 20 years is forecast to be 4.4 percent, compared to 4.7 percent over the last 20 years. By 2015, the total annual air cargo volume at LAX is forecast to be approximately 4.2 million tons, 2.2 times the 1996 level. Air cargo is more sensitive to domestic and world economic conditions than is passenger traffic; so changes in the price of air service, airline schedules, service policies, and other factors could significantly influence cargo forecasts.

2.2.3.3 Aircraft Operations Forecast

An aircraft operation is defined as an aircraft arrival or departure. Future aircraft operations were forecasted from the passenger and cargo forecasts. The long-term aviation trends that affect aircraft operations at LAX include airline routes, size and capacity of typical aircraft and load factors.

Aircraft operations data from the FAA and LAWA, as well as projections of future activity from the FAA's national forecast office, were utilized to project LAX aircraft operations. Each major component of aircraft activity was separately forecast, based on the passenger and cargo activity forecasts, as well as historical operations and aircraft fleet mix.

In the 20 years between1975 and 1994, annual aircraft operations at LAX grew from 453,593 to 689,888. This is an average annual growth rate of 2.2 percent. For the next 20 years, an average annual growth of 1.8 percent is expected, with over one million aircraft operations projected for the year 2015.

The highest growth rate (4.8 percent annually) is forecast for international operations, because it is the fastest growing segment of passenger demand. International aircraft operations are forecast to increase to 217,800 by 2015, from 81,289 in 1994. Domestic aircraft operations are forecast to increase at an average annual rate of 1.1 percent, increasing to 701,500 in 2015, from 561,905 in 1994.

2.3 The LAX Master Plan Process

Whether, and if so how, to accommodate the future demand for LAX facilities, has been the subject of LAWA's three-phase Master Plan process, which was initiated in 1995. Phase I included development of a Strategic Framework, which defined existing airport conditions, estimated future demand and initiated a public consultation process. Phase II, Concept Analysis, included conceptual planning for facilities and airport layout to meet forecasted demand, and further public consultation. Four general development concepts were published in December 1996. Phase III, Environmental Assessment, consists of an exhaustive evaluation of the alternative development concepts from Phase II, following both Federal and State environmental review procedures. Following thorough public review of the assessment, a preferred alternative that balances economic and environmental needs will be considered by the LAWA Board of Directors, the Los Angeles City Council and Mayor, and the Federal Aviation Administration.

The environmental review process, now in progress, is taking the form of a joint Environmental Impact Statement (or EIS, under Federal environmental law) and an Environmental Impact Report (or EIR, under California law). This report will provide complete descriptions of the existing environmental conditions in and around LAX, and the potential impacts of the improvements associated with each of the LAX development concepts on the physical environment.

The LAX Master Plan Draft EIS/EIR analyzes three "no-build"[8] and three "build" alternatives for the future of LAX. In brief, these Alternatives are:

[8] The three "no-build" alternatives includes : 1) an "Existing Conditions" alternative; 2) a "CEQA Baseline" alternative; and 3) a

- **No Action/No Project Alternative.** This alternative assumes that no new improvements would be implemented during the next 20 years at LAX, with the exception of currently planned and programmed projects at the airport and related regional transportation infrastructure. The airlines can be expected to change the air service provided at the airport as a result of the capacity limitations which would result. The fleet of aircraft would include a larger share of wide-body aircraft up to the capacity of the terminals. Congestion, delays, and passenger inconvenience would be common all year, not just during peak holiday periods. This Alternative assumes that annual air passenger volumes would continue to increase to 71.2 MAP by 2005, from 57.97 MAP in 1996. But, as a result of capacity constraints, future annual passenger growth beyond 2005 would slow considerably, so that it reaches 78.7 MAP by 2015, or roughly 80% of forecasted demand. This Alternative also assumes that cargo volumes would increases to 3.1 ACT in 2005, from 1.9 ACT in 1996, but that no further ACT growth would occur between 2005 and 2015, due to operating constraints at LAX.
- **Build Alternative A - Five Runways-North Airfield.** This alternative adds a new 6,700-foot Runway 24R on the north airfield approximately 400 feet north of the existing Runway 24R location. The existing Runways 24C and 24L would be relocated to be roughly 800 and 1,600, respectively, from Runway 24R. Runway 24L would also be extended to 12,000 feet. The terminal facilities would be expanded to the west with a new western entrance and landside terminal facilities. A people mover would provide passenger access from the new west short-term parking garage and the west terminal to the new concourses west of the Tom Bradley International Terminal (TBIT) and to the Central Terminal Area (CTA). Cargo facilities would be expanded in the southeast corner of the airport. Additional land would be acquired in that area to provide additional area for the cargo facility expansion. Construction of the improvements included in Alternative A would enable LAX to accommodate 71.2 MAP by 2005. By 2015, completion of the Alternative A improvements would enable LAX to accommodate 97.9 MAP, or nearly all of forecasted demand. These improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons (ACT) in 2005 and 4.2 ACT by 2015, which is 100 percent of forecasted cargo demand for that year.
- **Build Alternative B - Five Runways-South Airfield.** This alternative adds a new 6,700-foot runway on the southside in the existing cargo area. The existing south runways would be relocated north so that the lateral spacing between the south inboard runway and the new runway would be 2,500 feet. This separation would provide for staggered approach capability on the south complex with Category 1 weather minimums (200-foot ceilings and 1-mile visibility). The terminal improvements are similar to the other Alternatives, except that the south CTA terminals would be reconfigured as the north terminal area is reconfigured in Alternative A. A people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The cargo facilities would be relocated to the area north of Century Boulevard in the Manchester Square community and in the Continental City/Imperial East area. The annual passenger volume growth assumptions for Alternative B are identical to Alternative A (i.e., 71.2 MAP in 2005 and 97.9 MAP in 2015), and so are the assumptions about growth in airfreight cargo tonnage (i.e., 3.1 ACT in 2005 and 4.2 ACT in 2015).
- **Build Alternative C – Four Runways.** This alternative maintains the existing four runway system with modifications to the two north airfield runways and to one runway in the south airfield. In the north airfield, Runways 24R and 24L would be relocated, widened, and extended. In the south airfield, Runway 25L would be relocated, and Taxiways B and C would be realigned and widened. Terminal facilities would be expanded to the west, and a people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The road system for moving air cargo would be improved with the construction of a continuous air cargo circulator roadway along the airport property boundary. Alternative C improvements would enable LAX to accommodate 71.2 MAP by 2005, and 89.6 MAP by 2015, or roughly 91% of forecasted demand. These improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons in 2005 and 4.2 ACT by 2015, or 100 percent of forecasted airfreight cargo demand, just as in Alternatives A and B.

"No Master Plan" alternative. The "No Master Plan" scenario is described above and used throughout this report. The "Existing Conditions" replicate the historical activity and conditions existing in 1996 The "CEQA Baseline" scenario assumes that no additional airport activity beyond the Existing Conditions will occur but that land use development and increased vehicle traffic in the vicinity of the airport will occur.

2.4 Purpose of the Analysis

Regional airports play an essential role in supporting the growth of a metropolitan economy like that of the five-county Southern California region. They directly employ thousands of workers and produce millions of dollars per year in taxes and other revenues for the host jurisdiction. More generally, they support the growth of the regional economy by facilitating the efficient movement of people, goods and services that originate in, or are transported through, the region in response to its amenities and market opportunities. Airports and related aviation facilities create competitive advantages for a region that become structurally integrated into its economy by enabling industries that either depend on, or learn to take advantage of, efficient air transportation to access domestic and international markets. Los Angeles International Airport plays this growth-facilitating role in Southern California. Based on analytic techniques described in subsequent sections of this Report, it is estimated that in 1994, the base year for the analysis reported here, LAX was directly related to $60 billion[9] in total economic output and about 408,000 jobs, or one out of every 20 jobs in the regional economy. The total includes about 59,000 jobs at LAX, with the balance in a wide range of passenger spending-related jobs and airfreight cargo-related manufacturing jobs in other locations. When the multiplier effect of these direct impacts is taken into account, LAX's impact in the region swells to $110 billion and 932,000 jobs. Most of this impact occurs in the City and County of Los Angeles, and more particularly, within a 20-mile radius around LAX.

The scale of current and future economic activity associated with a regionally significant airport like LAX -- expressed in numbers of jobs and dollars of economic output -- can be measured by tracing the relationships between sectors of the economy that depend on air transportation and the number of air passenger enplanements and deplanements and tons of air cargo loaded and unloaded at the airport. These relationships change over time in response to changes in the structure of the economy, the nature of the industries in it and the costs of doing business.

Though not strictly required as part of either an EIS or EIR, an assessment of economic impacts is clearly an important consideration in the decision making process about the future of LAX. In addition, some of the EIS/EIR analysis topics are related to the affects of each alternative on the regional economy. This Report presents, therefore, estimates of the impact that each Alternative would have on the regional economy in terms of total economic output (i.e., a general measure of total economic effect) and employment, of construction of each Alternative and of operation of the airport following construction. Early versions of the analysis reported here were initially developed to aid the process of identifying alternative LAX improvement scenarios in during Phases I and II of the Master Plan. This economic impact analysis would be used in assessing various environmental topics (e.g., socioeconomics, public schools and induced growth), as well as informing City decision-makers and the public about the possible economic consequences of each Alternative.

2.5 Organization of the Report

The four sections of the Report that follow this general introduction are as follows:

- **Section 3. Methodology for Assessing the Economic Impacts of LAX and the LAX Master Plan EIS/EIR Alternatives.** The next section presents and explains the analytic framework and data sources used by HR&A to estimate the contribution that LAX makes to the regional economy today, and would make under each of the LAX Master Plan Alternatives now undergoing environmental review. It explains how this framework and approach differ from past estimates of LAX's economic impacts and why. This Section includes a description of the REMI forecasting models that serve as the foundation of the impact estimates. It also describes how various historical data about the relationships between indicators of activity levels at LAX (i.e., passenger volumes, by type of passenger and cargo tonnage, by type of cargo) and the behavior of the regional economy were assembled as inputs to the impact estimating process.
- **Section 4. Overview of LAX's Role in the Los Angeles Regional Economy.** This section describes the structure of the economy of Southern California, and LAX's interactions with it. The complexities and variety of these relationships are illustrated with two sets of case studies. The first focuses on two industries that are among the most critical to the future health of the regional economy – the motion picture production/multimedia sector and the electronics manufacturing sector – but whose connections with LAX may not be obvious. The second set focuses on four sectors with

[9] All dollar amounts are expressed in constant 1996 dollars.

special needs for air transportation services – fresh cut flowers, apparel, processed foods and auto parts and components. This Section concludes with two "baseline" forecasts of LAX's impact on the regional economy in 2015, which bracket the likely upper and lower bound of LAX Master Plan Alternatives. The first is a "Fixed Activity" Forecast, in which it is assumed that LAX operation is constrained to its 1995 passenger and cargo activity levels until the year 2015. The second is a "Demand Forecast," in which LAX is allowed to meet the full measure of future demand for air transportation services in 2015.

- **Section 5. Summary Regional Impacts of LAX and the LAX Master Plan EIS/EIR Alternatives.** This section presents the results of applying the analytic framework described in Section 4 to the current operation of LAX, and to four EIS/EIR Alternatives, each defined in terms of millions of annual passengers and tons of airfreight cargo. The estimates of economic impact in 2005 and 2015 are presented in terns of total economic output – a summary measure of economic activity – and employment. Where applicable, estimates are also presented for the number of households and population associated with on-site LAX-related employment under each Alternative, in each of two impact areas around LAX that are being used in the LAX Master Plan EIS/EIR.
- **Section 6. Geographic Distribution of LAX Employment Impacts.** Next, the direct regional employment impacts presented in Section 5 are disaggregated by several geographic perspectives – by county and several subareas of Los Angeles County, including the City of Los Angeles and the other South Bay cities and communities that are immediately adjacent to LAX. Within the City of Los Angeles, the estimates are further disaggregated by City Council District and Community Plan Area.
- **Section 7. Conclusions.** The final section provides summary observations about the significance of LAX to the regional economy, today and under each of the LAX Master Plan Alternatives.

3. METHODOLOGY FOR ASSESSING ECONOMIC IMPACTS

This Section describes the analytic approach used by HR&A to estimate the economic impacts of LAX under each of the LAX Master Plan EIS/EIR Alternatives. It also discusses how this approach differs from previous estimates of LAX's impact on the regional economy, and other impact studies prepared for other airports around the nation. It provides a description of the REMI econometric models of Los Angeles County and the other four Southern California counties, which serve as the foundation for the impact estimates. Finally, this Section describes how HR&A developed the statistical relationships between the general characteristics of the EIS/EIR Alternatives – i.e., measures of passengers volumes and cargo tonnage -- and their relationships to the regional economy.

3.1 Traditional Airport Economic Impact Methodology

A survey of 10 major airport economic studies conducted during the 1980s and 1990s found that a prime motivation for regional airports to undertake analysis of their impact on the local economy has been a desire to inform the public and decision makers about the economic significance of airports as they compete for scarce public funds or seek to deflect proposed limits on airport operations – i.e., as a marketing device.[10] In an effort to bring a greater measure of objectivity and consistency to this process, and to take advantage of emerging national data sources, the Federal Aviation Administration now recommends a particular approach for conducting such studies.[11] It involves surveys to determine "direct" and "indirect" employment and spending at on- and off-airport locations, and the use of regional economic "multipliers" to estimate the "induced" effects that flow from direct and indirect impacts. The most frequently used source of regional multipliers is the U.S. Department of Commerce's Regional Input-Output Modeling System ("RIMS II"). The RIMS II model, which is derived from national economic relationships, provides employment, earnings and total income multipliers for states and counties throughout the U.S.

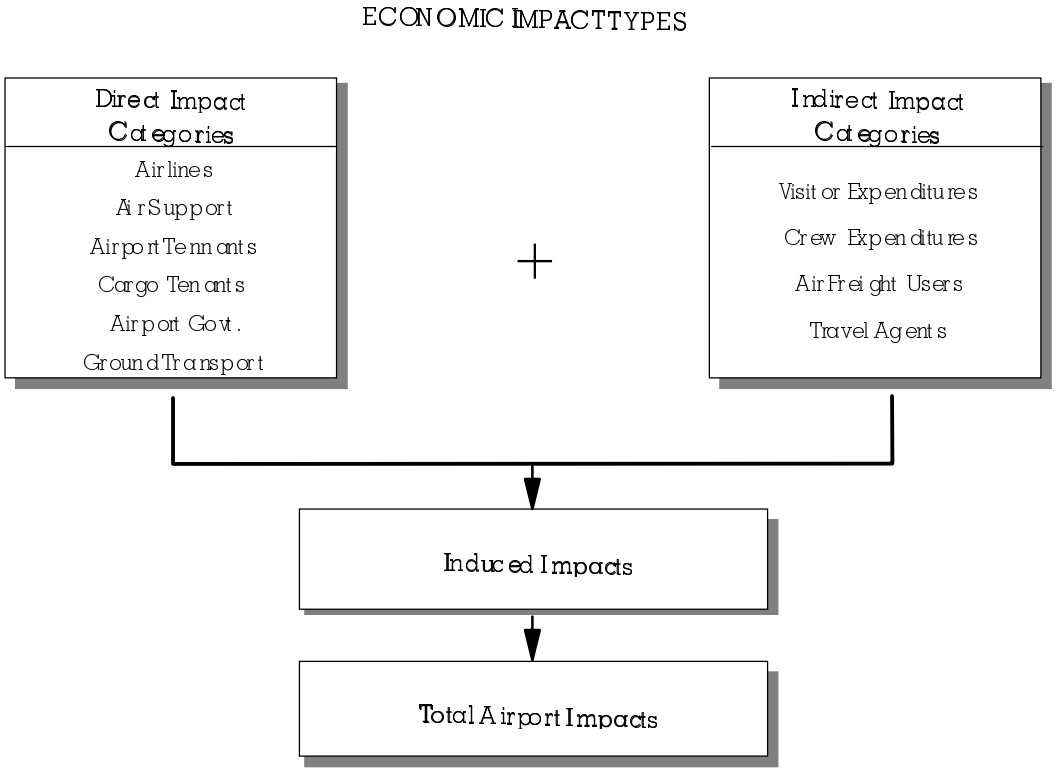
[10] Douglas S. McLeod, "Recommended Regional Economic Impact Procedures for Aviation-Related Projects," 1147 *Transportation Research Record*, 1987, pp. 15-24.

[11] Stewart E. Butler, Ph.D. and Laurence J. Kiernan, "*Estimating the Regional Economic Significance of Airports*, Federal Aviation Administration, U.S. Department of Transportation (USDOT), January 1992. This is an abbreviated version of a 1986 study by the same authors, "*Measuring the Regional Economic Significance of Airports,*" also prepared for the FAA and USDOT.

Schematically, the FAA-recommended approach divides the economic impacts of regional airports into three distinct categories as shown in **Figure 3,** Structure of the FAA-Recommended Economics Impact Methodology.. "Direct impacts" are consequences of economic activities carried out at the airport by airlines, airport management, fixed base operators, and other tenants with a direct involvement in aviation. "Indirect impacts" derive primarily from off-site economic activities that are attributable to the airport. These activities include services provided by travel agencies, hotels, restaurants, and retail establishments. The multiplier effects of direct and indirect impacts create "induced impacts." These include businesses supplying goods and services to direct and indirect activities, and households supported by jobs created as a consequence of direct and indirect activities. Economic impacts are usually measured in terms of output (or gross sales) and jobs.

Figure 3

Structure of the FAA-Recommended Economic Impact Methodology



The FAA methodology generally proceeds through the following analysis steps:

- Determine Direct Airport Impacts. This task involves the enumeration of all on-airport employment and estimation of its payroll. Enumeration includes both traditional airport employment (e.g., airline and government employees) consequences, plus more specialized businesses that rely on access to airports, such as aviation maintenance and manufacturing. Typically, data describing employment, payrolls and business sales are obtained by surveying firms that meet the definition of the direct impact category.
- *Estimate Indirect Airport Impacts.* Indirect airport impacts are generally estimated using several approaches. Off-airport air transportation impacts, such as airline crew expenditures and travel agent commissions are estimated from survey data. Visitor spending impacts are often estimated through further surveys of departing passengers that identify trip purpose, trip duration and spending patterns.

- *Estimate Induced Impacts of Airport*. Induced impacts are estimated using industry sector-specific multipliers estimated from input-output (I-O) models, such as RIMS II. Direct and indirect output and employment impacts are multiplied by their respective I-O multipliers to calculate the induced impacts of the airport.
- *Calculate Total Economic Impacts.* The total economic impacts of an airport are the sum of the direct, indirect and induced impacts, using the output and/or employment impact measures.

The input-output approach had been used previously by LAWA and the other airports in the Southern California region to analyze the economic impacts of LAX and the other airports. In a 1986 study,[12] it was estimated that LAX had a total regional impact of $28.6 billion (of which $2.5 billion was "direct") and about 373,000 jobs. By 1990,[13] the total impact was estimated to have increased to about $37.0 billion ($3.3 billion "direct;" all amounts unadjusted for the effects of inflation) and about 402,000 jobs. A 1993 update[14] put the total regional impact at $42.5 billion and 420,000 jobs.

3.2 Limitations of the Traditional Methodology

There are critical definitional and analytic limitations to the traditional approach to airport impact analysis that rendered it inappropriate for the current LAX Master Plan process. These include the need for a more dynamic, future-oriented analysis; an approach that more explicitly accounts for the intricate and subtle relationships between airports and the surrounding economy on which they depend; and the ability to account for predictable changes in these future relationships, such as the effects of productivity changes on employment. These limitations, inherent in the traditional approach for use in the LAX Master Plan, and the assessment of LAX Master Plan EIS/EIR Alternatives, are discussed below.

3.2.1 Dynamic vs. Static Analysis

The traditional methodology is designed to prepare estimates of static (one-time) economic impacts. It offers little direction on how to prepare impact estimates over multi-year planning horizons. Moreover, the absence of a structure in which to think about how regional economies and airports grow and interact over time is exacerbated by the use of Input-Output (I-O) model concepts that are also inherently static. Los Angles today would be a very different place if LAX did not exist, just as it would if the freeway system, the Owens River Water project, or other growth-facilitating infrastructure systems did not exist.

Probably the most important limitation of input-output models is the linear and static nature of the theoretical framework and data used to estimate these models. Input-output models describe the quantitative relationship between changes in demand (increases and decreases) within an economy for a specified time period, usually one year. Because of the inherent linearity of I-O models, increases and decreases in demand of the same magnitude differ only in their sign – the magnitude of the positive or negative effects is identical. I-O models are also insensitive to differences in the magnitude of a change in demand on supply and demand for factors of production. Thus the impacts of a demand increase equal to one-half the output in all given sector would be a simple multiple of the effects of a demand increase equal to a 1/500 change in sectoral output, despite the fact that the larger demand shift would be much more likely to create shortages in the supply of factors of production and increases in the price of factors in short supply.

Despite the likelihood of standard market responses, I-O models implicitly assume that factor supplies are adequate to meet demand, that prices remain constant, that factor proportions remain constant, and that sectoral output will meet the increase in demand. When assessing the economic impacts of "small' projects (relative to the size of the economy), I-O assumptions are generally consistent with the actual effects of the project on the economy. When assessing large projects, such as airports, that comprise a significant share of total output and play a key role in the day-to-day functioning of the economy, the standard I-O assumptions bear little relationship to a sensible economic impact assessment.

The purpose of the LAX economic impact analysis also differs fundamentally from the one-time "snapshot" of LAX's impact on the regional economy that has been prepared in the past, and from similar analyses performed for other airports around the nation. A future-oriented impact analysis capable of testing different LAX development scenarios calls for a very different modeling approach. Specifically, a

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[12] Wilbur Smith Associates, *Economic Impact of the Los Angeles International Airport*, prepared for the Los Angeles Dept. of Airports, 1986

[13] Wilbur Smith Associates, *Economic Impact Update*, prepared for the Los Angeles Dept. of Airports, March 1992

[14] Wilbur Smith Associates, *Southern California Basin Airport Economic Impact Update*, prepared for the Los Angeles Dept. of Airports, July 1994.

dynamic econometric modeling approach is required instead of the more conventional static input-output approach, in order to account for the complexities of the economic interactions between LAX and the regional economy over time. An econometric model forecasts employment, wages, output, relative costs, and other variables for industries in a region as the relationships among them, and the costs of production, change over time. In input-output analysis, the inter-industry relationships are fixed as of a single point in time. LAX expansion is likely to affect not just the demand for airport services, but the cost of providing such services to the Southern California region. Only an econometric modeling approach is capable of capturing the dynamic effects of these relationships as they change over time.

An econometric model accomplishes two tasks. First, it forecasts the future of a regional economy based on current conditions and probable future conditions linked to forecasts for the national, state and regional economies. This is referred to as a "control" forecast. Second, it forecasts the future condition of that same regional economy after the model operator has introduced a new policy or other changes. This second forecast is called the alternative forecast, or the simulation. The differences between the control forecast and the simulation represents the effects of the policy or other changes introduced into the simulation. In order to measure the impacts of alternative development scenarios for LAX, the alternatives must be expressed in parameters that can be recognized by the econometric model, and then introduced to produce a simulated future.

3.2.2 Accounting For The Network Economics of Airports

The FAA methodology as it is usually applied also does not explicitly address the relationship between activity at air carrier airports and the economic impacts of the activity. By focusing directly on the impacts of airport operations, such as employment and payroll, the FAA methodology tends to steer most analyses away from the critical relationship between passenger and cargo activity levels and the consequent economic impacts. By failing to articulate the linkages between airport activity and economic impacts, the true role that airports play as regional infrastructure in regional economic growth is obscured. As a consequence, many analyses have mistakenly concluded that airports "cause" economic growth, when in fact airports facilitate economic growth, which is largely driven by macro-economic conditions and comparative regional advantages. Moreover, the economic context within which a specific airport functions is often ignored or obscured by the focus on estimating impacts rather than describing and measuring these economic relationships.

This limitation is apparent in the lack of attention to the network characteristics that airports exhibit as they interact with the regional economy. Traditional airport economic impact analyses has concerned itself with inbound and outbound passenger and freight cargo. In most cases, they have examined the impact of connecting traffic of both types only to the extent that (a) connecting passengers contribute to retail sales at the airport, and hence local sales tax receipts, or (b) cargo value, which was assumed inherently to have some multiplier affect in the region, even if it were merely moving through the airport without being used in the region. Likewise, the impacts of connecting passengers are often limited to measuring the sales tax they contribute to the local jurisdiction. These traditional approaches underestimate the total economic impact of an airport like LAX that facilitates a substantial amount of connecting passenger and cargo traffic.

The large volume of connecting traffic routed through LAX is what enables the airport to efficiently serve as a major hub. There are two broad types of benefits provided by hub airports to their regions: (a) lower ticket prices for inbound and outbound passengers; and (b) greater frequency of flights into and out of the airport.

The first benefit, lower ticket prices, results from economies of density. Economic theory suggests that forces, which cause traffic volume to increase along the spokes of a network, tend to reduce fares in the markets served by the network. Lower ticket prices are clearly of value to the region, reducing the cost of travel for area residents flying out of Los Angeles and lowering the cost for nonresidents traveling into Los Angeles for business or for pleasure.

Given the importance of tourism to the new economy of Los Angeles, the dimensions of this advantage may be substantial. Lower ticket prices might increase the number of non-resident travelers flying into Los Angeles or might induce frequent travelers to relocate in the region in order to take advantage of lower ticket prices.

The second benefit provided by the LAX network, frequent flight schedules, has even more obvious potential for positively increasing the impact of the airport on the region. LAX provides daily (in some cases, hourly and even half-hourly) flights to a multitude of destinations. In particular, and as noted

above, LAX links much of the United States, Canada and Mexico with Asia, in its role as a "gateway" to the Pacific Rim. This is of tremendous benefit to both passengers and shippers, by virtue of the fact that air transport is necessarily a dual production operation. That is to say, airplanes generate both passenger and cargo availability simultaneously. Companies which locate some of their operations in the Los Angeles area can leverage this resource by engaging in various forms of time-based competition, which in many cases require access to an airport hub to function effectively. LAX provides the Los Angeles region with a competitive advantage in recruiting and retaining businesses which value this sort of shipping availability over other regions which do not have access to an airport hub. This network externality disadvantages other regions competing with Los Angeles for businesses operating in time-sensitive or shipping intensive contexts.

Companies that ship their goods as cargo and locate some of their operations in the Los Angeles area can leverage this resource by engaging in Just-in-Time manufacturing and Cross-Docking inventory management. Just-in-Time tightly couples producers with suppliers, such that raw materials and intermediate products are delivered in small batches "just in time" to be assembled into finished goods and delivered "just in time" to be sold and delivered to customers. The idea behind this approach is to limit inventory carrying costs and -- in the process -- expose and correct flaws in the production cycle, reduce manufacturing setup times, increase employee involvement and accountability, and ultimately improve production throughput. Just-in-Time means that all participants in the production process are fully integrated, working seamlessly as one manufacturing system. Not surprisingly, this requires access to frequent and reliable transportation systems.

"Cross Docking" addresses the product distribution and delivery components of the production cycle, which begins with raw materials and ends in delivery of finished goods. Cross Docking, as practiced by Wal Mart, for example, is a logistics technique in which goods are continuously delivered to warehouses, where they are selected, repacked, and then dispatched to stores, often without ever sitting in inventory. Cross Docking enables the companies using it to achieve the economies that come with purchasing full truckloads of goods while avoiding the usual inventory and handling costs. In Wal Mart's case, it amounts to a two to three percent reduction in the cost of sales, which that company uses to achieve its comparatively low prices to consumers.[15]

Companies that adopt time-based competition practices are not limited to large, global, vertically integrated manufacturers. Most large manufacturers rely on a network of smaller suppliers, which provide everything from raw materials to the myriad of intermediate products necessary to assemble and deliver finished goods. All of these suppliers must be involved in time-sensitive processes, if their production feeds into a tightly-coupled production process. Moreover, many smaller manufacturers are discovering the advantages of reducing inventory carrying costs and of reaching markets quickly in response to customer demands. A recent *Wall Street Journal* article illustrates this by pointing out that the need for supporting shippers who want to move their products 'Just in Time' has "spawned entire new industries. Chile has become a huge exporter of Pacific salmon and macadamia nuts. Japan air-ships its famous cherries around the world. Every afternoon, New York's Kennedy Airport receives at least one jet full of hundreds of boxes of Giorgio Armani shoes from Italy."[16]

The Los Angeles region benefits from the presence of LAX through cost of shipping effects. That is to say, companies gain a cost advantage if shipping costs through LAX are cheaper relative to shipping costs elsewhere. The strictures of time-based competition, however, suggest that while the cost of shipping effect is important, it may be outweighed by other considerations, such as the ability to integrate supplier chains and to deliver goods to market with minimal inventory carrying costs and maximum agility.

There are at least three types of time-sensitive manufacturing or distributing activities present in the region:

- Warehousing activities for retail goods shipped into Los Angeles from all over the world, particularly the Pacific Rim, for distribution to points across the United States. Examples include consumer electronics products, communications equipment, photoelectric equipment, and retail clothing and accessories.
- Manufacturing of intermediate products for delivery to producers of finished goods: examples include various automotive subassemblies and parts, computer components, and light industrial products.

[15] "Competing on Capabilities: The New Rules of Corporate Strategy," *Harvard Business Review,* March-April 1992.
[16] " Passenger Carriers Are Rushing to Ride Air Cargo Boom," *Wall Street Journal*, June 2, 1995, page B-3.

- Final assembly and testing of finished goods: examples include industrial lighting products, medical equipment and testing devices, and various electronics products.

Companies stand to gain a significant competitive edge by virtue of this capabilities-based competition and might well choose to not locate in Los Angeles, or if they are already located in the region to relocate, should capacity at LAX become constrained in the future. That is to say, the impact of capacity constraints at LAX on the regional economy could be decidedly non-linear, inasmuch as shipping delays or lack of shipping availability might force such firms to relocate to regions that have the resources to support highly time-sensitive operations. An econometric modeling approach takes this into account when it adjusts for changes in the cost of doing business that are related to airport capacity.

3.2.3 Accounting For Productivity Changes Over Time

Projected growth in employment over the 1996-2015 period in the economic sectors related to LAX -- i.e., the air transportation sector, passenger spending sectors (e.g., hotels and entertainment) and 17 selected manufacturing sectors that produce goods for export by air – increases with projected growth in economic output in these same sectors.

But, growth in output does not have a linear relation to the need for additional labor resources. Employment in 17 LAX-related manufacturing sectors is projected to *fall* by 11 percent by 2015, despite the fact that output is projected to increase by 50 percent. Similarly, although employment in the air transportation sector is projected to increase by 37 percent, output is projected to increase by 82 percent. At the same time, employment in the passenger spending sectors is projected to increase by 32 percent and output is projected to grow by 51 percent. This is a product of the complex relationship between growth in the demand for output and demand for labor and other factors of production. Although increases in output are likely to increase the demand for labor, and thereby increase employment, changes in factor costs, productivity and the nature of the production function have important moderating effects on the demand for labor, or cause actual reductions in labor even as output grows.

If either relative factor prices or labor productivity changes during the projection period, the demand for labor may increase or decrease depending on the size and direction of the changes. Over the 20-year projection period for the LAX Master Plan, small annual increases in productivity have large cumulative effects on the demand for labor. For example, assuming that productivity increases by two percent per year over the 1996-2015 period, the demand for labor will fall by 33 percent, assuming output is held constant. Stated another way, total economic output will increase by 49 percent in 2015 using the quantity of labor inputs supplied in 1996.

Factor price effects can also affect the demand for labor. If the supply of labor falls in response to demographic factors, such as the aging of the baby boom generation, wages (the factor price for labor) would rise and firms would tend to substitute less costly factors of production for labor.

The shape of the production function may also have important impacts on changes in the demand for labor relative to output. In some industries, especially those providing services, there is a tight relationship between output and labor demand because the nature of the product relies heavily on labor inputs in *fixed proportions* relative to other factor inputs. For example, hotels and restaurants rely heavily on labor inputs, and holding quality constant, increased service levels (e.g., numbers of occupied hotel rooms, meals served) translate directly into increased labor demand. Industries that rely on fixed coefficient production functions are much less sensitive to changes in factor prices, because a unit of output requires a fixed amount of labor (e.g., one waiter per 10 restaurant tables) regardless of its price. Opportunities for productivity enhancements are also limited in many service industries, because the service produced is labor intensive, and reductions in the quantity of labor used to produce the service will change the quality and character of the service. If anything, there has been a tendency in the recent past for many high-end personal, household and business service industries to increase the relative and absolute quantity of labor inputs, which decreases productivity, but increases labor demand.

In contrast, many manufacturing sectors can and do readily incorporate productivity enhancements into their production functions. Recent advancements in computer and related technologies allow one worker to perform tasks that once took many workers to complete. In addition to increasing productivity, technological enhancements encourage firms to substitute capital for labor, further reducing the demand for labor.

The bulk of the changes in labor demand relative to output can be explained by changes in productivity. Using output per worker as a measure of productivity, the range in productivity increases across the three sectors directly related to the LAX Master Plan Alternatives are significant. On a three year annual

average basis, increases in output per worker range from a low of 0.6 percent to 0.8 percent for the passenger spending sectors, to a high of 2.3 percent to 2.7 percent for the manufacturing sectors producing air exports. Output per worker for the air transportation sector ranges from 1.1 percent to 1.4 percent. The values used in the REMI model rely on and are consistent with historical changes in output per worker for each sector.

Over the 20-year projection period of the LAX Master Plan, the cumulative (i.e., compounded) changes in output per worker are striking. In the manufacturing sectors, output per worker is projected to increase from $137,800 to $231,400, or 68 percent, while output per worker in the passenger spending sectors is projected to increase by 15 percent, from $39,600 to $45,400. Considering that output in the manufacturing sectors is projected to increase by 50 percent, or 18 percentage points less than output per worker, demand for workers, and hence employment, can be expected to fall. In the case of the passenger spending sectors, output demand is projected to increase by 51 percent during a period when output per worker is projected to increase by only 15 percent. As a result, employment in these sectors can be expected to increase. Employment is also projected to increase in the air transportation sector, where increases in output per worker are expected to lag increased demand for air transportation services.

The net effect of these trends for the employment implications of the LAX Master Plan EIS/EIR Alternatives is a function of the relative mix of industries implied by each. This explains why, for example, adding the 1996-2015 incremental jobs to the number of jobs that existed in 1996, would yield a (incorrect) sum, compared with the total number of LAX-related jobs for each Alternative that will exist in a snapshot of the economy taken in the year 2015. Though the economic output associated with the EIS/EIR Alternatives implies additional jobs, these jobs will respond to a very different output-labor relationship than existed in 1996, and the 1996 jobs base associated with some LAX-related sectors, particularly in manufacturing, will shrink over time. Once again, only an econometric modeling approach is capable of accurately accounting for these relationships as they evolve over time.

3.2.4 A Redefinition of "Direct" Impacts

As noted above, the standard FAA methodology counts "direct" impacts as only those jobs and other measures of economic activity that occur on airport property, while any off-airport jobs or other impact measures are counted as indirect or induced impacts, regardless of how directly related to airport activity the off-airport impacts may be. This approach in inconsistent with standard impact-output economic analysis.

The economic modeling approach taken by HR&A integrates three analytic dimensions in order to create a comprehensive (and hopefully comprehensible) impact accounting framework: a) two readily observed measures of economic activity at LAX -- air passenger enplanements and deplanements, and tons of air cargo loaded and unloaded; b) two geographic areas of impact -- on-airport and off-airport; and c) the generally accepted typology of economic impacts (e.g., direct, indirect, and induced) that is used in input-output analyses. By integrating the three dimensions, the economic impacts of LAX can be clearly identified in terms of what economic activity generated the impact; where the impact was located; and the economic nature of the impact. **Table 2,** Economic Impact Accounting Framework for the LAX Master Plan, illustrates the general structure of the accounting framework that was developed to estimate and report the economic impacts of LAX and the LAX Master Plan EIS/EIR Alternatives.

Table 2

Economic Impact Accounting Framework for the LAX Master Plan

Location/Activity	Direct Impacts	Indirect Impacts	Induced Impacts
On-Airport Activities -- Impacts Restricted to Air Transportation Sector			
Passengers	Ticket Purchases -->	Derived from REMI Models	
Cargo	Freight Charges -->	Derived from REMI Models	
Off-Airport Activities -- Includes Any Other Passenger or Cargo Related Activity			
Passengers - Ground Trans. - Lodging - Food - Recreation	Consumption of goods & Services made possible by availability of LAX air transportation	Derived from REMI Models	
Cargo - "Cost of doing business" benefits	Production of goods & Services made possible by availability of LAX air transportation	Derived from REMI Models	

Source: HR&A, Inc.

The logic of the modeling structure is geared to passenger and cargo activity levels in order to test the effects of LAX Master Plan EIS/EIR Alternatives that are distinguished, in part, by different passenger and cargo activity levels. The accounting structure also clarifies several important concepts about the role and likely impacts of LAX in the region's economy. First, LAX is clearly a key infrastructure element that facilitates economic activity by providing an important means of access for people and goods to enter and leave the region. LAX's role as an infrastructure element is made clear, because in the absence of passenger and cargo activity, commercial airports do not generate economic impacts, nor would airports have any economic basis for existing.

Second, airports are only important economically to the extent that economic activities will not occur due to a capacity shortfall. Thus, it is important to understand the extent to which other airports and other transportation alternatives in the region offer viable alternatives to passengers and/or cargo movement in and out of Southern California. Passengers, goods and services are attracted to amenities and markets in Southern California. LAX facilitates that movement. Assuming that the supply of capacity at LAX may be constrained by one or more Master Plan alternatives, it is important to recognize that the impact of such constraints at LAX may be partially or fully offset by shifting activities to another airport in the region (e.g., Burbank or Ontario) or by developing an alternative means for transporting persons and goods into and out of the region. An example of this type of "substitution" effect can be seen in the response to rapid growth of Orange County manufacturing between 1960 and 1990. Cargo demand resulting from this growth relied almost exclusively on air freight service out of LAX, because cargo operations were essentially prohibited at John Wayne Airport.

From a strict economic perspective, the impact accounting framework allows LAX Master Plan Alternatives to be described in terms of air passenger and cargo activity on- and off-airport. The passenger and cargo activities made possible by LAX correspond to the direct impacts of the airport, which in conjunction with an econometric model and ancillary models, can be used to estimate the indirect and induced impacts of the airport.[17]

As shown in **Figure 4**, Direct Impacts of the Air Transportation Sector, the direct impacts of passenger and cargo activity at LAX can be classified into three distinct and mutually exclusive categories:

[17] This alternative approach to accounting for LAX direct impacts was independently reviewed in a recent analysis of regional infrastructure systems, and found preferable to the traditional FAA approach. See, Steven P. Erie, et al., *International Trade and Job Creation in Southern California: Facilitating Los Angeles/Long Beach Port, Rail and Airport Development*, prepared for The California Policy Seminar, University of California, Berkeley, 1996, at pp. 61-65.

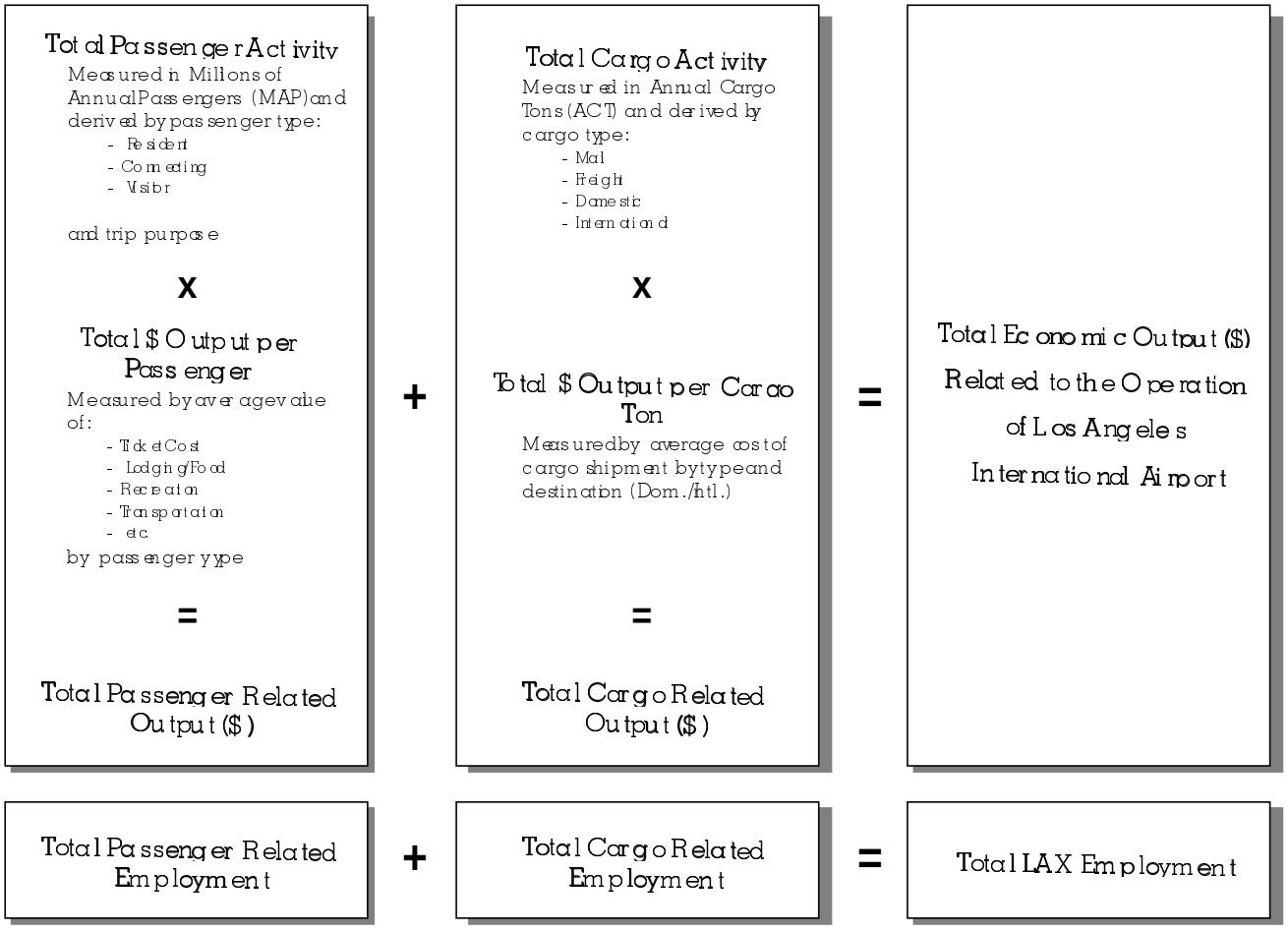
- **Air Transportation Sector**, which consists primarily of activities related to carrying-out and supporting aircraft operations;[18]
- **Passenger Spending,** or consumption, in sectors of the economy other than air transportation by local and non-local passengers who enter the region as a consequence of air transportation services at LAX;
- **Cargo-Related** production of goods and services impacts in the region that occur as a consequence of the availability of air transportation services at LAX.

Passenger and cargo activity levels can be used to estimate the amount of gross economic activity taking place at LAX. For modeling purposes, the airport activity statistics described above are expressed by econometric and input-output models in terms of LAX's contribution of dollars of annual output (i.e., the sum of the dollar value of production inputs, profits and business taxes) that can be attributed to the air transportation sector. The level of passenger and cargo output at the airport in a given year can also be used to estimate direct airport employment. Direct airport employment is a necessary input to the production of air transportation services required to meet the demand for passenger and cargo activities. **Figure 4** summarizes these relationships.

[18] The air transportation sector is defined by the Federal Office of Management and Budget (OMB) as containing all of the services generally associated with the operation and use of an airport, including passenger and cargo related air transportation services.

Figure 4

Direct Impacts of the Air Transportation Sector



3.3 The REMI Models of the Southern California Economy

For all of the reasons noted above, estimating the impacts of LAX Master Plan EIS/EIR Alternatives on the economy of Southern California requires use of an econometric model of the regional economy. After reviewing the merits and characteristics of alternative econometric models available from several vendors, the models supplied by Regional Econometric Models, Inc., (REMI) were selected. This subsection summarizes the general characteristics of REMI models and the factors that make it particularly appropriate

3.3.1 Overview of The REMI Forecasting Model

REMI produces county-level econometric models that utilize a time series of actual historical data about the behavior of the national and regional economy over the 1969-1996 period. The models are based on the same basic set of input-output relationships at the core of the RIMS II model favored by the FAA, but

go well beyond these relationships to incorporate feedback as the economy changes over time in response to changes in population and economic opportunities.

The REMI models used here consist of five "blocks" of economic and demographic variables, as shown in **Figure 5**, Remi Model Block Diagram. These variables interact simultaneously to produce the model outputs. The REMI model produces 50 tables covering 2,000 variables contained in the five economic and demographic blocks. It generates a "control" forecast – i.e., a baseline forecast in the absence of a policy intervention – and alternative forecasts that incorporate one or more changes in policy variables – i.e., the simulation forecast. **Figure 6,** Remi Model Policy Question Diagram, illustrates how the REMI model is used to answer a policy question.

The explicit structure of the model facilitates the use of policy variables that represent a wide range of policy options and makes it possible to trace the policy effect on each of the variables in the model. The REMI model can be configured to produce alternative forecasts of basic socioeconomic indicators, including population and employment and can account for changes in business cycles. It allows the users to manipulate most input variables and give forecasts for them through an extensive list of output variables. It also allows the user to generate forecasts for any combination of future years, allowing the user flexibility in analyzing the timing of economic impacts.

The primary exogenous variables are final demand (e.g., airport passengers or tons of airfreight cargo) and output by industry. These variables are forecast first at the national level, which provide the input to the regional model. The national level forecast can also incorporate policy changes in the national economy and their resulting changes in the regional economy.

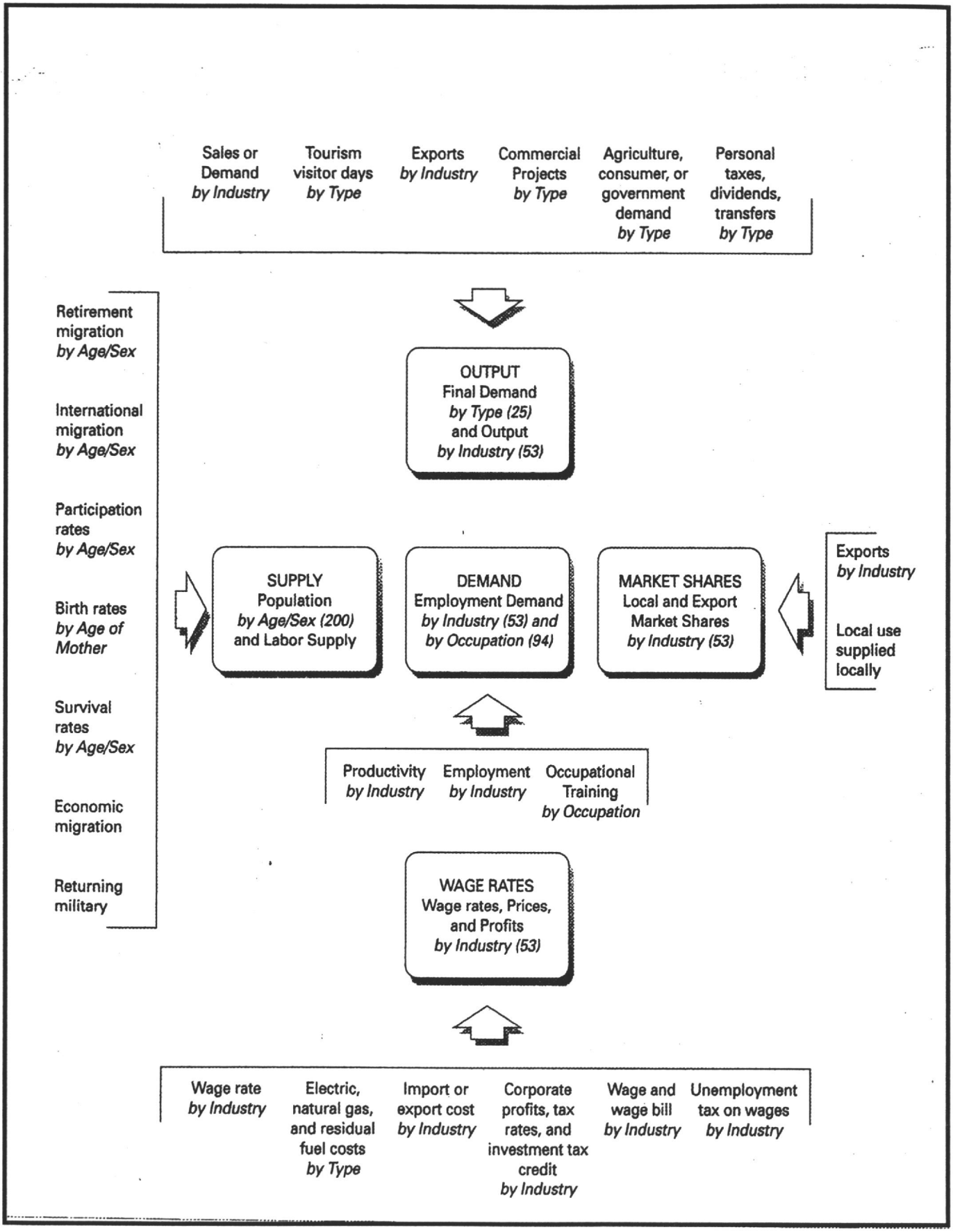
The structure of the REMI model incorporates inter-industry transactions and endogenous final demand feedback. In addition, the model includes substitution among factors of production in response to changes in relative factor costs, migration in response to changes in expected income, wage responses to changes in labor market conditions, and changes in the share of local and export markets in response to changes in regional profitability and production costs. It focuses on theoretical structural restrictions and opportunities rather than individual econometric estimates, based on single time-series observations for each region. The model includes price responsive product and factor demands and supplies, as commonly found in Computable General Equilibrium (CGE) models. The model design does not require product and factor markets to clear continuously, however. The time paths of responses between variables are determined by combining *a priori* model structure with econometrically estimated parameters.

The REMI model has been in use and under refinement since about 1980. It has been extensively documented and tested by a national community of users, and has been judged as meeting the highest professional standards. REMI models have been applied to a wide variety of analytic problems around the nation, including airport impact analysis elsewhere in the nation. A REMI model was used to analyze the economic impacts of the City of Chicago airport system, including O'Hare Airport, the second busiest airport in the world.[19]

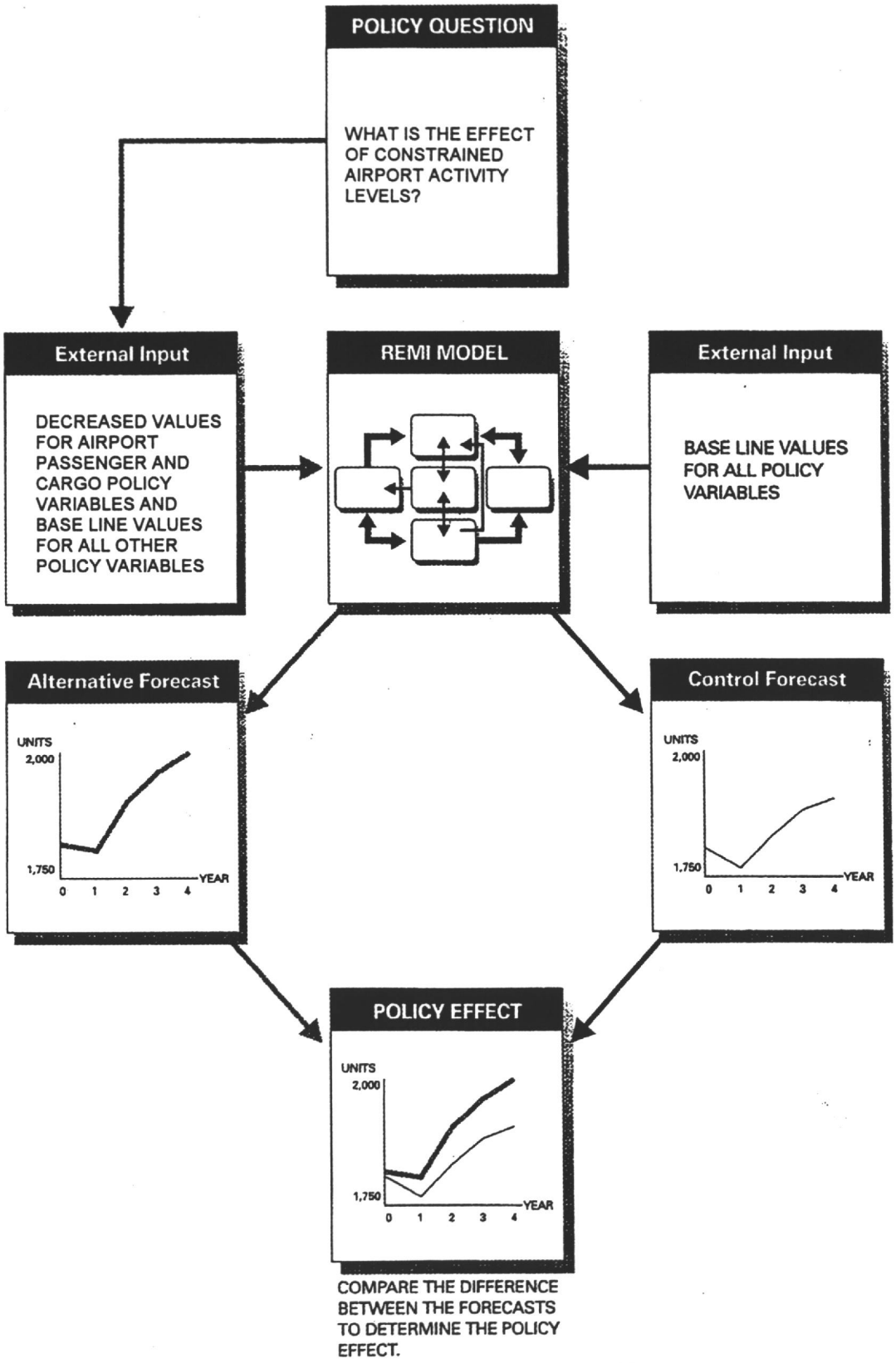
The REMI model has also been used by other large, regionally significant agencies in the Los Angeles area for examining the economic impact of their own policies, including the South Coast Air Quality Management District. The REMI model can be customized to Los Angeles County and the Southern California region. It includes specific and tailored data for industry-specific wage rates, production costs, employment, profitability and sales prices, as well as consumer prices, housing prices, employment opportunity, population, state and local government spending, investment, income and personal consumption for each of the five counties under study, including Los Angeles, Orange, Riverside, San Bernardino and Ventura.

For purposes of the LAX Master Plan EIS/EIR Alternatives analysis, two REMI models of Southern California were utilized. The first, referred to elsewhere in this Report as "LA1" or "Region 1," includes the County of Los Angeles only. The second, "LA2" or "Region 2," is the sum of the other four Southern California counties – Ventura, Orange, Riverside and San Bernardino.

[19] National Economic Research Associates, Inc., *Contributions of the Chicago Airport System to the Chicago Regional Economy*, prepared for the City of Chicago Department of Aviation, March 1993. The specific use of the REMI model in this case involved measuring the impact of the airports before and after "subtracting" them from the regional economy. Inasmuch as the regional economy would have undoubtedly developed very differently in the absence of a regional airport system, this analytic approach was judged to be inappropriate for the LAX Master Plan analysis.



Los Angeles International Airport Master Plan	REMI Model Policy Variables	Figure 5



Los Angeles International Airport Master Plan	REMI Model Policy Question Diagram	Figure 6

3.3.2 REMI Model Validation

The 53-sector REMI model with two geographic regions was evaluated against actual employment recorded by the State of California's Employment Development Department for the 1969-1992 period, and the UCLA Business Forecasting Project's forecast to the year 2010 ("UCLA Model"). These analyses and review of related studies and models of the Southern California regional economy indicate that the REMI model provides a reasonable basis for making forecasts of the regional economy and for assessing the effects of the LAX Master Plan EIS/EIR Alternatives on the regional economy.

3.3.2.1 Actual and Predicted Employment Using REMI

As indicated in **Figure 7**, REMI actual and predicted values for total private non-farm employment[20] in Los Angeles County from 1969 to 1992 track very closely, indicating that the model is a reliable tool for predicting employment. Over this historical period, employment in the County increased to 4.41 million in 1992, from 2.93 million in 1969. In absolute terms, the error bars in the bottom portion of **Figure 7** show that the difference between actual employment and REMI's predicted employment varies from less than 5,000 workers in 1982 to a high of approximately 169,000 workers in 1979. In percentage terms the prediction errors ranged from less than one percent, recorded in a number of years, to a maximum of approximately 4.5 percent in 1979. The error bars indicate that the largest deviations between actual and predicted employment occur during the periods of rapid economic growth that were recorded in the late 1970s and the late 1980s. In general, the REMI model accounts quite well for the major upturns and downturns in the County economy over the 1969 to 1992 period.

Figure 8 depicts actual and REMI's predicted employment for the air transportation sector, which in Los Angeles County, is primarily located at LAX. **Figure 8** shows that while the model's fit to the air transportation sector is good, it is not as precise as the fit for the entire private sector economy. This result is not surprising, given the much smaller size of the air transportation sector and its relatively higher sensitivity to numerous subtle economic factors that are not easily incorporated into regional economic models. As shown by the error bars at the bottom of **Figure 8**, the model consistently underpredicts employment in the sector from 1969 to 1983, and then consistently overpredicts employment in the sector from 1984 to 1987. In absolute terms, the prediction errors range from less than 1,000 employees to slightly more than 4,000 employees. In percentage terms, the prediction errors range from slightly more than 15 percent to less than one percent.

[20] The employment counts exclude agricultural employment and government sector employment, but include self-employed proprietors.

Figure 7

REMI Actual and Predicted Non-Farm Employment:
Los Angeles County, 1969-1992

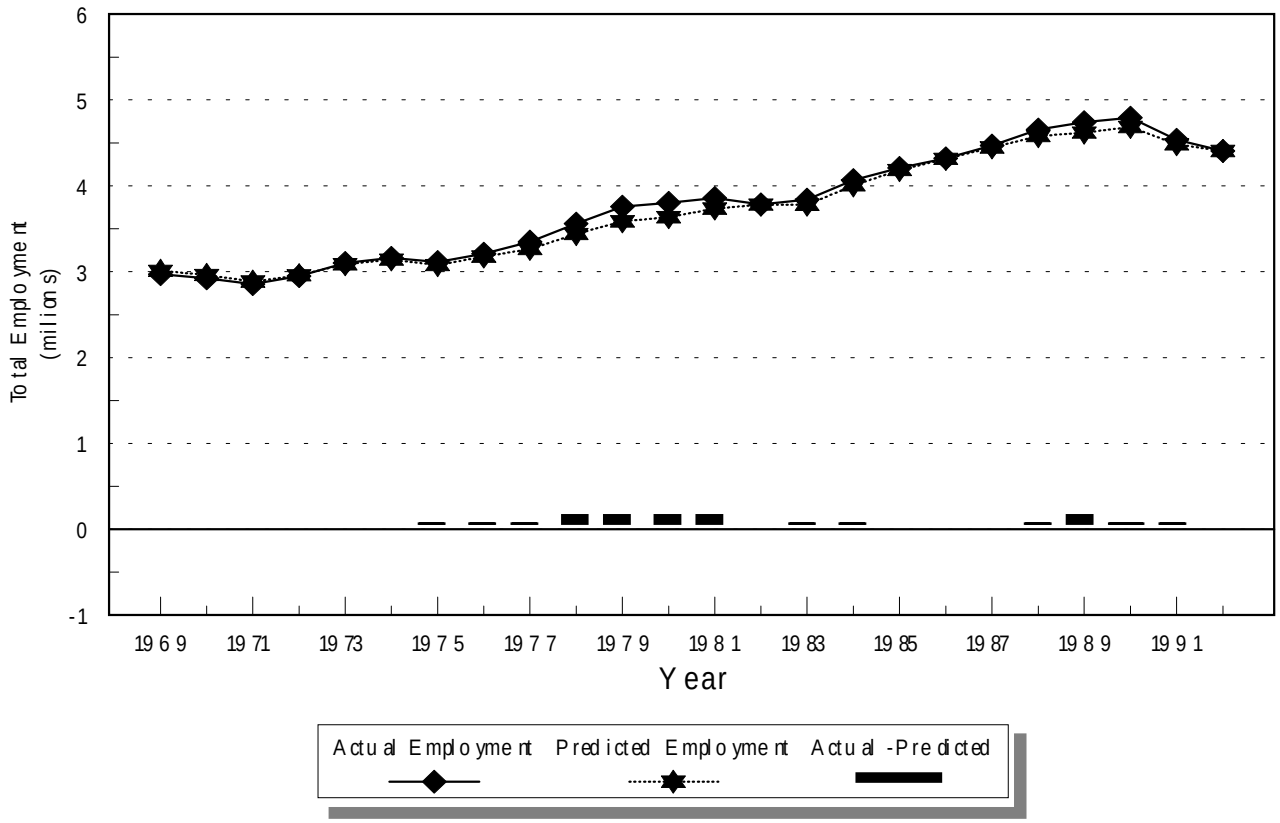
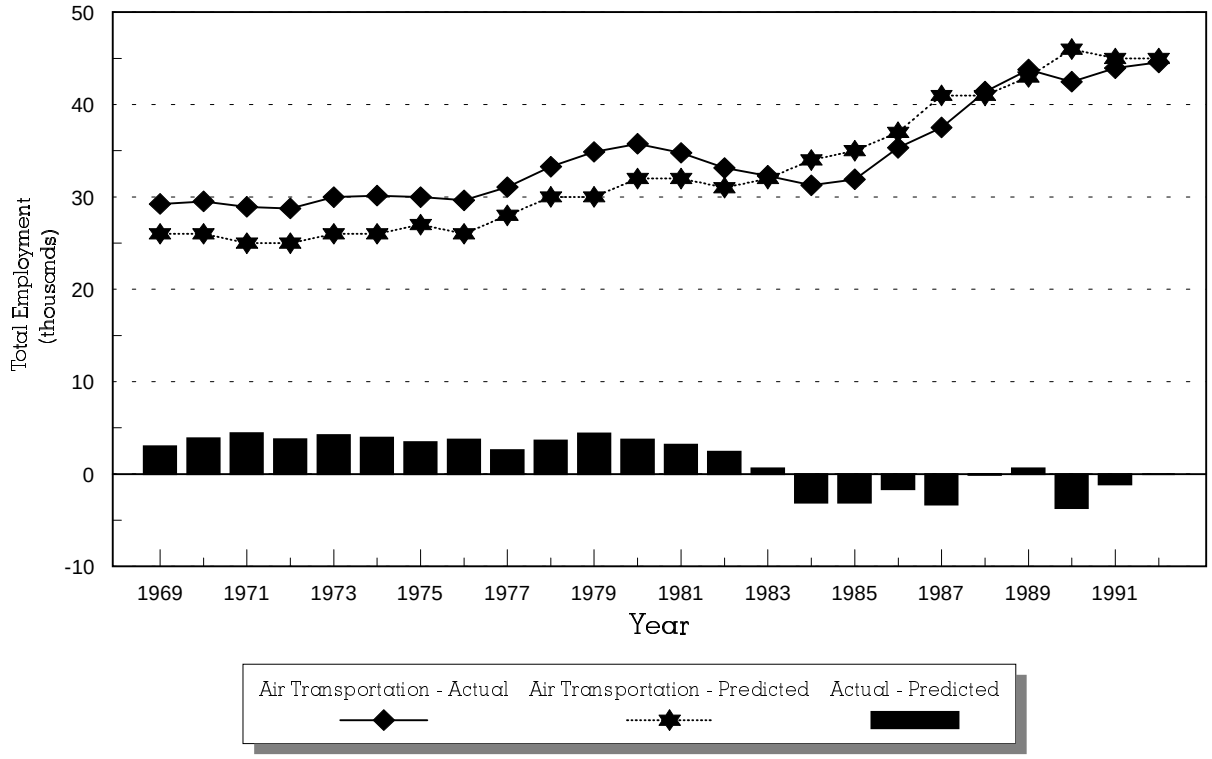


Figure 8

REMI Actual and Predicted Employment:
Air Transportation Sector, 1969-192



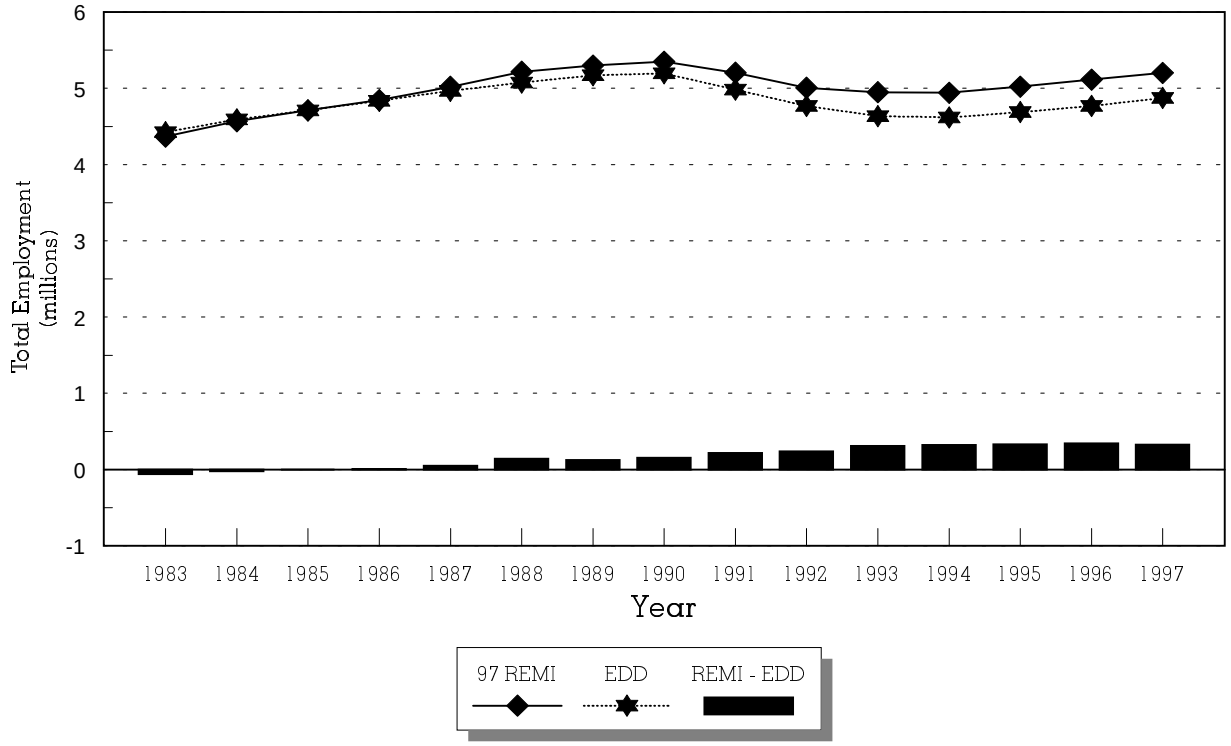
3.3.2.2 Comparison Between the REMI Model and the UCLA Model

As another means of validating the 97 REMI Model used in this analysis, the Model's regional employment forecast was compared with employment histories and projections from two "external" sources. First, the historical employment figures in the 97 REMI Model were compared with data from California's Employment Development Department (EDD), the official source for employment trends in California. The REMI and EDD employment data are not strictly comparable, because, as noted above, they use different employment concepts. Unlike REMI, EDD includes the self-employed in its employment tally. To adjust for this difference, data for southern California from the Bureau of Economic Analysis ("BEA") were used to add the self-employed to the EDD employment data.

Figure 9 compares the 97 REMI Model history with adjusted EDD historical employment for Los Angeles County in the years 1983 to 1997. The REMI and adjusted EDD historical employment figures are very similar, both in absolute number of jobs and in the shape of trend lines. The figures are virtually identical for much of the 1980s, while the 97 REMI Model shows a somewhat higher employment figure throughout the 1990s (i.e., in 1997, REMI records 5.2 million jobs while the adjusted EDD figure is 4.87 million). Overall, the comparison indicates that the 97 REMI Model's baseline employment data are consistent with that of EDD.

Figure 9

97 REMI Model vs. EDD Employment
Los Angeles County, 1983 – 1997



3.3.2.3 Correspondence between the REMI and SCAG Forecasts

A comparison was also made between the 97 REMI Model's baseline employment forecast and the regional growth forecast prepared by the Southern California Association of Governments (SCAG), the regional planning agency for the six-county southern California region, including Imperial County. As is the case with REMI and EDD data, SCAG and REMI use very different methodologies to derive their employment figures, making it difficult to compare the absolute numbers in these two forecasts. A useful comparison can be made, however, between the REMI and SCAG forecast for the *rate* of employment growth through 2015. Such a comparison is shown in **Figure 10**.

Figure 10 shows that in the period between 1994 and 2005, SCAG and 97 REMI Model employment growth projections are very similar. The 97 REMI Model shows a slightly higher growth rate (26.5% versus 24.2% for SCAG). After 2005, however, SCAG projects much stronger job growth. By 2015, SCAG foresees a total job growth of 47.5 percent, versus the 97 REMI Model's 39.1 percent. Much of this difference between the REMI and SCAG forecast, however, is due to very different population forecasts, and hence the labor force available to fill jobs, that underlie these employment projections. In 2015, SCAG projects that the six-county population will be almost 20.8 million, whereas REMI projects a population of 18.7 million.[21] The fact that SCAG's population forecast is about 10 percent higher than the 97 REMI Model forecast explains much of the difference between the two employment growth forecasts.

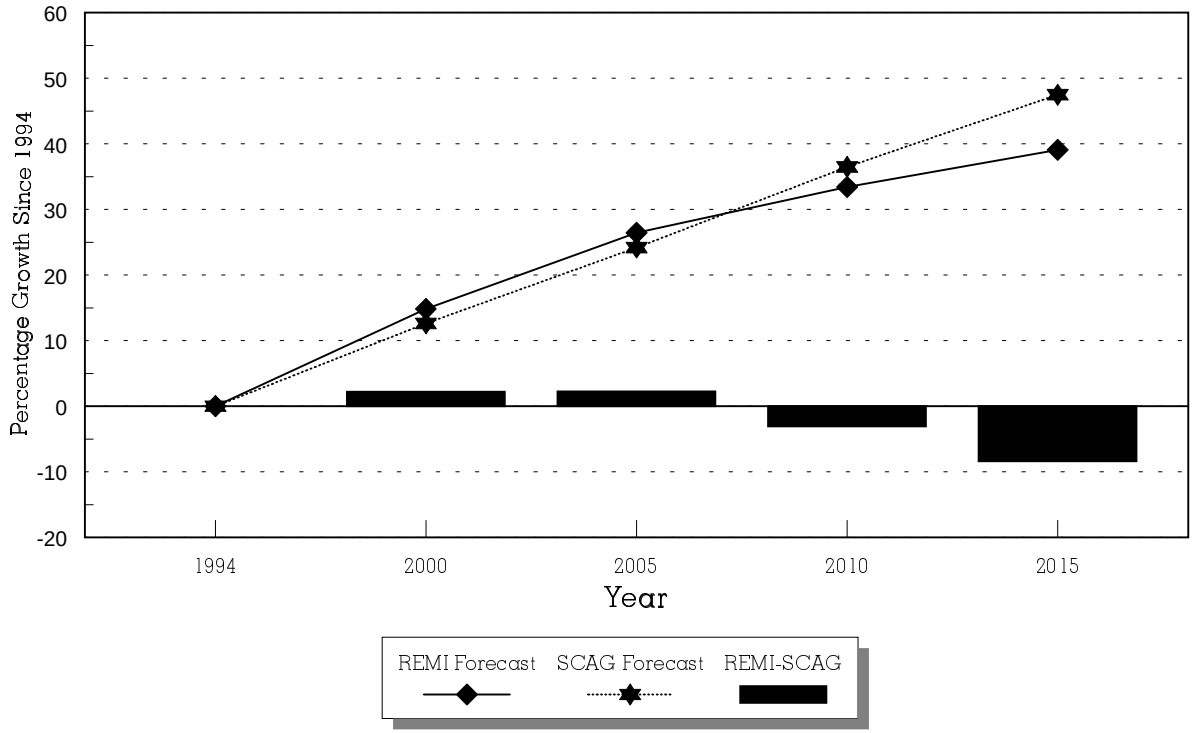
Recently, SCAG acknowledged the logical inconsistency between its population forecast and its employment forecast, which resulted from the subregional negotiation process through which its forecast

[21] The relatively low population in Imperial County is not the source of this difference.

is prepared. SCAG has embarked on a process to revise both in a downward direction. SCAG's Forecasting Technical Task Force, with assistance from Dr. Stephen Levy of the Center for the Continuing Study of the California Economy, has determined that employment growth is the more suspect component of the forecast, because it implies a future regional capture of U.S. job growth that is twice as much as the region ever garnered in the past, even during the peak economic expansion of the 1980s. There is simply no indicator on the horizon to support this outcome, and plenty of countervailing trends, including an aging labor force. As of this writing, SCAG staff is considering a reduction in the 2020 population estimate of about 850,000, and an employment reduction of about 1,000,000.[22] Changes of this magnitude would narrow the gap in the growth rate differences between the official SCAG forecast and the 97 REMI Model, as shown in Chart 8.

Figure 10

97 REMI Model versus SCAG Forecast of Growth Rate in Total Employment
Southern California Region, 1994 – 2015



In sum, these comparisons all suggest that the REMI model's forecast for future employment in the Southern California region is reasonably consistent with other forecasts on which policy makers usually depend. This means that it is reasonable to utilize the detailed economic relationships in the REMI model for Southern California to help develop estimates of the impact that the LAX Master Plan EIS/EIR Alternatives could have on the regional economy.

[22] In the City of Los Angeles, the change could be on the order of 291,000 fewer people and 58,000 fewer jobs. SCAG staff are now working on a formula for disaggregating the regional reductions by subregion, county and city.

3.4 Derivation of the Passenger and Cargo Activity Economic Impact Factors

As noted above, estimating the economic impacts of the LAX Master Plan EIS/EIR Alternatives requires, first, using descriptions of the Alternatives that can be recognized by the REMI model, and second, using descriptions that distinguish between the characteristics of the Alternatives that clearly link back to economic impacts. Millions of Annual Passengers (MAP) and air cargo tons (ACT) were determined to be the best common denominator descriptors. The initial modeling task, therefore, was to estimate a set of per-MAP and per-ACT measures of economic output and employment that reflected all of the subtle distinctions among the types of passengers and types of cargo, and then to assess the relationships between each passenger and cargo type and the regional economy. This subsection provides an overview of how this was accomplished. The next subsection provides further details about how the model was employed to capture the effects of passenger spending by category of passenger using LAX.

3.4.1 Estimating Historic Activity Levels at the Region's Airports

In order to project the relationships between possible future airport passenger and cargo activity levels and regional economic impacts, the first challenge was to document how these relationships have performed historically. HR&A developed a time series of historic passenger and cargo activity for each of the region's five major airports, including Los Angeles International Airport (LAX); Ontario International Airport (ONT); Burbank Airport (BUR); Long Beach Airport (LGB); and John Wayne Airport (SNA). To do so, HR&A aggregated data from a variety of sources in order to develop a time series of these two indicators.[23] The components of the disaggregation are described below.

- **Annual Passenger Traffic.** The annual passenger activity statistics, measured in Millions of Annual Passengers (MAP), show the actual and projected passenger activity, for domestic and for international passengers, by airport in the region, from 1985 to 2010. Statistics on historic and current passenger traffic for each of the five primary regional airports (LAX, ONT, BUR, SNA and LGB) were assembled from the data sources noted below. Year 2005 estimates by airport developed by Wilbur Smith Associates were used to project trends to that year. John Wayne Airport passenger traffic was held constant at the 2005 level to 2010 due to existing legislative constraints. SCAG Year 2010 MAP estimates for the region and for LAX were used to project the 2010 amount and distribution of air traffic within the region in 2010. Non-LAX activity in 2010 was distributed across the remaining airports (excluding John Wayne) based on the projected year 2005 distribution.

The split between domestic and international passenger traffic at LAX was provided by LAWA's historical data through 1996. Growth in international passenger traffic was assumed to increase evenly from 1996 to the year 2000 figure projected by Landrum & Brown, and to increase at the same annual rate after that year until the year 2010. Though Ontario Airport is referred to as "International", historical data show that the airport, in fact, served only a small number of international passengers for a short period during 1992 and 1993. As a result, Ontario Airport is assumed not to handle international passengers during the projection period. No other airports in the region handle, or are projected to handle, international passenger traffic.

- **Annual Cargo Tons.** Historical data on annual domestic and international cargo tonnage handled at LAX were provided by LAWA staff. Similar data for other airports in the region were available from the 1992 SCAG study, and were interpolated between known values to obtain time series data from 1985 through 1996. Regional and airport-by-airport projections provided in the SCAG study were used to project year 2000 and 2010 cargo activity levels at LAX and the other regional airports. Growth was assumed to occur evenly between "known" data points.

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[23] The principal data sources used for this analysis are:
Los Angeles Department of Airports, Facilities Planning Bureau, *Airport Forecasts and Planning Options for the year 2000*, January 1990.
Los Angeles Department of Airports, Facilities Planning Bureau, LAX traffic comparison statistics 1985 through 1994, compiled by Gerald Shafer, LADOA Accounting/Statistics. Also, similar statistics for Ontario International. Airport.
LAX Master Plan Phase I working papers prepared by Landrum & Brown, 1996.
J.D. Franz Research, *1993 Air Passenger Survey Results*, prepared for the LADOA, August 1994.
Southern California Association of Governments, *Air Cargo in the SCAG Region*, November 1992.
Wilbur Smith Associates, *Economic Impact Update: Los Angeles International. Airport*, March 1992. Also similar Wilbur Smith reports for Van Nuys and Ontario International Airports.
Wilbur Smith Associates, *Southern California Basin Airport Economic Impact Update*, July 1994.

project year 2000 and 2010 cargo activity levels at LAX and the other regional airports. Growth was assumed to occur evenly between "known" data points.

All regional international air cargo has historically been handled at LAX. This trend was assumed to continue. Historical trends are used to project the continued increase in the share of international, as compared with domestic, cargo handled at LAX, with more than half of LAX's cargo projected to be international by the year 2010. The projected distribution between mail and freight cargo was estimated based on historical trends and SCAG regional data for the years 2000 and 2010.

The time series includes the level of domestic and international passenger activity (measured as the total of annual arrivals and departures) and the level of international and domestic cargo activity (measured as the total annual tonnage of air cargo (mail and freight) shipped through the airport). **Table 3** provides an example of the time series relationships that were derived from these data sources. The indicators

Table 3

Historic Activity Indicators for Airports in the Southern California Region

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
MAP: LAX	37.6	41.4	44.9	44.4	45	45.8	45.7	47	47.8	51.1	53.9	58
MAP: ONT	3.7	4.2	4.6	4.8	5.3	5.4	5.7	5.9	6.2	6.8	7.4	8
MAP: SNA (John Wayne)	2	2.5	3.1	3.6	4.1	4.6	5.1	5.6	6.1	6.3	6.5	6.7
MAP: BUR	2.9	3.1	3.3	3.4	3.6	3.8	4	4.2	4.3	4.7	5.1	5.5
MAP: LGB	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.6	0.6	0.7	0.7
LA County: Sector	41.2	45.1	48.8	48.5	49.3	50.4	50.4	51.9	52.8	56.4	59.7	64.1
Region: Sector	46.8	51.9	56.4	56.9	58.7	60.4	61.2	63.5	65.1	69.5	73.6	78.9
Cargo Mail - Dom.: Region (Tons)	153,012	161,654	171,782	171,646	167,016	176,651	188,717	193,459	205,582	224,829	232,531	238,978
Cargo Freight - Dom.: Region (Tons)	663,542	689,614	791,770	848,853	897,838	957,941	935,722	1,006,258	1,088,191	1,266,247	1,296,330	1,428,054
Cargo Total - Dom.: Region (Tons)	786,554	851,267	963,552	1,020,500	1,064,855	1,134,593	1,124,440	1,199,717	1,293,773	1,491,076	1,528,861	1,667,032
Cargo Total - Dom.: LA1 (Tons)	642,896	684,018	772,711	806,068	826,832	872,979	839,235	878,413	936,368	1,097,571	1,099,257	1,201,327
Cargo Mail - Intl.: Region (Tons)	12,610	12,629	11,172	10,643	10,581	11,894	10,778	10,740	13,989	12,068	15,399	18,352
Cargo Freight - Intl.: Region (Tons)	302,830	352,220	411,179	433,559	449,488	443,452	455,120	531,456	575,952	666,312	727,372	765,633
Cargo Total - Intl.: Region (Tons)	315,439	364,849	422,351	444,202	460,069	455,346	465,989	542,196	589,941	678,380	742,771	783,985
Cargo Total - Intl.: LA1 (Tons)	315,439	364,849	422,351	444,202	460,069	455,346	465,989	542,196	589,941	678,380	742,771	783,985
Cargo Total: Region (Tons)	1,101,994	1,216,116	1,385,903	1,464,702	1,524,924	1,589,939	1,590,338	1,741,913	1,883,714	2,169,456	2,271,632	2,451,017
Cargo Total: LA1 (Tons)	958,835	1,048,867	1,195,062	1,250,270	1,286,901	1,328,325	1,305,133	1,420,609	1,526,309	1,775,951	1,842,028	1,985,312
Intl. Share of Regional Cargo Traffic	28.60%	30.00%	30.50%	30.30%	30.20%	28.60%	29.30%	31.10%	31.30%	31.30%	32.70%	32.00%
LA1 Share of Regional Cargo Traffic	87.00%	86.20%	86.20%	85.40%	84.40%	83.50%	82.10%	81.60%	81.00%	81.90%	81.10%	81.00%
LAX Share of Regional Cargo Traffic	84.30%	83.60%	83.70%	82.80%	81.70%	80.80%	79.10%	78.40%	77.60%	78.50%	77.50%	77.30%

show the historic growth in air passenger and cargo traffic in the region. Since 1985, regional passenger traffic has increased by approximately 69 percent (from 47 MAP in 1985 to 79 MAP in 1996) while passenger traffic in Los Angeles County has increased by only 56 percent, from 41 MAP in 1985 to 64 MAP in 1996. After Long Beach Airport, whose passenger activity was almost flat during the period studied, LAX was the slowest growing passenger airport in the region, and was far outpaced by passenger increases at SNA (235%), BUR (90%) and ONT (116%). Still, in 1996, LAX served nearly 74% of all regional air passenger demand.

With respect to cargo, regional cargo activity increased over 122 percent since 1985, reaching more than 2.4 million annual cargo tons (ACT) by 1996. The highest cargo growth rates occurred in the international freight sector, which grew by 152 percent between 1985 and 1996. Because international air cargo is carried only through LAX, this statistic explains the strong cargo growth experienced there as compared with the rest of the region

3.4.2 Estimating the Relationship Between Passenger and Cargo Activity at LAX And Regional Economic Output

The next step in the analysis involved relating the disaggregated history and forecast of passenger and cargo activity to regional economic output. HR&A combined survey data from a 1990 survey of LAX employers with known historical data on the size of the air transportation sector in that same year, as derived from the REMI model, in order to estimate the 1990 relationship between air passenger activity, air cargo activity, and regional economic output in the air transportation sector. In 1990, this sector produced about $5.48 billion (1987 $). 1990 employer expenditure data provided in an employer survey[24] was first combined with known 1990 airport activity data to estimate the distribution of regional economic output among passenger and cargo activities. This distribution was then applied to the known 1990 air transportation sector total to derive per- MAP and per-annual cargo ton (ACT) factors.

Table 4 shows the distribution of expenditures by on-site airport employers at LAX, air support operations and airport government.

Table 4

Distribution of Airport Employer Expenditures
Based on Wilbur Smith Employer Survey Data for 1990

Employer Type	Total Annual Expenditures (,000)	Distribution of Expenditures
Airlines	$2,190,700	74.3%
Cargo/Freight Operators	231,000	7.8%
Air Support	395,800	13.4%
Airport Government	130,300	4.4%
Total	**$2,947,800**	**100.0%**

Source: Wilbur Smith Associates; HR&A

The data in **Table 4** show an estimated $2.947 billion in expenditures by LAX employers in 1990. Based on these data a further set of assumptions was then made to divide the estimated 1990 expenditure data across two dimensions: cargo/passenger and domestic/international.

A substantial volume of air cargo (and nearly all international air cargo) is carried on "passenger" flights in the belly areas of the aircraft not otherwise used for passenger baggage. As a result, a portion of the expenditures that are attributed to "Airlines" is actually associated with air cargo transportation, rather than passenger transportation services. It was necessary, therefore, to divide cargo related expenditures between cargo carried on "cargo only" flights and those resulting from cargo carried on "passenger" flights (referred to in the airline industry as combined passenger-cargo flights, or "combi.").

From **Table 5**, $231,000,000 (or 7.8% of all expenditures) represents the total dollar value of expenditures associated with the transportation of cargo on "cargo only" flights at LAX in 1990.[25] Based on SCAG data

[24] Wilbur Smith Associates, *Economic Impact Update, op. cit*.
[25] A review of the documentation of the 1992 Wilbur Smith survey reveals that the category "Cargo/Freight" in fact includes the all

also for 1990, approximately 9.5 percent of passenger airline revenues were attributable to the transportation of air cargo. Thus, an additional $208,117,000 (9.5% of $2,190,700,000 or 7.1% of all expenditures in **Table 4**) was attributable to cargo transportation on passenger flights, for a total of $439,117,000 (or 14.9% of all expenditures) attributable to cargo transportation at LAX. This calculation is summarized in **Table 5**.

Table 5

Initial Disaggregation of Cargo Expenditures at LAX, 1990
(in $000's)

Cargo Category	Estimated Expenditure Distribution	Percent Distribution
Cargo Only: Domestic		
Cargo Only: International		
Total Cargo Only	$ 231,000	7.8%
Cargo on Passenger: Domestic		
Cargo on Passenger: International		
Total Cargo on Passenger	208,117	7.1%
Total Cargo	439,117	14.9%
Total LAX Employer Expenditures	**$2,947,800**	**100.0%**

Source: HR&A, Inc.

Also from SCAG data, "cargo only" flights account for 87 percent of the domestic air cargo transportation market. Because there is only a very small international "cargo only" market, it was assumed that the $231,000,000 associated with the transportation of cargo on "cargo only" flights in fact equals this 87 percent of the domestic cargo market.[26] Expenditures related to the *total* domestic cargo market at LAX, therefore, equal $265,517,000, with the difference of $34,517,000, or the remaining 13 percent between these two values, representing expenditures attributable to domestic air cargo on passenger flights at LAX. The remainder of the expenditures associated with cargo on passenger flights at LAX ($173,599,000) is attributable to international cargo. This refined distribution is summarized in **Table 6**.

Table 6

Disaggregation of Cargo-on-Combi-Flight Expenditures at LAX, 1990
(in $000's)

Cargo Category	Estimated Expenditure Distribution	Percent Distribution
Cargo Only: Domestic		
Cargo Only: International		
Total Cargo Only	**$ 231,000**	**7.8%**
Cargo on Passenger: Domestic	34,517	1.2%
Cargo on Passenger: International	173,599	5.9%
Total Cargo on Passenger	**208,117**	**7.1%**
Total Cargo	**439,117**	**14.9%**
Total LAX Employer Expenditures	**$2,947,800**	**100.0%**

Source: HR&A, Inc.

[26] cargo "airlines" as well as cargo related ground operations. The "Airlines" category includes only passenger airlines. This may overstate the proportion of expenditures related to domestic (versus international) cargo transportation, to a small degree, due to the fact that, for the purpose of making this distribution, the entire $231,000,000 figure was used to estimate the total LAX expenditure figure for the domestic cargo sector.

The next part of the calculation derives the expenditures for "cargo only" flights. Because 90 percent of the international cargo market at LAX is served by cargo carried on passenger flights, and this represents $173,599,000 in expenditures, total expenditures associated with international cargo transportation at LAX equal $192,888,000 ($173,599,000 divided by 0.90). The difference between these two figures ($19,289,000) represents expenditures attributable to the transportation of international cargo on "cargo only" flights at LAX. By subtraction, the remainder of the expenditures associated with cargo on "cargo only" flights at LAX ($211,711,000) is attributable to domestic cargo. This further refinement of total LAX employer expenditures is shown in **Table 7**.

Table 7

Disaggregation of Cargo-Only vs. Combi Expenditures at LAX, 1990 (in $000's)

Cargo Category	Estimated Expenditure Distribution	Percent Distribution
Cargo Only: Domestic	$ 211,711	7.2%
Cargo Only: International	19,289	0.7%
Total Cargo Only	**231,000**	**7.8%**
Cargo on Passenger: Domestic	34,517	1.2%
Cargo on Passenger: International	173,599	5.9%
Total Cargo on Passenger	**208,117**	**7.1%**
Total Cargo	**439,117**	**14.9%**
Total LAX Employer Expenditures	**$2,947,800**	**100.0%**

Source: HR&A, Inc.

This expenditure distribution between types of cargo was assumed to be the case for all of the airports in Los Angeles County, because LAX dominates cargo activity in the County. This distribution was then applied to the known total 1990 economic output for the Los Angeles County air transportation sector to estimate the total output associated with each of the components of cargo transportation in the County.

A similar set of calculations was made to estimate the details of the expenditure disaggregation for domestic and international *passenger* transportation. Because it is known (from **Table 4**) that total employer expenditures at LAX equaled $2,190,700,000 in 1990, the difference between that total and the $208,117,000 attributable to cargo transportation on passenger flights ($1,982,584) can be attributed to passenger operations. Passenger expenditures were then distributed between the domestic and international categories,[27] based on the distribution between domestic and international passengers at LAX in 1990.[28]

The Air Support and Airport Government category expenditures were added from **Table 4** and their percentages of total 1990 airport sector expenditures at LAX were calculated. The complete expenditure distribution is shown in **Table 8**.

[27] This calculation does not, at this point, account for the difference in average expenditures associated with international versus domestic passenger transportation. That distinction is accounted for later in the analysis.

[28] In 1990, an estimated 9.8 of 45.8 total MAP (or 21.4%) were attributable to international passengers.

Table 8

Complete Disaggregation of Expenditures at LAX, 1990
(in $000's)

Expenditure Category	Estimated Expenditure Distribution	Percent Distribution
Cargo Only: Domestic	$ 211,711	7.2%
Cargo Only: International	19,289	0.7%
Total Cargo Only	**231,000**	**7.8%**
Cargo on Passenger: Domestic	34,517	1.2%
Cargo on Passenger: International	173,599	5.9%
Total Cargo on Passenger	**208,117**	**7.1%**
Total Cargo	**439,117**	**14.9%**
Passenger: Domestic	1,595,188	54.1%
Passenger: International	387,396	13.1%
Total Passenger	**1,982,584**	**67.3%**
Total Airlines	2190,700	74.3%
Total Air Support	395,000	13.4%
Total Airport Government	130,300	4.4%
Total LAX Employer Expenditures	**$2,947,800**	**100.0%**

Source HR&A, Inc.

Once again, the relationships shown in **Table 8** were also assumed to represent all air transportation activities in Los Angeles County. The distribution was modified, though, for the rest of the region (Orange, Riverside, San Bernardino and Riverside Counties) to account for the fact that there is no international air transportation available at the two major airports in that area (ONT, SNA). For international "cargo only" activity, this adjustment was made by shifting the expenditure proportions attributable to international cargo operations into the domestic cargo category. For international passenger and "cargo on passenger" activity, this adjustment was made by shifting the expenditure proportions attributable to international operations into the domestic passenger category. **Table 9** compares the distributions used in the two areas in percentages.

Table 9

Distribution of Estimated 1990 Air Transportation Sector Expenditures by Cargo/Passenger and International/Domestic For the LA1 and LA2 Model Regions

Expenditure Category	Estimated LA1 (LA County) Distribution	Estimated LA2 (4-County) Distribution
Cargo Only: Domestic	7.2%	7.8%
Cargo Only: International	0.7%	0.0%
Total Cargo Only	**7.8%**	**7.8%**
Cargo on Passenger: Domestic	1.2%	1.2%
Cargo on Passenger: International	5.9%	0.0%
Total Cargo on Passenger	**7.1%**	**1.2%**
Total Cargo	**14.9%**	**9.0%**
Passenger: Domestic	54.1%	73.1%
Passenger: International	13.1%	0.0%
Total Passenger	**67.3%**	**73.1%**
Total Airlines	74.3%	74.3%
Total Air Support	13.4%	13.4%
Total Airport Government	4.4%	4.4%
Total LAX Employer Expenditures	**100.0%**	**100.0%**

Source: HR&A, Inc.

3.4.3 Passenger Activity and Direct Impacts of Passenger Spending

This subsection provides additional details on how the modeling was utilized to derive the per-MAP economic output factors presented above.

3.4.3.1 Estimating the Distribution of Regional Passenger Spending Across Passenger Types and Passenger Activities

The assumptions used to derive each level of the economic output distribution are described below.

The Regional Domestic-International Passenger Relationship

The split between domestic and international passenger traffic at LAX was provided by LAWA's historical data for the years 1985 to 1994. Because no international traffic is served at other airports in the region, this derivation was relatively simple. Essentially, LAX international traffic over the historic period was assumed to represent total regional international air travel.[29]

The Visitor/Resident/Connecting Passenger Relationship

1993 LAX passenger survey data were used to derive trends in this relationship over the 1985 to 1994 period. The most striking data in this time series show that connecting passenger traffic at LAX has increased to over 38 percent today, from only 20 percent of total activity in 1987. The growth trend in connecting passenger activity was assumed to continue through 2010, at which point it was assumed to have reached 50 percent of total passenger activity at LAX. In addition, as a working assumption, it was assumed that there was no connecting traffic at any of the other four major airports in the region, and, therefore, that all connecting traffic was attributable to activity at LAX. Traffic at the other regional airports was distributed based on the relationship between domestic resident and visitor traffic at LAX.

[29] The single exception to this rule results from the fact that Ontario "International" Airport did serve an estimated 50,000 international passengers during late 1993 and early 1994. International traffic at that facility did not exist before 1993.

The Visitor Passenger Business/Vacation Relationship

1993 LAX passenger survey data were used to derive trends in this relationship over the 1985 to 1994 period. LAX trends were assumed to apply to other airports in the region as well, with the exception that only domestic business/vacation trips occur at airports other than LAX, which serves both types of trips for domestic *and* international passengers. This split applies only to Visitor Passenger activity. Resident and Connecting Passenger activities are handled somewhat differently. (See below.)

The Length of Stay/"Days Out of Town" Relationship

1993 LAX passenger survey data were used in conjunction with information from the Los Angeles County Visitors Bureau to derive these estimates. These data are assumed to remain constant over both the historic and projection periods. For Visitor Passengers, these data provide an estimate of the length of time the passenger will spend in the region. For Resident Passengers, these data provide an estimate of the length of time the Resident Passenger will spend out of the region.[30]

Average "Per Day" Passenger Spending

1993 LAX passenger survey data were used to derive these estimates. Survey data show differences in spending by international versus domestic passengers. These data (converted to $1996) were assumed to remain constant over both the projection periods. LAX trends were assumed to apply to other airports in the region as well. For Visitor Passengers, these data provide an estimate of the average per-day expenditures for each passenger who visits the region. For Resident Passengers, it was estimated, based on survey data, that 20 percent of Resident Passengers at LAX leave a car at the airport during their trip. An average per-day parking cost of $7.50 per day was used to estimate the total revenue impact associated with parking fees charged at the region's airports.[31] Based on 1993 LAX survey data, Connecting Passengers were assumed to spend money at airport restaurant and retail establishments during their layover at LAX. Again, survey data *do* show differences in spending by international as versus domestic passengers. Domestic connecting passengers were assumed to spend $6.00, on average, during their layover, while international passengers were assumed to spend $11.00. Other airports in the region were (as noted previously) assumed not to serve connecting passengers.

The Functional Distribution of Passenger Spending:

1993 LAX passenger survey data were used to derive these estimates. Based on these data distributions of passenger spending were developed across six primary spending sectors (hotel, amusement and recreation, food and drink, retail, transportation and automotive services) and two visitor types (business, vacation). These distributions differ from one another based on the differing spending characteristics of the two types of passengers. Thirty-nine percent of Domestic Vacation Passengers are assumed to stay at hotels and, therefore, to spend in that sector. Sixty-four percent of International Vacation Passengers are assumed to stay at hotels, while 89 percent of Business Passengers exhibit this characteristic.

Connecting Passengers

Finally, Connecting Passengers were assumed to spend 50 percent of their airport expenditures in the food and drink sector and the remaining 50 percent in the retail sector. The only impacts attributed to Resident Passengers are those associated with the cost of parking at the airport. All of these impacts were attributed to the "Automotive Services" sector, which includes "Automobile Parking".[32]

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[30] This data are used to estimate parking revenue impacts for residents who leave cars at the airport during their trip. See following text for a more detailed discussion of this effect.

[31] The result of this analysis shows, for LAX, that the direct economic impact of parking fees charged at LAX was approximately $120 million in 1994. This is roughly two times the 1994 revenue which the LAWA showed for parking fees at LAX. Much of this difference may well be attributable to the revenues earned by the numerous non-LAWA owned parking businesses at or around the airport. The estimated direct *regional* output associated with fees charged for parking *at all five major airports combined* is $155 million for 1994.

[32] Parking costs are the only local impacts attributed to Resident passengers in the current analysis. To the extent that such passengers spend money at restaurant and retail establishments during the time they spend in one of the region's airports, this analysis may, to a small degree, have underestimated the impacts of Resident passengers. To an even lesser degree, expenditures associated with resident passenger transportation to the airport, to the extent that such transportation is provided by a private taxicab, limousine or shuttle service will cause some additional impacts on the local economy. This does not apply to Connecting and Visitor passengers, for whom these (airport spending and/or transportation) impacts *have* been measured. (See text.)

4. OVERVIEW OF LAX'S ROLE IN THE LOS ANGELES REGIONAL ECONOMY

This Section begins with a summary of the evolution of the Southern California economy, focusing in particular on the post-World War II transitions, including those which followed the 1990-94 regional recession. The economic linkages between LAX and the many hospitality (e.g., hotel, eating and drinking, amusement and recreation) and other visitor-serving sectors are relatively well understood, which is why traditional airport economic impact analysis focuses on that aspect of airport operation, though not usually as a "direct" economic impact, as they are treated in this Report. Much less well understood are the relationships between LAX and other kinds of firms that comprise the region's economic base. To explore this, HR&A undertook two sets of investigations leading to case studies of specific firms. The first focuses on two sectors that are critical to the long-term future of the regional economy, but whose need for air transportation services is not critical. The second set focuses on industries with a central dependence on air transportation services. The goal of both is to better understand the relationship between those sectors, the capacity of LAX and other airports in the region to support them, and the possible costs to those businesses if insufficient air transportation services are available in the future. The results of the first set of investigations -- on two critical industries – are reported in Section 4.2. The results of the second set of investigations – on industries that depend heavily on air transportation -- are reported in Section 4.3. Having illustrated the underlying dynamics with the case studies, the final subsection presents a forecast of the economic impacts under a scenario in which capacity is enhanced to fulfill all of the demand for air transportation services in the region that is implied by future population and economic growth.

4.1 The Structure of the Regional Economy

In the decades following World War II, dramatic changes have occurred in the structure of the economy of the State of California, and particularly the five-county region of Southern California. The most recent changes became particularly apparent during the 1990-94 recession, but they were rooted in the region's continuing evolution into one of the world's most dynamic economies. Historically, the post-agrarian foundation of the region's economy consisted of three primary pillars: oil production, defense-related manufacturing (including aerospace) and the entertainment and tourism sector (i.e., motion picture and television production, amusement and recreation services, and overnight lodging). Two of these pillars all but crumbled during the 1990s. National defense cutbacks, and the resulting reductions in the flow of funds to Southern California for military equipment manufacturing and research and development, sharply decreased employment in the manufacturing and aerospace industries. Oil production employment decreased because of environmental pressures and the high cost of exploration and drilling here. As these industries declined, the region listed toward higher unemployment than it had historically experienced, even as foreign immigration continued. Today, the entertainment and tourism sector is the only one of the region's three original pillars that still stands rock solid. Joining it are two new pillars -- foreign trade of value-added manufacturing in the high technology and medical technology fields, and the apparel industry. This evolution of the economy, and the continued growth of the population, is changing the region's demand for air transportation services.

The Southern California region is a formidable economic entity. With a Gross Region Product of over $400 billion, it would rank as the 12th largest economy in the world if it were a separate country, right between Canada and South Korea, as shown below in **Table 10**.

Table 10

So. California's Gross Regional Product Compared to The Gross Domestic Product of Nations (1995 $, in billions)

Rank	Nation	Gross Domestic Product
1	United States	$7,254
2	Japan	5,153
3	Mainland China	2,759
4	Germany	2,172
5	France	1,521
6	United Kingdom	1,110
7	Italy	1,082
8	Russia	664
9	Brazil	657
10	Spain	554
11	Canada	542
	SO. CAL. REGION	**433**
12	South Korea	425
13	Netherlands	391
14	India	326
15	Mexico	237

Source: U.S. Department of Commerce, *Statistical Abstract of the United States*, 1997 Edition, Table 1347.

From 1970 to 1997, the region's population rose by over 6 million and a remarkable 2.8 million jobs were created, while per capita personal income in the region rose from just over $4,700 in 1970 to $24,899 in 1997. This is an impressive economic record, quite possibly the best, in terms of the sheer magnitude of change, of any region in the world.

Following the end of the 1980-81 recession, the California economy expanded rapidly and out-performed the U.S. economy for the remainder of the decade. Fueled by rising defense expenditures, an expanding high technology sector and growing trade with the Pacific Rim, the State added new jobs at rates substantially exceeding those for the nation as a whole.[33] In many markets, employers began following their workers to the suburbs, generating unprecedented demand for suburban office and industrial space. Home prices began to exceed their pre-1981 recessionary levels.

Even as late as 1987, when the rest of the nation began to experience a downturn, the California economy continued to expand. Population growth accelerated, as did home prices. Unable to afford homes in the State's coastal markets, many households moved inland, generating a housing and retail boom in San Bernardino and Riverside Counties in particular.

4.1.1 General Structure of the Regional Economy

Key characteristics of the regional economy include the following:

- A large, diversified and skilled labor force that is the nation's largest regional labor market.
- A large domestic market (i.e., regional population base) and access to both western U.S. and overseas markets
- The State's largest port and airport system located within reach of the fast-growing markets in Mexico and the Pacific Rim.
- A rapidly growing financial services sector serving both domestic and international transactions.
- A high tech complex built around the region's educational institutions, skilled labor force and venture capital industry.
- The largest, and one of the most diverse, manufacturing complexes in the U.S.

[33] +5.74% to +2.33% year-to-year growth in California non-farm employment versus +4.64% to +2.02% year-to-year growth in the U.S. non-farm employment, over the period 1984-1990.

- A diversity of locations for living and working, which has enabled the region to absorb substantial population and job growth in urbanizing areas, though sometimes at a cost to the environment and the quality of life in those areas.

Despite the size and diversity of its economy the region has not been immune from change and upheaval in the State and national economies, with which it is inextricably linked. Recent upheavals include business cycle recessions and recoveries from the early '70s through the early '90s. National (and regional) recessions occurred in 1974-75, 1981-82, and from 1990 to the mid-1990s. During this period, each recession resulted in a larger percentage decline than its predecessor. In addition to being deeper, the 1990-94 recession was more prolonged than the 1974-75 and 1981-82 episodes. The region also experiences periodic natural (e.g., floods, wildfires and earthquakes) and human disasters (e.g., 1992 Los Angeles civil disturbance) that rock the economy.

Table 11 summarizes employment growth in seven major industry sectors of the region's economic base between 1972 and 1997. Most of the new jobs in basic industries were created in the services sector, particularly professional services and tourism/entertainment, both of which had job gains over 100 percent between 1972 and 1992, and double-digit gains between 1992 and 1997. The three manufacturing sectors – defense-related, high technology and diversified manufacturing – had only modest job growth between 1972 and 1992, and both experienced job losses between 1992 and 1997.

Table 11

Basic Industry Employment in the Southern California Region, 1972-1997

Industry Sector	1972	1992	1997	1972-1992 Growth		1992-1997 Growth	
				Number	Percent	Number	Percent
Professional Services	328.5	798.8	925.7	470.3	143.2%	126.9	15.9%
Diversified Manufacturing	673.9	721.8	763.3	47.9	7.1%	41.5	5.7%
Transportation and Wholesale	329.5	526.5	561.5	197.0	59.8%	35.0	6.6%
Tourism and Entertainment	107.0	248.3	314.0	141.3	132.1%	65.7	26.5%
Defense-related	250.1	236.2	153.0	-13.9	-5.6%	-83.2	-35.2%
Resource-based	78.6	116.8	74.1	38.2	48.6%	-42.7	-36.6%
High Technology Manufacturing	80.9	111.9	102.5	31.0	38.3%	-9.4	-8.4%
Total	**1,848.3**	**2,760.3**	**2,894.2**	**911.8**	**49.3%**	**133.8**	**4.8%**

Source: SCAG (1972 & 1992 data); Center for the Continuing Study of the California Economy (1997 data); HR&A, Inc.

The region's unemployment rate during the 1980s was below, or no more than, that for the United States, but since the inception of the 1990s recession, the region's unemployment rate has consistently exceeded the national rate. Los Angeles, San Bernardino and Ventura County unemployment rates tend to cluster in a narrow band between the Riverside rates, the highest of the five urbanized counties, and those for Orange County, which has consistently had the lowest unemployment rate in the region.

The rate of job growth is primarily determined by growth in the region's "economic base," which is comprised of "basic" and "non-basic" industries. Basic industries make a substantial share of their sales to customers outside of the region. That is, they export goods and services to customers elsewhere in California, throughout the nation, and throughout the world. Selling outside the boundaries of the region is what brings new income into the region. Aircraft, apparel, motion pictures, computer services, plastics, and amusements are all key industries in the region's economic base. Non-basic industries include the rest of manufacturing, air transportation, parts of the wholesale trade, hotel, and business services industries, as well as part of the services provided by the region's hospitals and universities, which serve people from outside the region.

Manufacturing has been, and will continue to be, an important part of the region’s economic base, because it creates both direct production jobs and jobs in many related industries. However, manufacturing jobs have been a steadily declining share of the national economic base as well as that of the region. For example, between 1979 and 1993 the U.S. economy added 20 million jobs while the number of manufacturing jobs fell by over 3 million. The region's share of manufacturing employment,

after growing steadily since the 1970s, began to decline in 1987. In 1997, there were more than 1 million manufacturing jobs in the region, accounting for over half of the State's manufacturing jobs and for 14.6 percent of total jobs in the region. The region's share of total U.S. manufacturing jobs, after falling to 5.2 percent in 1995, rose to 5.5% in 1997.

Manufacturing is very important to the region's prosperity, but it is not the only base sector with future opportunities. Non-manufacturing activities, like tourism, entertainment, and professional services, have become a significant component of the region's economic base.

Growth in the economic base will determine the opportunities for job growth and increases in income in the total economy. Prospects for job growth in supporting activities like retail trade, medical services, construction, and local education depend on employment expansion in basic industries. Regions with the fastest growing economic bases have the highest rates of overall employment growth.

The key major industry sectors in the region's economic base include the following.

4.1.1.1 Defense-Related Industries

The defense-related sector of the region's economic base is no longer large in terms of job levels compared with other sectors. In fact, defense activities have declined substantially as a share of the region's economic base. Yet current defense spending cuts loom large in the minds of most Southern Californians as a problem area impeding future economic growth. In 1972, the region contained nearly 2.5 jobs in aerospace and defense for every job in tourism and entertainment. By 1995, these roles had reversed, and there are now more than twice as many jobs in tourism and entertainment than exist in aerospace and defense. The regional economy is currently experiencing the second major decline in defense related jobs since the 1960's. After the Vietnam War, defense related jobs fell sharply from 367,800 in 1967 to 250,100 in 1972 and stayed relatively stable until a new defense build up occurred beginning in 1979.[34] Between 1972 and 1979 jobs in the SCAG region grew faster than in the nation without any boost from the defense sector. In fact, defense jobs fell as a share of the region's economic base in each year in the 1970's until the 1979 defense build-up. One problem in the current recession is a sharp decline in commercial sales to both domestic and foreign customers. The number of new firm orders for civil transport dropped form 1,015 in 1989 to 231 in 1992 for U.S. suppliers. While defense spending in the region is expected to continue falling, spending will still exceed $200 billion a year and retention of the region's competitive position in these markets is also an important regional economic goal.

4.1.1.2 International Trade

Foreign trade has emerged as a major sector in the region's economic base. The volume of merchandise trade through the Los Angeles Customs District grew from $6.2 billion in 1972 to $185.9 billion in 1997. Foreign trade has remained an area of strength in the regional economy, with the region doubling its share of U.S. trade volume between 1972 and 1997 (from 6% to over 12%). The total value of trade in the Los Angeles Customs District was $185.9 billion in 1997. The region's trade volume increased at an annual average rate of 13% between 1975 and 1996, with total trade volume growing by more than 50 percent between 1990 and 1996. The value of trade volume handled by the region's ports and airports was $68.5 billion in 1986, rising to $168.8 billion in 1996. The impact of trade on the region is even larger. Trade in services, not included in the Customs District data, is growing even faster than trade in goods. For every $3 in goods traded, there is now an additional $1 in trade in services. The jobs associated with foreign trade are hard to identify precisely, but they are numerous and spread throughout most sectors in the regional economy. Foreign trade creates jobs in three major areas: (a) goods manufactured in the region; (b) delivery of goods (e.g., trucking, wholesale trade, railroad, and air transportation industries); and (c) trade in services (e.g., air travel for tourist and business travelers; software and entertainment products, professional services, and education and health).

Despite the region's deep recession and slow growth for some large trading partners such as Japan, in 1992 the volume of trade through the area's ports increased by 8.1 percent, outpacing the 7.7 percent national increase. In 1993, the Los Angeles Customs District passed New York as the nation's largest center for foreign trade, and the total value of Los Angeles Custom District trade in 1997 was $185.9 billion. All national forecasters expect foreign trade to grow at roughly twice the rate of the domestic

[34] The defense related sector includes aircraft, missiles & space, search and navigation equipment, ship building & repair, and federal civilian defense jobs. In these sectors a significant share of activity is defense related. Some defense spending creates some jobs in other industries while not all production in these industries is defense related - for example, the commercial aircraft market.

economy in the years ahead, even without including added growth from the North American Free Trade Agreement and related trade initiatives. The 1990s recession did not hurt the value of international trade passing through the Los Angeles Customs District (LACD). In fact, without foreign trade as a buffer, unemployment in the region would today be even higher than it was.

Since the recession, exports produced in the region have grown steadily, from $20 billion in 1993 to $24.4 billion in 1996, a 2.1 percent increase. The value of exports in the region increased from $19.9 billion in 1986 to $68.9 billion in 1996. Over 50 percent of California exports in 1996 were sold to Asian countries. Other things being equal, export growth depends more on changes in real economic activity abroad than it does on real growth in the region. The slowdown in export growth through LACD in the 1990-92 period reflects weaker GDP growth in Japan, other Asian economies and Europe in the past few years. The value of exports rose 9.2 percent in 1991, virtually the same as in 1990, and a further gain of 7.5 percent was posted in 1992. Considering the severity of the downturn in economic activity and employment in other sectors of the regional economy, these growth rates, although slower than in the 1988-90 period, nonetheless can be considered quite good. The current international economic turmoil has slowed this growth, but most observers regard this as a temporary phenomenon, at least within the planning horizon of the LA Master Plan.

The value of imports rose from $48.7 billion in 1986 to $64.6 billion in 1990, and then to $99.9 billion in 1996. This amounted to an average annual growth rate of 7.5 percent between 1986 and 1996. On the import side, however, weaker demand for foreign (mainly Asian and Latin American) products both here and elsewhere in the United States stalled import growth through the LACD at only 3.3 percent in 1991. As import prices rose by more than this, the volume of goods handled fell, resulting, undoubtedly, in some loss of employment in the goods handling and transport areas. Import growth through the LACD, until just recently, resembled the growth rates of 1987-89.

In 1997, LACD accounted for roughly 12% of U.S. foreign trade volume. The pattern of export and import growth through the LACD in the past few years reflects trends in merchandise trade throughout the country. In fact, LACD has continued to increase its share of U.S. trade, on both the export and the import side of the ledger, fairly steadily since the early 1970s. Imports through LACD managed to gain market share even in 1991, when economic activity in southern California and the western U.S generally was more depressed than in the rest of the country.

4.1.1.3 Tourism and Entertainment

From a base of 107,000 jobs in 1972, the sector expanded by over 193 percent to include roughly 314,000 in 1997. This sector now accounts for more than twice as many jobs in the region as aerospace and defense. The tourism and entertainment sector, which includes the hotel, motion picture, and amusement industries, has been a strong growth sector in the region's economic base. Tourism creates jobs in other sectors as well, such as restaurants, retail stores, car rental agencies and air travel. Another sign of the impact of tourism and entertainment is that in 1992, for the first time, tourism and entertainment provided more jobs than the defense related sector in the region's economic base. The long-term outlook for the tourism and entertainment industry is positive. Rising incomes nationwide and worldwide will support above average growth rates in all parts of the industry. Moreover, the industry provides jobs at a variety of wage levels from high wage full time jobs in motion pictures to lower wage full and part time jobs in the hotel and amusement sectors.

The tourism and entertainment sector can make a significant contribution to the regional economy if the region maintains its competitive position in this fast growing, and constantly changing industry. Recent job gains in the motion picture production industry, one of the few bright spots in the region's otherwise bleak employment growth picture during the past few years, several recently approved studio expansions, approval of The Walt Disney Company's theme park expansion in Anaheim and Universal Studio's expansion now in the public review process, are among the positive indicators for the future of this sector.

4.1.1.4 Diversified Manufacturing

One way that the regional economy overcame past defense cuts was capitalizing on growth opportunities in other manufacturing subsectors. Between 1972 and 1989, jobs in the region's diversified manufacturing sector increased by more than 150,000, while similar jobs declined nationwide. As a result, the regional share of the national sector grew from 4.3 percent in 1972 to 5.4 percent in 1989, but, in the wake of the region's recession, fell to less than 4.7 percent in 1994. The region's share has since increased to 5.0 percent as of 1997, and is projected to reach 5.4 percent by 2005. With over 763,000 jobs in 1997, diversified manufacturing remains a significant component of the region's economic base.

The largest industries in this sector, in terms of production and jobs, are apparel, fabricated metal products, plastics, chemicals, publishing, and furniture. While a small portion of this sector serves defense industries, the vast majority of jobs are linked to civilian markets. Apparel has been one of the star performers with a steadily growing local job base even though deep job declines have been experienced nationwide. In 1997, apparel accounted for 135,400 jobs and textiles another 19,500. Together apparel and textile account for more jobs than the aircraft sector. Apparel has prospered in the face of foreign competition because Los Angeles has become an international design center.

Since 1989, the region's diversified manufacturing sector has declined in absolute size and lost a share of the national job pool. Part of the decline is associated with defense cuts and part with the region's deep construction slump. However, some diversified manufacturing firms have left the region for other reasons, and there is deep concern that a deteriorating business climate is threatening the region's competitive position in this key sector.

4.1.1.5 Professional Services

Professional service industries are now the largest sector in the region's economic base, with roughly 926,000 jobs in 1997, an increase of 10.1 percent since 1990. Moreover, professional services will provide the largest component of potential future job growth in the region's economic base. The region serves markets throughout California, the nation, and worldwide in industries like software, engineering and management services, and portions of the legal services, business services, and higher education sectors. Professional services often serve manufacturing industries. For example, Southern California is a major center for automobile design despite the absence of substantial car production in the region.

The competition for professional service jobs, usually paying high wages, points out the challenge in developing a competitiveness strategy for the region. While mature manufacturing industries often rank labor and other business costs as the dominant location factor, professional service industries more often value a highly educated labor force and quality of life considerations such as good schools, efficient transportation, a healthy environment, and world class recreation and entertainment opportunities.

4.1.1.6 High Technology

National and worldwide demand for the products of technology will make sales of technology based goods and services a leading growth market in the 1990's and beyond. Traditional measures of high technology manufacturing include the computer, electronic components, and instruments sectors. Now, however, growth is also becoming significant in other markets such as environmental technology, bio-tech, and advanced transportation technology. Historically, defense related industries have dominated the region's technology sector while the civilian sector has been larger to the north in Silicon Valley. With the increasing merger of multi-media technology and entertainment industry content, the concentration of this sector may be changing.

4.1.2 The State and National Outlook to 2015

The regional employment outlook depends to a great extent, of course, on the health of the California and national economies. Four sectors in particular propelled the State's economy during the 1980s:

- Foreign trade.
- High tech manufacturing.
- Professional services.
- Tourism and entertainment.

These sectors are particularly significant because: (a) they are expected to have above-average growth in national and international markets; (b) California has a high and rising share of U.S. jobs and output in these sectors; and (c) all four sectors play a significant role in the Southern California economy.

California, nevertheless, fared worse than the U.S. economy as a whole during the recession of the early 1990s. In 1993, for example, the State’s unemployment rate stood at 9.4 percent, compared to the national rate of 6.9 percent. Most of the State’s job losses between 1990 and 1994 occurred in manufacturing (-291,500 jobs), trade (-147,600 jobs) and construction (-97,500 jobs), and most of the statewide loss was concentrated in Southern California, particularly Los Angeles County. California has, however, experienced rapid job growth after 1994 in almost all major sectors. Most of the job gains occurred in services (497,300 new jobs) and trade (193,200), with the fastest rates of increase occurring in construction (18.8%) and services (14.0%). The 1990s employment trends are shown in **Table 12**.

Table 12

California Jobs By Major Sector, 1990-1997 (in thousands)

Sector	1990	1994	1997	Change 1990-1994 Number	Change 1990-1994 Percent	Change 1994-1997 Number	Change 1994-1997 Percent
Mining	37.7	31.9	29.4	-5.8	-15.4%	-2.5	-7.8%
Construction	561.8	464.3	551.7	-97.5	-17.4%	87.4	18.8%
Manufacturing	2,068.8	1,777.3	1,907.7	-291.5	-14.1%	130.4	7.3%
Transp., Public Util.	612.2	619.0	663.1	6.8	1.1%	44.1	7.1%
Trade	2,992.7	2,845.1	3,038.3	-147.6	-4.9%	193.2	6.8%
Fin., Ins., Real Estate	808.8	770.6	756.9	-38.2	-4.7%	-13.7	-1.8%
Services	3,343.1	3,558.2	4,055.5	215.1	6.4%	497.3	14.0%
Government	2,074.8	2,093.2	2,151.8	18.4	0.9%	58.6	2.8%
Total	**12,499.9**	**12,159.5**	**13,154.4**	**-340.3**	**-2.7%**	**994.9**	**8.2%**

Source: California Employment Development Dept., Center for Continuing Study of the California Economy, HR&A

Prospects for recovery of the State economy during the 1990s and beyond are linked to at least three factors, according to one analysis:[35]

- The number of new jobs created in the U.S. economy.
- California's share of these new jobs (historically about 16.2%). This, in turn, will depend on what industries are growing quickly in the national economy, and the State's competitive position.
- The rate of productivity growth, which determines increases in real (i.e., inflation-adjusted) wages and the standard of living.

Table 13 shows one closely followed projection to 2005, for various indicators of the health of the State economy, and for several of the State's regions, including Southern California. Highlights of the projection include the following:

- Annual growth of nearly 350,000 jobs, which will exceed the rate of job growth in the nation as a whole. Even with the recession, Southern California's annual job growth rate is expected to be just marginally lower (1.7% per year) than was the case for the prior decade (1.9% per year), just a hair below the annual job growth rate for the State as a whole (1.8%), and well ahead of the annual growth rate for the nation (1.2%).
- Total personal income in all regions, and in the State as a whole, is projected to grow faster than for the nation in the coming decade. This region will continue to account for the largest share of total State buying power, but this share will decline somewhat (from 49% to 47%) due to faster projected income growth in the San Diego, Sacramento and other inland regions.
- Per capita income growth rates, which varied considerably by region in the 1980s, is projected to become more uniform in the 1990s. At $28,345, Southern California's per capita income in 2005 is projected to be less than the State average ($29,767 in 1997 $).
- Total taxable sales grew at about half the rate for total income growth during the 1980s, probably due to large household spending on such non-taxable items as housing. This region is projected to experience an annual growth rate identical to the State average (3.4%), but its share of the State total is projected to decline from 48 to 46 percent.

[35] California Economic Growth, *op. cit.*, at 15-18.

Table 13

California Regional Economic Trends, 1990-2005

Economic Activity	Average Annual Growth 1979-1992	Average Annual Growth 1992-2005
TOTAL JOBS		
So. Cal. Region	1.9%	1.7%
San Francisco Bay Area	2.0%	1.6%
San Diego Region	3.6%	2.5%
Sacramento Region	3.6%	2.2%
Rest of State	2.4%	1.9%
California	2.2%	1.8%
TOTAL PERSONAL INCOME (1992$)		
So. Cal. Region	3.2%	2.6%
San Francisco Bay Area	3.2%	2.7%
San Diego Region	4.3%	3.6%
Sacramento Region	4.0%	3.6%
Rest of State	2.8%	3.3%
California	3.3%	2.9%
PER CAPITA INCOME (1992$)		
So. Cal. Region	0.8%	1.1%
San Francisco Bay Area	1.7%	1.0%
San Diego Region	1.3%	1.1%
Sacramento Region	0.9%	1.1%
Rest of State	0.0%	1.1%
California	0.9%	1.0%
TOTAL TAXABLE SALES (1992$)		
So. Cal. Region	1.7%	2.6%
San Francisco Bay Area	1.9%	2.7%
San Diego Region	3.2%	3.9%
Sacramento Region	3.0%	3.3%
Rest of State	1.3%	3.2%
California	1.7%	2.8%

Source: Center for the Continuing Study of the California Economy, HR&A

UCLA's long-term projection to 2015 for the State includes the following assumptions:

- A long-term decrease in net migration to California because of: (a) the depth and length of the current recession; (b) prospects that job growth in California will lag that for the nation as a whole; and (c) housing price differentials with neighboring states will continue to lure California households, particularly older households, to relocate out of the State.
- The primary source of the decrease in net migration will be a protracted decline in migration from the rest of the U.S. Foreign migration is expected to return to pre-recessionary levels by 1995, but to level off through 2010.
- Natural population increases will account for two-thirds of the State's growth in the 1990s, and 85% of the growth in the next decade.
- Labor force participation rates, which have declined in California since 1989, are assumed to begin rising again by 1995 and will reach pre-recessionary levels by 2000 and remain constant thereafter. Should the incentives for early retirement and the relatively low participation rates of Asian and Hispanic women increase, the size of the labor force could exceed the projection.

Accordingly, UCLA projects the following situation for the State over the next 20 years:

- Total California population is projected to grow from 30.0 million in 1990 to 35.7 million (+19%) in 2000, and by another 18 percent in the next 10 years, to 42.2 million in 2010. The growth in each of these two decades, though substantial, is considerably below the 26% growth rate during the 1980s.
- The number of households is projected to increase from 10.4 million in 1990 to 12.1 million (+17%) in 2000 and by another 12 percent in the next decade, to 13.6 million in 2010. Here again, the growth in

each of these two decades, though substantial, is considerably below the 21% growth rate during the 1980s.

- The labor force is projected to increase from 14.7 million in 1990 to 17.1 million in 2000 and to 21.6 million in 2010.

To the extent that trade, high technology, professional services and tourism/entertainment remain high growth sectors in the world economy, California should reap particular economic benefits. The emerging consensus about the need to enhance the State's competitive position (e.g., education reform, increased spending on infrastructure related to the cost of business and quality of life, regulatory cost reduction and streamlining, long-term State budget stability) could also prove crucial to the State's recovery.

4.1.3 The Regional Employment Forecast to 2015

The Southern California Association of Governments (SCAG) prepares projections of employment by industry (at the three-digit SIC code level through 2010) to the year 2020, based on the forecasts of national employment growth prepared periodically by the U.S. Department of Labor, Bureau of Labor Statistics and a range of other factors, including the expectations of its member jurisdictions.[36] SCAG's current projection shows the number of jobs (including agriculture and self-employment) in the region rising from 6.8 million in 1990 to 9.8 million in the year 2015, for an increase of nearly 39 percent. In the face of expected employment declines in several sectors of manufacturing, this is a substantial increase. Yet it is well below the region's historical performance. In the 18 years from 1972 through 1990, employment in SCAG's six counties grew by more than 66 percent.

Given these projections, it is unlikely that employment growth in the region will keep pace with population and labor force expansion. The clear implication is that southern California will either experience higher unemployment rates than it is accustomed to, or, more likely, that future population growth will feature lower rates of net in-migration. That is, a higher unemployment rate in Southern California than in the rest of California and the nation will lead residents to leave for greener pastures, while simultaneously slowing the rate of immigration from outside the region.

Among the notable conclusions of SCAG's forecast are the following:

- Manufacturing employment is projected to decline to the year 2000, and then increase slightly above 1990 levels by 2010, for a net increase of only 26,000 jobs, or a cumulative annual growth rate of only 0.1% over the projection period. By 2010, this sector's share of total employment in the region is projected to fall from 17.5% (in 1990) to just under 13%. It is SCAG's goal to halt the projected shrinkage in manufacturing jobs in order to provide enough jobs and a decent standard of living for the future labor force.
- The services sector is projected to show the largest absolute (+1.3 million jobs) and annual growth rate increase (+2.7%/year). The share of services jobs in the regional total is projected to rise from just over 25% in 1990 to more than 31% in 2010.
- The trade sector is projected to add about 651,000 jobs to 2010, for the second highest annual growth rate (+1.8%). Its share of total jobs will increase slightly from 21% in 1990 to 22% in 2010.
- The transportation and public utilities sector, and the finance, insurance and real estate sector, are projected to add 123,000 and 171,000 jobs, respectively, for an annual growth rate of 1.7% to 2010. The combined share of these sectors is projected to remain at about 10.5% of all jobs in the region.
- The government sector is projected to register an increase of 229,000 jobs by 2010, for an annual growth rate of 1.2% over the period. In 2010, this sector will account for about 11% of all jobs in the region, compared to about 12% in 1990.
- The construction sector is projected to add about 76,000 jobs by 2010, for an annual growth rate of 1.1%. Its share of total jobs in the region will remain steady at about 4%.

SCAG's current projection suggests that most of the employment growth that the region will experience will occur in its outlying areas, rather than in Los Angeles County. **Table 14** shows that more than half (57%) of the employment growth will occur outside the region's largest county than within it.

[36] SCAG's projection is based on the region's expected share of growth in 49 "basic" industries. Job projections for 21 "non-basic" (or local) industries are then derived using historical trends in the ratio of basic to non-basic employment. The SCAG region includes Imperial County, which is not included in the analysis reported herein.

Table 14

Regional Employment Growth By County, 1994-2015

County	1994-2015 Growth	1994-2015 % Increase
Los Angeles	**1,378,963**	**33.4%**
Orange	679,817	53.9%
Riverside	461,364	119.2%
San Bernardino	498,345	102.5%
Ventura	155,660	55.1%
Imperial	29,722	56.7%
Subtotal, Non-LA County	**1,824,908**	
Total	**3,203,871**	

Source: SCAG "modeling forecast," June, 1997

SCAG's forecast of future regional employment is compared with several other published forecasts in **Table 15**. Woods & Poole Economics, Inc. shows the lowest projected average annual employment growth rate (0.5 percent) and thus the lowest total employment (9.5 million) in 2015. The SCAG forecast reflects the highest percentage average annual growth at 1.5 percent. The highest total employment forecast is 10.6 million forecast by National Planning Associates.

Table 15

So. California Regional Employment Forecasts

Year	LA Region Employment in Thousands			
	NPA	W&P	REMI	SCAG
1975	4,993	4,993	5,103	4,515
1980	6,204	6,203	6,240	5,244
1985	7,026	7,026	6,997	5,968
1990	8,316	8,316	8,268	6,866
1995	7,907	8,000	8,060	N/A
2000	8,695	8,383	9,083	7,526
2005	9,404	8,752	10,000	8,525
2010	10,077	9,120	10,551	9,091
2015	10,617	9,487	11,000	9,808
	Average Annual Growth Rate			
1990-2015	1.0%	0.5%	1.1%	1.5%

N/A = Not Available.

Sources: National Planning Associates (NPA), Woods & Poole Economics, Inc. (W&P), Regional Economic Models, Inc. (REMI), So. California Association of Governments (SCAG); HR&A, Inc.

As noted previously in Section 3 of this Report, some of the differences in employment projections from these sources are definitional in nature, and others are a product of different forecasting methods. Order of magnitude, the SCAG forecast is reasonably consistent with the REMI model's forecast.

4.2 Dependence on LAX By Industries Critical to the Future Regional Economy

The relationship between the basic industries in the regional economy and the demand for air transportation services is best explained by looking at specific industry sectors that have been, and are projected to continue being, critical to the region's economic future.

Though the reasons for the choices will be obvious to close observers of the Southern California economy, the selection of two sectors for assessment of their relationships with LAX was based on careful review of data in the REMI model, numerous articles and publications on topics related to the future of the region[37] and discussions with individuals about their perceptions of the likelihood of growth in various local industries. Without exception, these sources pointed toward two sectors which have long been perceived as success stories of the Southern California economy -- the motion picture/television[38] and emerging multimedia industry and the electronics manufacturing industry.[39]

According to industry experts, California's motion picture and multimedia industry is currently second to none in size, capacity for innovation and development potential. Its commercial reach is effectively worldwide. As for the electronics manufacturing sector, according to the Los Angeles Times, "The Los Angeles/Long Beach customs district has more international trade than any other in the United States. Trade is expected to play an even bigger role in the next century in the economy of California, the gateway to the Pacific Rim", and "Electronics Leads" with over $5.6 billion in exports of electronic circuits and micro-assemblies in 1994. Both of these industries are (currently) growing in terms of employment and revenues and are expected to be key players in augmenting the value-added capacity of the regional economy.

Table 16, below, shows the REMI estimated employment and output growth (in 1992$) for the top ten projected growth industries in the Los Angeles County economy (measured in terms of output). Three of the top five sectors -- Real Estate, Wholesale Trade and Retail Trade -- were excluded because they do not sell goods and services produced in the region to the rest of the country or the world. Firms in these sectors satisfy demand for local services from the existing economy, but do not generally bring money into the regional economy.[40]

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[37] These included, for example:
"The State's Economy in the Year 2000: The Next California," Los Angeles *Times*, September 12, 1995, Section J (on the history and future of both the motion picture/multimedia and electronics industries).
"With Aerospace Ailing, Hollywood Looks to be Region's New Top Gun," Los Angeles *Times*, November 1, 1995, Section D (on the growing and expanding motion picture/multimedia entertainment industry).

[38] This includes companies in Standard Industrial Classification (SIC) Codes 7800, 7810, 7812, 7819, 7820, 7822, 7829, 7830, 7832, which are the motion pictures, motion picture products and services, motion pictures and video production, services allied to motion pictures, motion picture distribution and services, motion pictures and tape distribution, motion pictures distribution services, motion picture theaters and motion picture drive-ins, respectively.

[39] The electronics industry is herein defined as companies with SIC codes 3670,3671,3672,3674,3675,3676,3677,3678,3679,3690,3691,3692,3694,3695, and 3699.

[40] The sale of investment real estate to non-local parties is an exception to this generalization.

Table 16

Employment and Output Growth for the Top Ten Industries Los Angeles County (billions of 1992$)

Output Rank	Industry Name	1994 to 2015 Output Growth	1994 to 2015 Emp. Growth
1	Machinery and Computer Equipment	$36.1	13,602
2	Wholesale Trade	29.9	96,840
3	Real Estate	28.0	51,419
4	Miscellaneous Business Services	25.6	279,115
5	Retail Trade (excludes eating and drinking establishments)	16.2	105,354
6	Motion Pictures (includes multimedia entertainment)	15.3	70,173
7	Electronic Equipment (excludes computer equipment)[1]	12.7	(6,236)
8	Health Services	10.9	204,713
9	Auto Repair and Services	10.2	27,830
10	Miscellaneous Professional Services	9.7	237,972

[1] Labor Productivity increases in the electronic equipment sector is projected to induce employment losses over time even in the face of substantial projected increases (of over 133% between 1996 and 2015) in total output.

Source: HR&A, Inc.

The motion picture/multimedia and "electronics" sectors rank sixth and seventh, with $15.3 and $12.7 billion (1992$) in projected output growth over the 1996 to 2015 period. The remaining sectors in the top ten list are *service* sectors, whose ties to the airport, to the extent that they exist, are likely to be passenger-related.

Neither the motion picture-multimedia industry, nor the electronics industry, has traditionally been described as "airport dependent" in the distribution of finished goods to end-users. These studies define the variables that describe the relationship between each of these two growth industries and the activity at LAX, both today and into the future.

4.2.1 Motion Picture and MultiMedia Production

Motion picture and television production firms are the backbone of the emerging multimedia industry. Beginning in 1994, there were more jobs in motion picture/t.v. production in Los Angeles County than in aircraft manufacturing. Fueling the explosive growth of this sector is the merger of the creative talent of Hollywood with the advanced computer technology talent of Northern California's Silicon Valley. This creative merger has spawned entire new manufacturing industries (including computerized games, toys, and educational and business software), new forms of themed electronic amusements (at such diverse venues as multiplex cinemas, restaurants, shopping malls and sports stadiums), and even a new category of real estate development -- urban entertainment destinations. This new, multi-dimensional integration of entertainment and tourism is already in evidence at Universal City. The entertainment and tourism sector is in many ways ideal for leading the region and Los Angeles County into the next century. It imposes relatively modest impacts on infrastructure and the environment, compared with other forms of development. It generates demands for many services and products which are filled by large numbers of diverse small entrepreneurs, many of whom are also located in the County and the region. The entertainment industry, in particular, is one of the few that is simultaneously open to new entrants, funding, global competition, and new market development. Its use of non-routine partnering with a variety of small specialized firms and entrepreneurs for project-by-project collaborations, and strategic alliances with competitors, are exactly the characteristics that economists believe are essential for business to compete successfully in the increasingly global economy. And, Los Angeles County maintains, at least for now, a competitive edge in this sector because of a very high concentration of film, television and commercial production studios and their allied creative and technical businesses. Despite fierce competition from other regions, over 90 percent of California's motion picture production and support industries are located in Los Angeles County.

4.2.1.1 Industry Overview

This new amalgam of related businesses is difficult to define as a sector of the economy. In fact, it crosses several sectors. One way of approaching a definition of the industry is through a description of its main processes and outputs. **Figure 11** portrays the essential elements of the multimedia industry, and places it in its wider functional context**.**

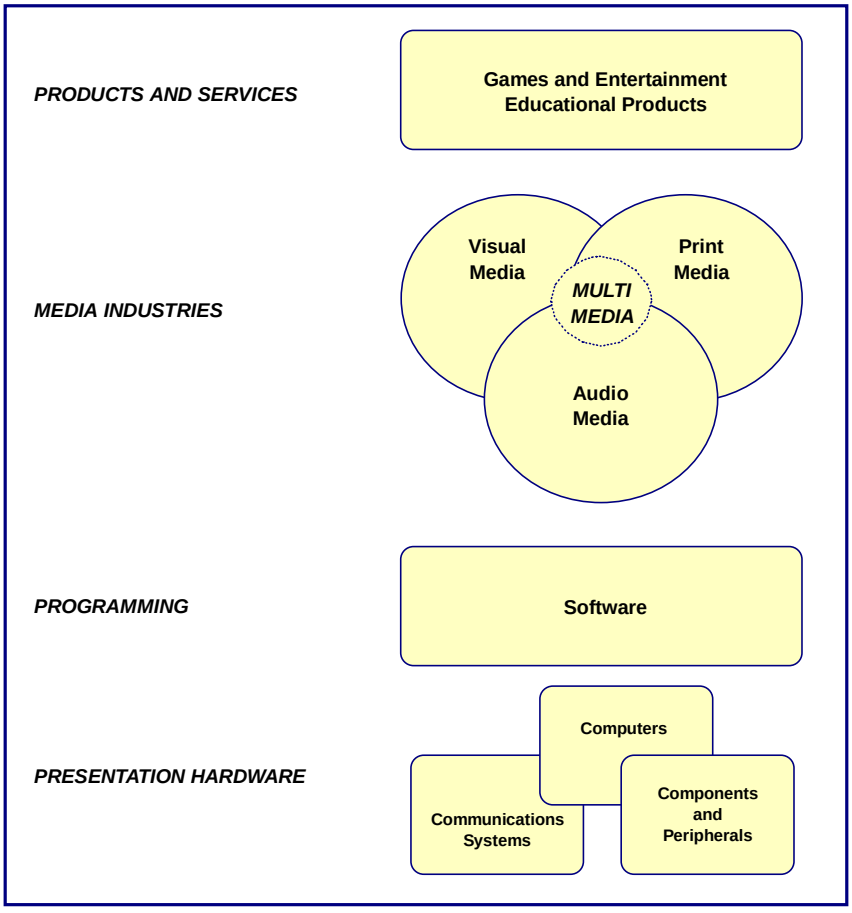
At the nexus of the three overlapping circles is the multimedia industry representing 1) visual media, such as motion pictures and television; 2) print media, such as books, magazines, and newspapers; and 3) audio media, such as musical recordings, sound effects, and radio. The products of these media can assume conventional analog forms, like celluloid film or books, or they can, to an increasing degree, be digitized and stored electronically, which makes it possible to use/take part in them in interactive form. As digitization diffuses through all the media, the three overlapping circles in **Figure 11** will, in essence, converge into a single, yet functionally complex multimedia industry. Digitization will also impact total freight volume because it allows more data to be stored on a smaller surface.[41]

There is a growing trend for large media conglomerates to move into the multimedia industry by establishing new multimedia divisions. Motion picture studios in Los Angeles are aggressively positioning themselves in the multimedia business as a way of extending their commercial range and of adding value to their traditional in-house products. The multimedia industry is nurtured by a technological base of machinery and hardware sectors, including computers and communications systems, together with an assortment of components and peripherals. Software and systems engineering link the technological base with the media industry. For instance, authoring tools allow multimedia producers to perform specific operations such as animation using the technological base.

[41] This Figure is adapted from Allan Scott.

Figure 11

The Multimedia Industry in Functional Context



The concentration of television network and film studio financial divisions in New York influences the travel logistics of this industry. Executives fly frequently through LAX, because of the availability of direct flights to the East Coast, to propose projects, secure financing, and finalize contracts. The demand for such flights is expected to increase, given the increasing number of joint ventures with overseas clients, many of whom also use New York as point of location. The air freight logistics of the multimedia sector are beginning to be transformed by the profusion of telecommunications. Air freight en route to publishers in the Silicon Valley is increasingly being forwarded by modem. However, the volume and frequency of movie industry cargo that goes through LAX is still increasing because of the recent expatriation of animation work to Asian producers.

4.2.1.2 Location and Employment Distribution

Small motion picture firms (i.e., less than 20 employees) account for 89 percent of all motion picture firms in Southern California (see **Table 17**). Their relationship with LAX in terms of weight, volume and logistics paints a picture of how the majority of motion picture firms are functioning in this industry.

Table 17

Employment Distribution of Motion Picture Firms in Southern California.

Employees	Number of Firms	Percentage
0-9	13,780	81.0%
10-19	1,428	8.0%
20-49	1,165	7.0%
50-99	334	2.0%
100-249	156	1.0%
250-499	46	0.2%
500-999	12	0.07%
1,000+	62	0.3%
All	16,983	100.0%

Source: U.S. Dept. of Commerce, County Business Patterns, 1992.

Table 18 demonstrates that motion picture firms are overwhelmingly concentrated in Los Angeles County. What this means is that these firms channel their cargo and personnel primarily through LAX, rather than through other airports in the regional system.

Table 18

Distribution of Motion Picture Firms in Southern California by County

County	Number of Firms	Percentage
Los Angeles	15,147	89.2%
Orange	825	4.9%
Riverside	333	2.0%
San Bernardino	388	2.3%
Ventura	290	1.7%
Total 5 County Region	**16,983**	**100.0%**

Source: U.S. Dept. of Commerce, *County Business Patterns, 1992*; HR&A.

4.2.1.3 Conclusions from Seven Case Studies

Case studies were conducted by HR&A to illuminate the specific relationships between LAX and the motion picture-multimedia production industries. The case studies were based on interviews with representatives of seven of the region's motion picture/multimedia and electronics firms. The interviews focused on three aspects of each firm and its relationship with LAX: 1) operations, products and services, 2) existing logistics and related operations, and 3) airport capacity and strategic response. The cases included production houses, laboratories, duplicators, distributors, and multimedia firms. They were identified from a series of sources including a.) a series of lists of "airport related" firms provided by the LAWA and staff from surrounding jurisdictions; b.) a list of firms which ship via LAX, developed through a multi-day "on-site" reconnaissance of the numerous cargo facilities located around the airport; and c.) a database of "import/export" firms acquired by HR&A from the *Journal of Commerce*.[42] Interviews were conducted based on each firm's willingness to participate in the study and its capacity to represent the industry being studied. Summaries of the case studies are included in Appendix B to this Report.

The case studies suggest five factors that describe the relationship of motion picture/multimedia firms to the Los Angeles International Airport in terms of volume and logistics:

[42] *1995 Directory of United States Importers and Exporters*, *The Journal of Commerce*, Phillipsburg, New Jersey.

- **Magneto Optical Storage**. Digitized formats are becoming the preferred method for storing data. They allow more information to be stored on a smaller surface that is higher quality and less expensive to transport. As their use increases, air cargo demand will decline.
- **Telecommunications.** The modem is becoming a prevalent method of transporting software. It enables the product to reach the publisher more quickly and at a significantly lower cost. As their use increases, air cargo demand will decline.
- **Network and Studio Financial Centers in New York.** Hollywood executives travel frequently across the country to secure domestic contracts as well as managing an increasing number of joint ventures with foreign companies. As this interaction increases, demand for fast, frequent coast to coast and international flights increases.
- **Indirect Transfer.** Freight forwarding companies place cargo on connecting flights when direct transfer is not possible. This is particularly clear in the case of cargo transferred at night.
- **Crews**. Production companies that produce numerous, short films in different locations will often hire crews and equipment at the filming location in order to decrease transportation costs. Production companies that produce a smaller volume of longer production films (i.e. feature films) transport the crew, round-trip, from Southern California to the production site.

In sum, the cases suggest two opposing trends about this sector's future need for air transportation services. On the one hand, while Southern California remains the hub of film distribution from local laboratories to film depots located throughout the United States, the profusion of advanced technology suggests this portion of the motion picture/multimedia industry may become increasingly less airport dependent in the future. This phenomenon is further affected by the decentralization of production facilities since the early 1970s. No longer financed solely by the major studios, production houses are streamlining operation costs, including transportation, in order to remain cost competitive in this industry. Digitization promises less cargo in terms of weight and volume and the modem signifies an increase in on-line product transport. In addition, small motion picture firms, which account for 89 percent of all motion picture firms in Southern California, are saving money on operating costs by hiring crews on site in lieu of transporting local crews to various locations.

On the other hand, air transportation service is critical to the burgeoning internationalization of both the executive and technical parts of the business. The continued concentration of financing in New York, the increasingly global reach of business operations, while headquarters for operations remain centered in Los Angeles, means that the demand for frequent direct passenger and cargo service will expand.

4.2.2 The Electronics Manufacturing Industry

California's economy is in a rebound that is broad-based. One aspect of this growth is in international trade. California companies have a (disproportionate) 25 percent share of total U.S. exports to Pacific Rim countries, compared to 15 percent of the nation's overall exports. Among the state's largest exports are machinery, computers and electronic components. During the 1990s, these industries were increasing their sales to the Pacific Rim dramatically, which has been the fastest-growing market and population base in the world. (The recent economic turmoil in Asia is generally considered a transitory phenomenon that will not alter the long-term growth picture over the time horizon of the LAX Master Plan.)

In order to become more competitive, electronics manufacturers are increasingly adopting new delivery and distribution techniques to cut lead times and operating costs. Just-in time (JIT) inventories are transforming the frequency of freight schedules and consolidated distribution networks are transforming the logistics of shipments.

Of all the new manufacturing processes, JIT is probably the most pervasive in the industry. Just-in-time systems are defined as those that produce and deliver finished goods just in time to be sold, subassemblies just in time to be assembled into finished goods, fabricated parts just in time to go into subassemblies, and purchased materials just in time to be transformed into fabricated parts. When suppliers subscribe to this system, much of the cost and overhead associated with mass production vanishes. There is no need for raw material inventories, or sophisticated billing, ordering, shipping, and receiving procedures.

Just-in-time systems have drastically altered the frequency (but not the total volume) of shipments exiting and entering production facilities. This is illustrated below in the description of three of the five firms surveyed, which indicated that JIT impacted their shipping schedules. For firms located in Los Angeles County and surrounding areas, JIT means an increase in the daily frequency of air shipments channeled through LAX.

Electronics manufacturers are further curbing costs by centralizing their distribution facilities. With the total cost of maintaining inventory reaching 52 percent of distribution costs in 1993, up from 34 percent in 1975, it is becoming cost-prohibitive for many companies to warehouse high levels of inventory. Centralized distribution entails a decrease in the number of warehouse facilities holding inventory for distribution. Goods are transported to a single "parts-banks" and then distributed to end-users from that location only.

A likely scenario for electronics firms dealing with customers in the Pacific Rim, or Asian-owned firms located in the Los Angeles area, is that there will be an increase in the number of "parts banks" in Southern California. This means a future increase in the frequency and the volume of electronics freight flowing through LAX.

4.2.2.1 Location and Employment Distribution

Table 19

Employment Distribution of Electronics Firms in Southern California

Employees	Number of Firms	Percentage
0-9	798	40.5%
10-19	300	15.2%
20-49	411	20.8%
50-99	216	11.0%
100-249	178	9.0%
250-499	40	2.0%
500-999	26	1.3%
1,000+	4	0.2%
Total	**1,973**	**100.0%**

Source: County Business Patterns, 1992.

Small electronics firms account for 40 percent of all electronics firms located in Southern California, as shown in **Table 19**. In order to survive in today's competitive global market, small firms have demonstrated their organizational flexibility by implementing JIT inventories and other cost-cutting manufacturing techniques.

Electronics firms located in Southern California are overwhelmingly concentrated in Los Angeles County, as shown in **Table 20**. This means that for those firms shipping and receiving air freight, a large portion of that cargo passes through LAX.

Table 20

Distribution of Electronics Firms in Southern California By County

County	Number of Firms	Percent
Los Angeles	919	46.6%
Orange	726	36.8%
Riverside	71	3.6%
San Bernardino	87	4.4%
Ventura	170	8.6%
Total 5 County Region	**1,973**	**100.0%**

Source: County Business Patterns, 1992.

4.2.2.2 Conclusions From the Case Studies

Five case studies of electronics industry firms and the importance of the air transportation services provided by LAX were developed as described above for the motion picture- multimedia industries. Summaries of the case studies are also contained in Appendix B

These cases suggest that many different factors will affect the relationship between electronics firms in Southern California and the Los Angeles International Airport in terms of shipping volume, frequency and logistics:

- **Just-in-Time Inventories.** -- This manufacturing logistics technique has become industry standard and has, by its very nature, increased the frequency of shipments.
- **Centralized Distribution Systems**. -- This method of distribution is growing in popularity and will drastically alter cargo logistics. This is particularly true for firms dealing with the Pacific Rim ,which will increasingly use Los Angeles as a strategic point of location for domestic parts-bank facilities.
- **Expanding Asian Markets**. – This boom has bolstered international sales and shipments to the Pacific Rim thorough LAX (except for the recent slow down, which is expected to be short-lived).

Given the disproportionately large concentration of Southern California's electronics firms in Los Angeles and Orange Counties, planning for the future of LAX must carefully consider the air freight volume, weight, and logistics of this industry. The availability of air freight transportation is integral to this industry in cutting cycle times and therefore enhancing its position as a global competitor, as well as affecting the logistics of Yen-sensitive firms that plan to locate their parts-banks in Southern California.

4.3 Examples of Economic Sectors Dependent on LAX

This second set of industry investigations explores the relationship between four Southern California industries for which air transportation is critical to business operations. Review of the needs of these industries provides another window on the impacts of LAX. In this case, the focus is on the air transportation costs to certain industries that are thriving in the Los Angeles regional economy, in large part because of the availability of efficient air transportation services provided by LAX, and the potential cost impacts if future air transportation services do not meet their needs.

4.3.1 Selection of Sectors to Which LAX Activity is Critical

Four industries known to be heavily dependent upon shipping capacity at LAX, based on various data sources, were selected for further investigation. These were the cut flower, apparel, processed food, and automotive parts industries.

Both the apparel and processed food industries are important components of Southern California's manufacturing base. California's apparel industry is an important, but often overlooked, contributor to the state's economy. Growth of the industry is attributed to the popularity of California-designed women's wear. Over 57 percent of Southern California apparel firms assemble their products overseas. At the same time, however, many of the area’s largest manufacturers depend on export sales to augment sometimes sluggish domestic markets. The food processing industry is also dependent on regional exports. It caters to 32 million consumers in the California, and sends its many products to all parts of the world. New markets for prepared food are expanding dramatically both in Mexico and in the Pacific Rim.

California's manufacturing industries provide over 12 percent of U.S. Gross Domestic Product (GDP) and generate more goods and services than all of the other western states combined. Moreover, California is a major center for foreign trade, handling three-fourths of goods shipped through West Coast ports and 40 percent of all U.S. trade with Asia. Manufacturing industries such as electronics, processed food, and apparel are leading sectors in California's economy in terms of export commodities, employment and total share of the U.S. market for those industries.

The automotive parts and components industry was included in this study because of its logistical transformations, including centralized distribution systems, and their enormous impact on Southern California's port traffic. These logistical tactics are growing in popularity within California's electronics industry as well.

Finally, Southern California's cut flower industry is increasingly becoming a viable import and export sector that is critically dependent on shipping activity at LAX. Export sales are increasing in order to offset a shrinking domestic market. Within the last ten years imports assumed anywhere from 55 percent to 90 percent of the U.S. market. Imports of cut flowers to Southern California totaled over $22 million for roses, carnations, pompons and chrysanthemums alone in 1994.

4.3.2 The Fresh Cut Flower Industry

This sector is composed of establishments primarily engaged in the wholesale distribution of cut flowers.[43] The cut flower industry is increasingly becoming a viable import and export sector in the Southern California economy that is critically dependent on the Los Angeles International Airport. Until recently, most cut flower distributors/wholesalers catered solely to domestic markets. Distributors are now working to increase their international sales in order offset a domestic market flooded by flower imports from Columbia and other ports of call.[44]

Since the early 1970s flowers grown offshore have dramatically increased their toehold in the domestic market. In the last two decades, carnations, chrysanthemums, pompons and roses from Colombia, Ecuador, Mexico and other nations have grabbed anywhere from 55 to 90 percent of the U.S. market. Local flower wholesalers/distributors are now purchasing overseas blossoms that are not available locally in order to meet year-round demand for certain flowers.

The four main flower growing areas in California include San Diego, Carpinteria, Salinas and Half Moon Bay. These areas are home to more than 500 commercial flower growers and together make California the most prolific flower growing state in the nation. These growers and their distributors have two main advantages in choosing to export. The mild weather in Southern California means that some crops are in season locally when they are out of season in much of the rest of the world. When the dollar is at a low point, especially against the yen, U.S. exports are cheaper.

Advances in horticultural technology now enable flowers to be transported over long distances. Delicate breeds are hybridized to be more robust and pesticides enable pest free blossoms to meet rigid USDA and foreign inspection standards. According to an executive at Florimex[45] San Francisco, Asian companies desire the highest quality products. Of those, Japan has the most stringent customs inspection. Evidence of a single pest on a blossom is cause for an entire shipment to be destroyed. For California growers, the challenge is to balance this "zero bug tolerance" in Japan against the state's environmental regulations on pesticide use. The incentive for some established California growers to seek export markets is still low. Some companies have trouble preparing and packaging their product to meet various country's specifications after years of doing only domestic business. Nonetheless, local wholesalers are demonstrating a solid trend toward export expansion. This means a significant increase in the frequency and volume of cut flowers flowing through LAX, which is strategically located next to two of California's main flower growing regions.

4.3.2.1 Distribution of Firms and Sales

Because the SIC code for cut flower wholesalers also includes artificial flowers, florist's supplies, nursery stock and potted plant wholesalers, it is difficult to sketch the distribution of firms and reported sales using this method. According to the California Association of Flower Growers and the California Cut Flower Commission, the only data available on this industry in Southern California is based on reports of inspections by the Plant Protection and Quarantine Offices of the USDA.

Table 21 shows Southern California's interstate flower shipments. Approximately 60% of the reported interstate flower shipments travel through LAX.[46]

[43] SIC 5193.

[44] Personal communication with Frederick Klose, Export Specialist at the Agricultural Export Program of the California Department of Food and Agriculture.

[45] Florimex is one of the largest importers and exporters of flowers, with 51 offices nation-wide, excluding Southern California.

[46] Personal communication with Andy Hatch, cut-flower reporter for the Federal-State Market News,

Table 21

Domestic Interstate Flower Shipments, Southern California 1994

Variety	Number of Shipments
Roses	15,491,763
Standard Carnations	1,556,240
Miniature Carnations (bunches)	247,412
Pompon Chrysanthemums (bunches)	5,361,262
Total	**22,656,677**

Source: Ornamental Crops National Market Trends, December 8, 1995.

Fresh flower retailers prefer that cut flowers be transported by air in order to increase their product's shelf life. Roses, for example, have among the shortest shelf lives, averaging about 3-4 days. This means that there is a small margin of time available for transport to retailers. LAX becomes a critical path component of the relationship between growers and wholesalers.

Ventura County demonstrates the continued resiliency of this industry. One of Southern California's most prolific flower growing counties, Ventura's sale of cut flowers totaled $28.7 million in 1994, up 24 percent from the $23 million sold in 1993. This is a significant increase in sales since 1992, depicted in **Table 22**, when cut flowers accounted for less than $20 million in sales.

Table 22

Cut Flower Production and Values, Ventura County 1992

Flower Crop	Production	Unit	Dollar Value
Flower Bloom & Stems	5,691,796	Blooms	$2,935,000
Cut Greens & Dried Flowers	659,801	Bunches	2,139,000
Flower Bunches		Bunches	16,719,000
Gypsophila[1]	2,714,421		4,404,000
Miscellaneous	6,909,000		12,315,000
Total			**$38,512,000**

[1] Various plants of the Gypsophila genus having small white or pink flowers and including the baby's-breath.

Source: California Flower Growers Association, Membership Directory, 1995.

4.3.2.2 Conclusions from the Case Studies

The following observations about the relationship between this industry and Los Angeles International Airport emerge from two case studies (see Appendix B). The industry is characterized by:

- An increasing number of overseas imports, most notably from Columbia and Ecuador.
- An increasing number of domestic wholesalers tapping Asian markets or increasing their market share therein.
- Advances in hybridization and pesticide technology enabling more robust breeds to travel longer distances and meet stringent inspection standards.
- Trading for Southern California's cut flowers remains moderate to fairly active. Production of most blossoms is expected to increase or remain about the same.

The basic economics of the cut-flower industry is changing. Market realities are forcing domestic wholesalers to purchase more flowers from overseas suppliers and expand their market share wherever there is a viable consumer base.

Currently, targets for U.S. exports include Japan and Taiwan. Although Japan has the most stringent inspection standards, customers there are willing to pay an extremely high price for flower products which they regard as high quality. And, even though the Taiwanese impose high tariffs on imported goods,

Taiwan is considered a good market because there is almost no local flower production during its hot summer months, when there are no major U.S. flower-giving holidays to absorb supply. According to Taiwanese government statistics, imports of cut flowers from the U.S. totaled 3,796 kilos in the first half of 1993, nearly double the U.S. market share since 1991.

4.3.3 The Apparel Industry

Southern California's apparel industry produces garments largely in the contemporary to junior women's market. Segments of this industry include buyers and designers, with a high concentration in sewing.[47] There are two types of firms in this industry. Manufacturers perform the front-end functions of design and marketing, whereas contractors provide the labor to sew the garments. Manufacturers are large revenue generators since they must access capital in order to invest in design and marketing, whereas contracting firms usually employ fewer than 20 people.

Southern California's apparel industry demonstrates growth potential for several reasons. First, apparel manufacturers and contractors are buttressed by the burgeoning local textile industry. Textile production is one of Los Angeles County's newest success stories. Its expansion was driven by the need for increasingly high-quality, but smaller lot sizes of knitted, dyed and printed fabrics to supply local garment makers. Textile production enables local responsiveness to market trends by imparting an integrated garment design and manufacturing economy.

In addition, Southern California's apparel advantage derives from its immigrant laborers and entrepreneurs who allow apparel manufacturers to produce cheaply. Production is complemented by numerous academic institutions, the wholesale marts, retail centers and a plethora of support industries that offer specialized services that anchor the apparel industry in the region.

An estimated 119,400 people held fashion-related jobs in Southern California last year in an industry that represents more than $15 billion of the regional economy.[48] Average annual retail sales of clothing manufactured in Los Angeles, at $63 billion, far exceeded the $17 billion sales of New York's venerable garment trade.

Several factors make this industry airport dependent. Changes in customers tastes resulting in demands for more quality, diversity and timeliness have made "quick response" crucial for the survival of those in the production chain. This brings to light the importance of the region’s integrated apparel economy. At critical junctures in the production process, air transport is used to cut cycle times associated with surface transport lead times.

Additionally, Southern California's geographical location provides opportunities for the industry's expansion. Acting as a gateway to Latin America and the Pacific Rim, Los Angeles and surrounding counties are exploiting their geographic advantage by exporting and tapping demand that exists in these regions. There is great demand for the "California Look" associated with apparel produced in Southern California.[49]

According to Larry Martin, President of the American Apparel Manufacturers Association, and Galo Pesantes, President of the Hispanic-American Garment Contractors Association, a majority of Southern California manufacturers that assemble apparel in Central America, Hong Kong and Taiwan have those products shipped back to California via air in order to cut cycle times. Assembled goods are then finished in California and distributed to end-users. Garments with a "heavy fashion component" traveling to distant markets are increasingly moved as air-freight in order to further cut cycle times.

Some industry executives believe that too many of Southern California's garment industry workers use antiquated equipment and methods because contractors either don't want to invest in costly modern equipment or insist that 50-year-old methods produce the best results. This means that some assembly and manufacture is being turned over to overseas operations that are increasingly turning to computerized equipment. By some estimates, 90% of the fashion industry work in Los Angeles is still done by hand (*Los Angeles Times*, March 12, 1995). This phenomenon signals an increasing amount of air-freight of assembled products returning to Southern California manufacturers for finishing and distribution. According to Ed Garber Associates, 57% percent of Southern California apparel firms assemble their products overseas.

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[47] SIC codes 2300-2389.
[48] U.S. Labor Department data, as reported in the *Los Angeles Times*, March 1, 1995.
[49] Mayor's Office of Economic Development, City of Los Angeles, draft industry assessment,1995).

4.3.3.1 Location and Distribution of Firms

As shown in **Table 23**, Southern California's apparel manufacturers are overwhelmingly concentrated in Los Angeles County.

Table 23

Distribution of Apparel Firms in Southern California

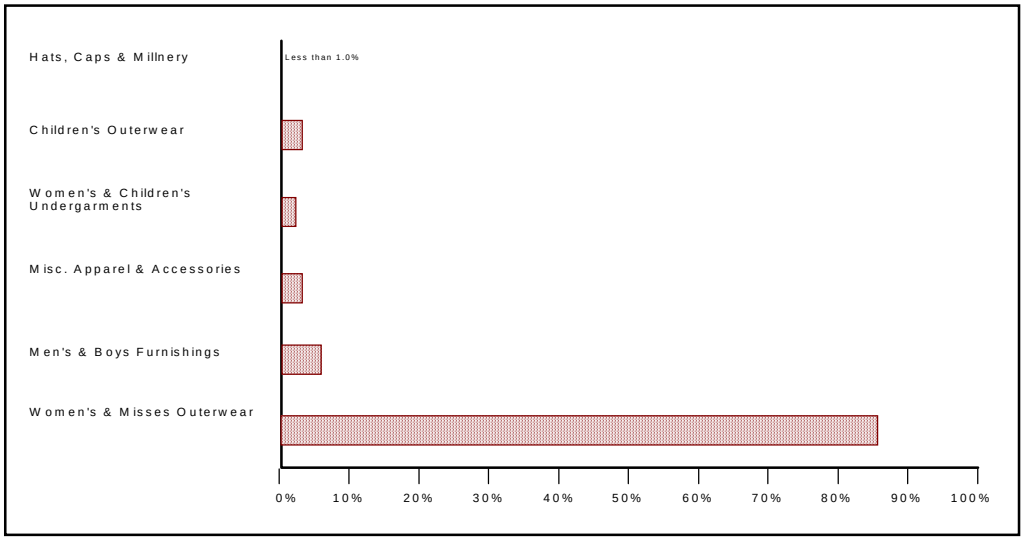
County	Number of Firms
Los Angeles	3,242
Orange	310
San Bernardino	23
Riverside	16
Ventura	11
Total	**3,602**

Source: County Business Patterns, 1993.

As mentioned earlier, garments with a high-fashion component will typically be transported to distant markets via air in order to meet demand and cut cycle times. Given that most of Los Angeles County's apparel firms manufacture women's outwear (**Figure 12**), a sector with a large high-fashion component ratio, there is a strong indication that many of these products will be distributed to distant markets via air.

Figure 12

Distribution of Apparel Firms in Los Angeles County by Product Type



Source: County Business Patterns, 1993.

4.3.3.2 Case Studies

Two case studies of apparel industry firms (see Appendix B) indicate the following about the industry's relationship with the Los Angeles International Airport:

- The apparel industry is highly competitive, demanding quicker cycles times at critical junctures of production. This mean that for many orders that are small volume and travel long distances, products will be shipped via air.
- Products with a high-fashion component require fast turn-over times and are most likely shipped to long-distance retailers via air.
- Some domestic manufacturers use antiquated methods of manufacture, forcing assembly and manufacture to be turned over to overseas operations. In order to cut lead times, these products are typically flown back to Southern California for finishing and distribution.

On the export side, movement of goods through the airport depends on the high-fashion component, the country the products are being shipped to and, of course, the size of the shipment. On the import side, assembled products are shipped by air when transport lead times must be curbed to in order get finished products to market on time.

LAX is critical to Southern California's apparel industry at critical junctures of the production chain. Use of the airport will increase given a steady increase in international sales and the advent of a local textile industry that enables apparel manufacturers to be flexible and responsive in an integrated regional economy.

4.3.4 The Processed Food Industry

The "processed food industry" is an umbrella term used to describe activities associated with the manufacture of food and beverages for human consumption. Food processing activities include meat, dairy, fruits, vegetables, grain mill products, bakery goods, sugar, confectioneries, fats, oils, and beverages.[50]

California is the national leader in both population and agricultural production and it is therefore a logical location for food processing facilities. California has led the country in agricultural production for 46 years. The region's qualitative edge derives from its access to the nation's most adaptive agriculture, a well developed machinery industry, the largest and best-positioned ports, and the availability of air-freight transport. Advantages for future growth in food processing in Los Angeles include a substantial regional market, existence of a large number of interrelated industries that allow "rapid response" of suppliers, strategic position for exporting to the Pacific Rim, and a supply of low-wage labor.

Food processing and brokering companies in Orange County demonstrate the growth potential of this industry. These companies account for at least 5,00 local jobs and more than $6 billion in reported sales. They are strategically located near the fertile Central and Imperial Valley farmlands where raw supplies can be transported quickly to processing plants and then distributed locally or to markets in Mexico and the Pacific Rim. According to one industry executive, Southern California has become the gateway for the transport of processed foods to international markets.

Food processing has a high job multiplier effect because it interacts with a number of other industries. These include food wholesaling and retailing, as well as the manufacturers of packaging materials, industrial and agricultural chemicals, biotechnology products, and farm and food production machinery. California products experiencing the fastest growth are those with the highest value added, including canned fruits and vegetable, wine and frozen foods.

4.3.4.1 Distribution of Firms

Southern California food processing firms are concentrated in Los Angeles and Orange Counties (**Table 24**). Southern California's food processing firms generally transport food stuffs by surface, with the exception of highly-perishables. Typically, air transport is used only for the transport of small volume, emergency shipments, accounting for a very small percentage of total shipments or for the transport of delicatessen and dairy products that are highly perishable.[51] Such delicatessen items include pudding,

[50] SIC Codes 2000-2099.
[51] Personal communication with executives at Hunt-Wesson and Kraft Foods,

fresh pasta, processed meat, and dips. Highly perishable dairy items include cottage cheese, yogurt, and ricotta cheese.

Table 24

Distribution of Food Processing Firms in Southern California by County

County	Number of Firms
Los Angeles	1,315
Orange	415
San Bernardino	181
Riverside	96
Ventura	56
Total	**2,063**

Source: Southern California Business Patterns, 1993.

Table 25 shows some of the types of Southern California firms that deal with highly perishable items. These numbers do not reflect the total number of firms that manufacture highly perishable goods, which would be significantly higher.

Table 25

Southern California Firms Dealing with Highly Perishable Foods

Type of Manufacturer	SIC Code	Number of Firms
Sausages and other prepared meats	2013	41
Poultry slaughtering and processing	2015	14
Fresh or frozen prepared fish	2092	23
Cheese, natural and processed	2022	12
Fluid milk	2026	23
Bread, cake and related products	2051	126
Total		**239**

Source: County Business Patterns, 1993.

At a minimum, however, *County Business Patterns* lists 239 firms that process highly-perishable foods in Southern California. This number indicates a significant amount of processed food cargo which passes through LAX.

4.3.4.2 Cargo Logistics and Related Operation

Both regional and international markets account for the food processing industry's present and potential growth. The Southland is a sprawling consumer market where a number of major restaurant operators are headquartered including Taco Bell, Carl Karcher Enterprises, Del Taco, Family Restaurants Inc.(formerly Restaurant Enterprises Group), American Restaurant Group, Ell Pollo Loco, and In-N-Out Burger.

California also has a tremendous processed food consumer base composed of 32 million residents that generate 13% of the nation's gross national product.[52] Generally, the food processing industry's domestic end-users of highly perishable products receive products via surface transport because of their close proximity. Domestically, food processors are regionally specific in their distribution of highly perishables. Mexican and Asian markets are also targeted by the processed food industry. Each however, presents a unique aspect of the industry's logistics.

[52] *The California Economic Review*, Trade and Commerce, Fourth Quarter 1994.

The Mexican market for processed foods is sprawling. Until recently, most people in Mexico's fresh food eating culture didn't give much thought to frozen/processed foods. But with 20 percent of Mexico's workforce now made up of women, and the availability of domestic maids and cooks more problematic, the convenience of frozen/processed foods is becoming more attractive. This is complemented by a viable consumer base. Almost ten million people earn $1,500 to $5,000 monthly. Another 22 million are paid between $500 and $1,500 monthly.[53]

Despite consumer demand, there are a number of obstacles confronting processed food exports from Southern California to Mexico. First and foremost, a reliable infrastructure that will reduce shipping times, and maintain product integrity is still in its infancy. Currently, most processed foods in Mexico get to end users via distribution centers. Total space in those distribution facilities totals no more than 1.5 million square meters, of which only ten percent is dedicated to frozen foods. In fact, there are only 36 public refrigerated warehouses operating in the entire country.

Southern California's food processing industry generally services Mexican end-users via surface transport. This is due to the close proximity of end-users and the availability of only one cargo airport, located in Mexico City.

Asian-Pacific markets, however, are demanding both air and surface freight from Southern California producers. As the GNP of the Asian archipelago increases, eating habits in those countries also will change resulting in increased demand for Western dairy products, delicatessen item, fruits, and vegetables. As mentioned earlier, highly perishable items reach Asian markets almost exclusively through air shipments.

4.3.4.3 Conclusions from the Case Studies

Two case studies in this industry (see Appendix B) suggest the following about its relationship to the need for air transportation:

- The brief shelf life of highly perishable items means that they must be shipped to distant markets by air.
- California's proximity to the Pacific Rim and the growing consumer base for processed foods therein, means that most highly perishable items will flow through LAX.
- Southern California's processed food manufacturers are overwhelmingly agglomerated in Los Angeles and Orange County, which makes LAX integral to their transport of highly perishable products.
- Southern California continues to lead the nation in agricultural production, making it a logical location for food processing facilities and providing a solid foundation for the future growth of the industry.

The highly perishable components of Southern California's processed food industry are critically dependent on the Los Angeles International Airport. Without doubt, this industry has tremendous growth potential. The region’s adaptive agriculture, buttressed by a well developed machinery industry, ensures such growth. These factors are multiplied by a healthy regional market and an expanding overseas consumer base.

4.3.5 The Automobile Part And Component Industries

North American auto sales will continue to grow, signaling a healthy market for parts and components manufacturers. The expected drop of almost 800,000 units in North American light-vehicle sales this year is merely part of the cyclical nature of the industry.[54] Total light-vehicle sales are expected to drop to 15,994,200 units this year, from 16,768,400 in 1994, but will jump to 17,847,300 units by the year 2000.

4.3.5.1 Cargo Logistics and Related Operations

The parts and components industry is undergoing a logistical transformation that will undoubtedly impact air freight transportation in Southern California. There are two components to this transformation: 1.) the application of Just-in-Time (JIT) systems to production as well as logistics, and 2.) the advent of centralized distribution systems as a means of cutting cycle times.

More than fifteen years ago, Toyota's just-in-time production system was identified as one of the principle sources of its very high quality and productivity results. In order to become more competitive, auto

[53] *Quick Frozen Food International*, January 1994.
[54] *Automotive News*, November 13, 1995.

manufacturers all over the world adopted new delivery and distribution techniques to cut lead times and operating costs.

Of all the new manufacturing processes, JIT is probably the most pervasive in the industry. As indicated above, Just-in-Time systems are defined as those that produce and deliver finished goods just in time to be sold, subassemblies just in time to be assembled into finished goods, fabricated parts just in time to go into subassemblies, and purchased materials just in time to be transformed into fabricated parts.[55] When suppliers subscribe to this system, much of the cost and overhead associated with mass production vanishes. There is no need for raw material inventories, or sophisticated billing, ordering, shipping, and receiving procedures.

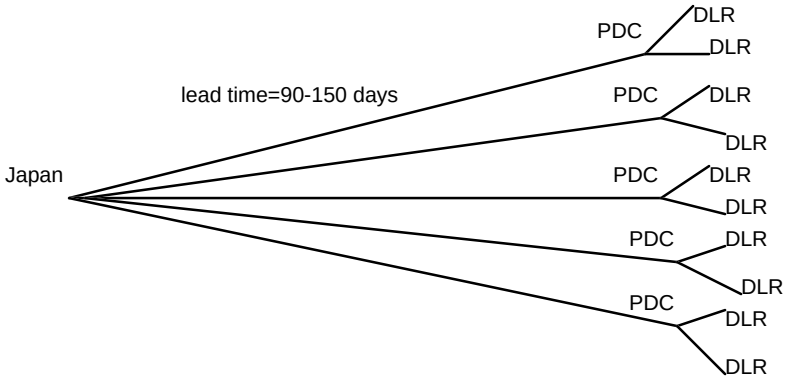
Just-in-Time systems have drastically altered the frequency (not total volume) of shipments exiting and entering production facilities. In fact, the firms surveyed indicated that JIT impacted their shipping schedules. For firms located in Los Angeles County and surrounding areas, JIT means an increase in the daily frequency of air shipments channeled through LAX.

Once again, Toyota has started an efficiency revolution. The company has sparked a trend that takes the just-in-time idea and applies it to logistics in order to curb transportation costs and reduce cycle times. As Asian auto makers increase North American sales, their domestic parts-buying volume is reaching critical mass. In order to deal with this problem, Asian auto-makers are capitalizing on the demand by moving North American service-parts management from overseas to California in order to reduce costs.

Under the old system, known as the “single echelon” distribution system, parts distribution centers (PDC's) ordered parts directly from Asia, often incurring lead times of 90-150 days. (See **Figure 13**) If the PDC was out of stock on a given part, the dealer (DLR) would have to wait a long period of time before getting the part to the customer.

Figure 13

Single Echelon Distribution



Under the new “multi echelon” distribution system, PDC's incur a maximum 10 day lead time by ordering from a centralized distribution facility located in the U.S (**Figure 14**). Therefore, more parts and components are received by the customer in a timely fashion. California is the logical geographic choice for centralized distribution facilities as well as PDC's.

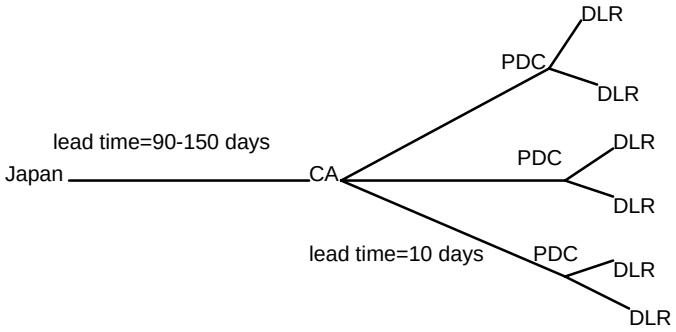
With the total cost of maintaining inventory reaching 52 percent of distribution costs in 1993, up from 34 percent in 1975, it is becoming cost-prohibitive for many companies to warehouse high levels of inventory. Centralized distribution further entails a decrease in the number of warehouse facilities holding inventory for distribution and signifies the growing popularity of the multi-echelon system.

[55] Richard Schonberger, *Japanese Manufacturing Techniques*, New York Free Press, 1982, p16.

For California, this trend signifies future increases in the frequency and volume of automotive parts and components freight. The majority of goods flowing from the central facility to the various PDC's is transported via air in order to further cut lead times.

Figure 14

Multi Echelon Distribution System



4.3.5.2 Conclusions from the Case Studies

There are a number of variables that describe the relationship between automotive parts and components manufacturers/distributors in Southern California and the Los Angeles International Airport , according to two case studies on auto parts and components manufacturers (see Appendix B).

- JIT is the trademark of this industry and has increased the frequency of shipments.
- Centralized distribution is growing in popularity and will drastically alter cargo logistics. This is particularly true for firms dealing with the Pacific Rim, many of which use/will use Southern California as a strategic point of location for parts distribution facilities.
- Asian auto makers continue to expand their U.S. sales, indicating an increased demand for and supply of parts and components flowing through such distribution systems.

The LAX Master Plan will need to consider the air freight volume, weight, and logistics of this industry in its strategic planning. The availability of air freight transportation is integral to this industry in cutting cycle times and maintaining a competitive edge. In time, a growing number of auto makers will follow the Mazda/ Toyota model of centralized distribution

4.4 Baseline Forecasts to 2015

The preceding case studies indicate at the detail level the dynamics of the interrelationships between LAX and the region's economy. But, as noted in Section 3 of this Report, the primary purpose of the economic impact analysis of LAX is to estimate the effects of a range of possible Master Plan alternatives. Thus, to the cases must be added an aggregate picture. Accordingly, a "baseline" forecast to the planning horizon year 2015 was developed to bracket the range of economic impacts of LAX on the regional economy

This baseline forecast, called the *Demand Forecast*, presents a scenario in which direct LAX-related output and employment grow to 2015 at a rate that meets all the estimated economic demand for passenger and cargo activity at LAX, without regard to other factors that constrain growth below economically demanded levels. The discussion below describes the technique used to estimate the annualized activity indicators associated with the Demand forecast.

4.4.1 Details of the "Demand" Forecast

4.4.1.1 Assumed Passenger Activity at the Region's Airports

For the Demand Forecast, HR&A assumed that LAX would satisfy 100 percent of the regional demand for air transportation activity at LAX. Based on the aviation demand forecast provided by Landrum & Brown ("L&B"), the maximum demand for air passenger activity at LAX in 2015 was estimated at 98 map.[56] In order to estimate the regional impacts of this level of activity at LAX, it was also necessary to make assumptions about the levels of activity at other airports in the region. L&B data that estimates additional non-LAX demand in 2015 at approximately 33 MAP was distributed across the four other major airports in the region, including Ontario, John Wayne, Burbank and Long Beach airports. 2015 Passenger demand was distributed to each of these airports based on factors including their existing and projected capacity, the amount of local as compared to regional demand at each of the airports and the known legal constraints (activity caps) which have been placed on airports in the region.[57]

International passenger traffic at LAX, which equaled approximately 25 percent of the airport's total activity in 1994 (or approximately 13 of 51 MAP) was assumed to grow to 47 percent of total activity by the year 2015, or approximately 52 of the 111 total MAP assumed for that year. Other than LAX, Ontario airport is the only regional airport assumed to serve international passengers in the year 2015. ONT is assumed to serve approximately 14 percent international passenger traffic -- 2 of 14 total MAP -- or 3.7 percent of the region's total international traffic for that year.

Connecting passenger traffic at LAX, which equaled just over 31 percent of the airport's total activity in 1994 (or approximately 16 of 51 MAP) was assumed to grow to 35 percent of total activity by the year 2015, or approximately 39 of the 111 total MAP for that year. The proportions of resident and visitor traffic at LAX are adjusted over time to account for the modest increase in connecting passenger traffic.[58] None of the region's other airports was assumed to carry connecting passenger traffic to the year 2015.[59] The proportions of resident and visitor traffic at other regional airports were held constant over time, at 60 percent resident, 40 percent visitor.

Other assumptions about passenger type, passenger trip purpose and amount and distribution of spending and aircraft fleet mix are held constant over time for all airports in the region, including LAX.[60] **Figure 15** shows the passenger activity data assumed for the Demand Forecast for LAX and for the other airports combined.

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[56] The phrase "regional demand for air transportation activity at LAX" indicates that the source of the demand for activity at LAX is regional. While the 98 MAP figure is a measure of activity at LAX, much of the demand for that activity is generated outside of the Los Angeles County and, in the case of the international connecting traveler, for instance, outside of the United States.

[57] The only operational cap which was included in the projection was the 8.4 MAP cap which has been set for SNA (John Wayne Airport). Under the Demand forecast, SNA is forecast to reach this activity level by the year 2005, and remain at that level through the projection period. Though there has been recent action which suggests that the Burbank airport may experience a similar kind of constraint, no formal cap has yet been adopted for that facility, which is forecast to grow steadily to 14 MAP by 2015 under HR&A projections.

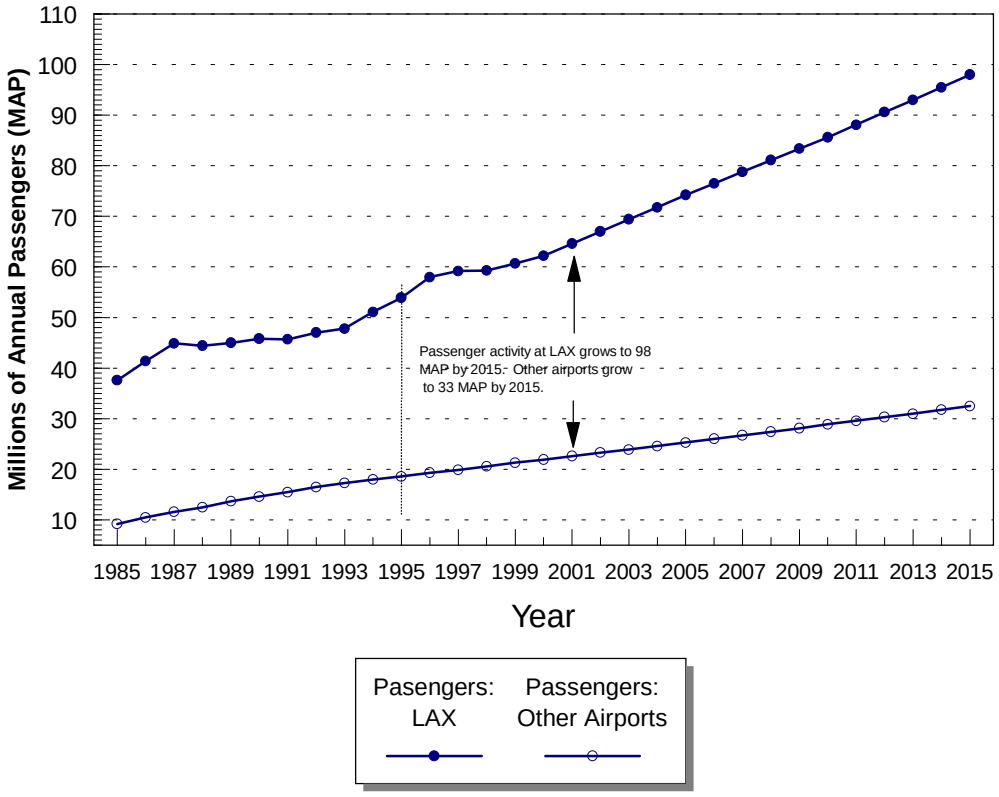
[58] Resident passenger traffic at LAX is assumed to decrease from 32% to 30% of total traffic between 1994 and 2015. Visitor passenger traffic at LAX is assumed to decrease from 37% to 35% of total traffic between 1994 and 2015.

[59] Though Ontario airport is believed to currently serve a small amount of connecting passenger traffic, the amount is not projected in this forecast to increase significantly over time.

[60] While it is almost certainly true that some or all of these relationships will shift at least marginally over time, these shifts are likely to be felt equally among any Master Plan alternative under analysis. As a result, such shifts, though they may be expected to affect the numeric outcomes of the analyses presented here, are not expected to affect the relationship between the outcome of one Master Plan alternative and another, and, therefore, do not have major policy implications within the context of this analysis.

Figure 15

Assumed Passenger Activity at the Region's Airports
Demand Forecast: 1985-2015



4.4.1.2 Assumed Cargo Activity at the Region's Airports

As noted above, air cargo handling capacity at LAX and the region's other airports has a direct impact on the output and the efficiency of the businesses which operate in the Southern California region. A number of the region's staple industries, including electronics manufacturing and distribution, rely heavily on the capacity to move large volumes of components and products into, out of and through the region's airports, particularly LAX. HR&A used regional air cargo activity data combined with data from the REMI model to estimate the value of goods produced in the local economy which depend, to some degree, on the availability of efficient air cargo capacity. By relating this data to the historic and projected air cargo activity levels at the region's airports, HR&A estimated the contribution of those airports to the output of the region and, perhaps more importantly, to estimate the impacts of a capacity constraint on the output of the industries which rely on air cargo capacity.

For LAX, annual cargo tonnage is divided into freight and mail tons, domestic and international tons, and arriving and departing tons. Gross tonnage data for other airports uses the freight/mail and domestic/international distinctions, but arrival and departure data for those airports was not incorporated and is, in some cases, not available.

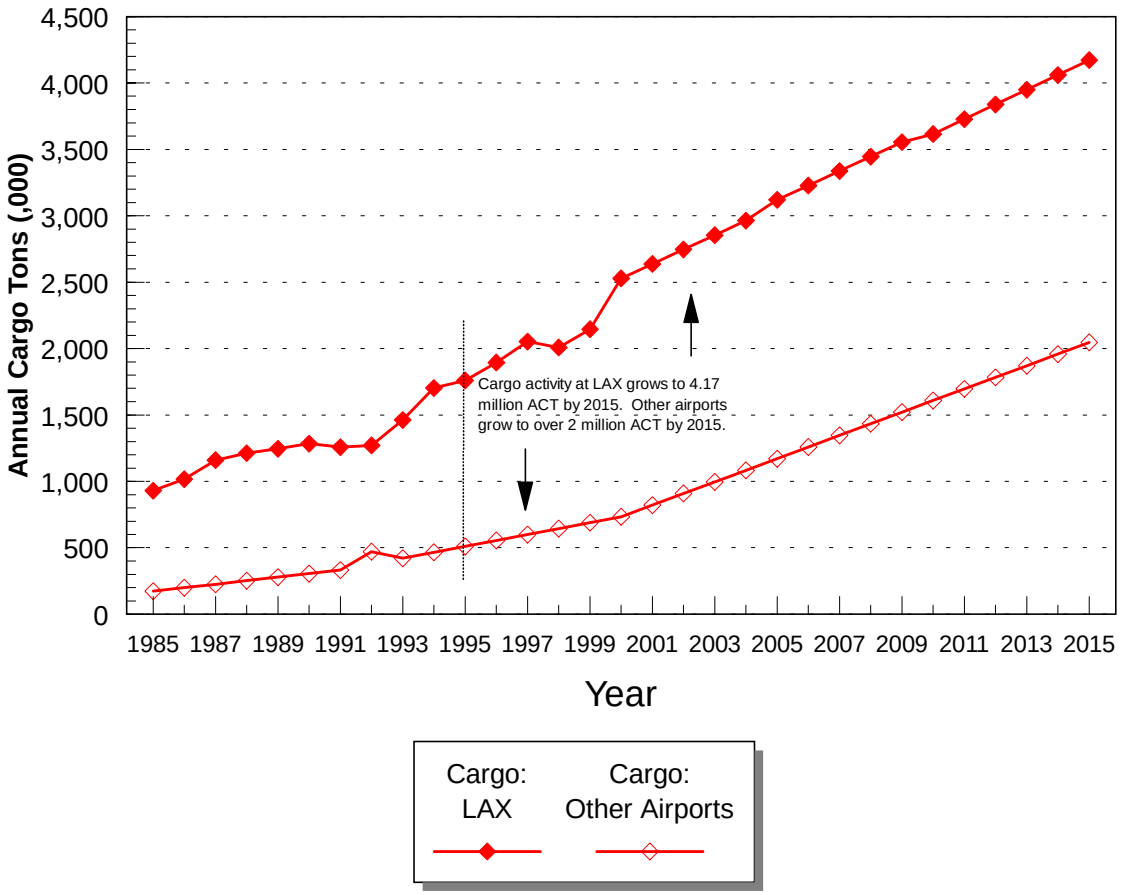
As with the passenger activity assumptions described above, for the Demand Forecast, HR&A assumed that LAX would operate at a level of activity sufficient to satisfy 100 percent of the regional demand for air cargo transportation activity at LAX. Based on time series data developed primarily from historical cargo

activity statistics provided by the LAWA and regional cargo demand projections developed by the Southern California Association of Governments, HR&A estimated that the 2015 regional demand for cargo activity at LAX will equal approximately 4.17 million annual cargo tons, an increase of 140 percent over the 1.75 million tons which LAX handled in 1995.[61]

In order to estimate the regional economic impacts of this level of cargo activity at LAX, it was also necessary to make several additional assumptions about the levels of cargo activity at other airports in the region. Historical and SCAG projection data were used to estimate cargo activity at the four other major airports in the region, including Ontario, John Wayne, Burbank and Long Beach airports. These airports, which together carried approximately 500,000 cargo tons in 1995 (23% of the region's air cargo activity) were projected to grow to carry over 2 million cargo tons annually by the year 2015, or nearly 36 percent of the region's total cargo, and to take some of the cargo "market share" away from LAX. **Figure 16** shows the cargo activity assumed for the Demand Forecast for LAX and for the other airports combined.

Figure 16

Assumed Cargo Activity at the Region's Airports
Demand Forecast: 1985 to 2015



[61] Southern California Association of Governments, *Air Cargo in the SCAG Region*, November, 1992.

4.4.2 Summary of Economic Activity Associated with the Demand Scenario

Figure 17 shows the projected growth in the three categories of economic output for the years 1985 to 2015 under the assumptions related to the Demand Forecast. **Figure 18** shows employment changes associated with these changes in output. The change in labor productivity is clearly evident in the downward slope of the employment line for the manufacturing sectors.

Figure 17

Historical and Projected Economic Output by Impact Category for Air Transportation, Passenger Spending and Air Cargo Related Manufacturing Sectors Demand Forecast: 1985 to 2015

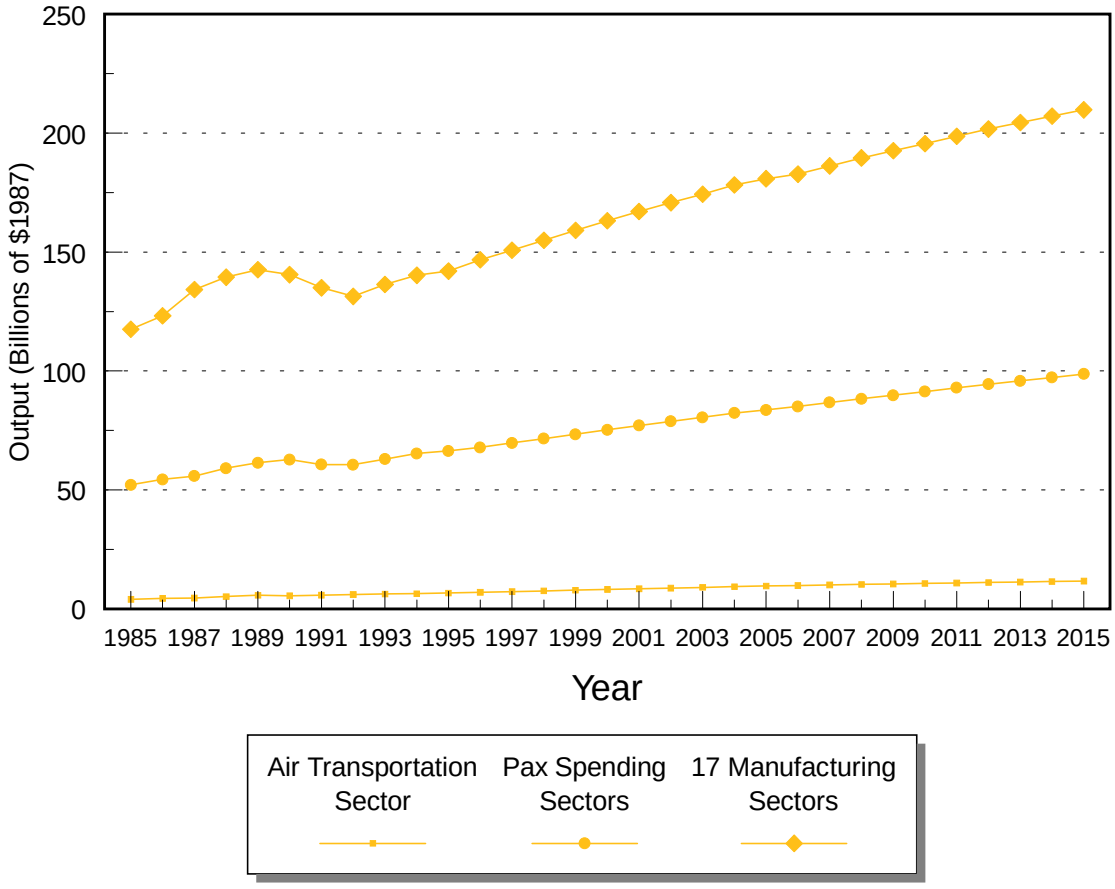
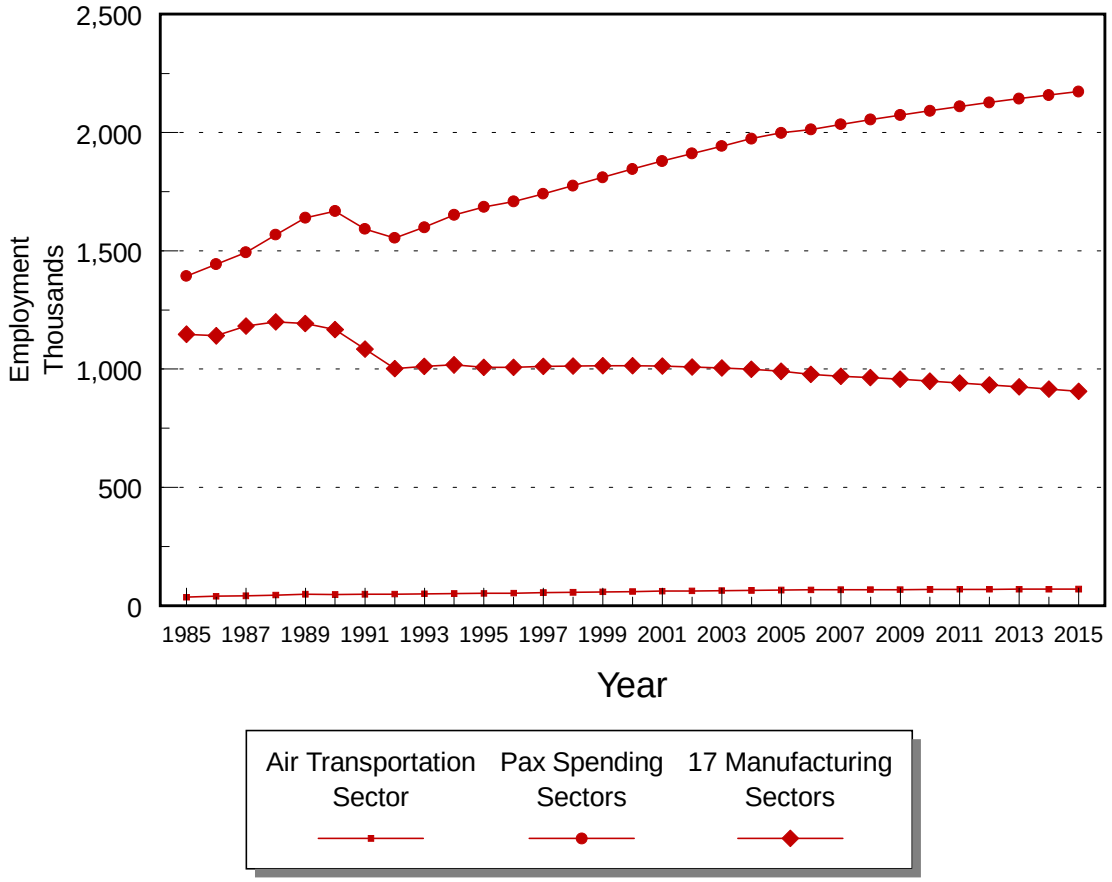


Figure 18

**Historical and Projected Employment by Impact Category
for Air Transportation, Passenger Spending and Air Cargo Related Manufacturing Sectors
Demand Forecast: 1985 to 2015**



4.4.3 Final Economic Impact Factors for the Demand Forecast and Comparison with EIS/EIR No Project Alternative

The set of Tables and Figures below compare the economic impacts of the Demand forecast with those of the EIS/EIR No Project Alternative. This comparison highlights the largest potential "opportunity costs" – i.e., the amount of employment and economic output lost by the Los Angeles region -- that would result if LAX does not expand to accommodate full demand for air transportation services.

Table 26 compares the economic impacts of the Demand Forecast with those of the No Project Alternative. At 2005, the difference between the Demand Forecast and the No Project Alternative is small, because incremental MAP growth is nearly equal to demand (74.2 MAP vs. 71.2 MAP) and cargo growth exactly equals demand (3.1 tons). The net result is a "sacrifice" of LAX-related economic activity throughout the region totaling $900 million (-1%) in economic output and about 13,000 jobs (-3%).

Table 26

Comparison of Airport Activity Levels and Economic Impacts Between the Demand Forecast and EIS/EIR No Project Alternative, 2005 (output in billions of 1996$)

	Demand Forecast	No Action/No Project	Difference #	%
Airport Activity				
MAP	74.2	71.2	-3.0	-4.04%
MACT	3.1	3.1	0.0	0.0%
Economic Output	$74.1	$73.2	-$0.9	-1.21%
Employment	437,958	424,968	-12,990	-2.97%

Source: HR&A, Inc.

A far greater contrast in economic output and jobs occurs by 2015, as shown in **Table 27**. By this time, the difference in MAP between the Demand Forecast and the No Project Alternative balloons to over 10 MAP, though 100 percent of demand for air cargo is satisfied.

Table 27

Comparison of Airport Activity Levels and Economic Impacts Between the Demand Forecast and the EIS/EIR No Project Alternative, 2015 (output in billions of 1996$)

	Demand Forecast	No Action/No Project	Difference #	%
Airport Activity				
MAP	97.96	78.7	-10.26	-19.66
MACT	4.2	4.2	0.0	0.0
Economic Output	$83.74	$63.7	-$20.04	-23.93%
Employment	448,316	350,110	-98,206	-21.91%

Source: HR&A, Inc.

By 2015, the region would forego $20 billion in LAX-related economic output and have 98,000 fewer jobs than would otherwise occur if LAX were to expand to meet full demand. The scale of these foregone economic opportunities is illustrated in **Figures 19** and **20**.

Each of the LAX Master Plan EIS/EIR alternatives, in fact, fall somewhat short of meeting full demand for air transportation services. The next two Chapters present detailed estimates, at various scales of geography, of their relative effects on the region's economic output and employment.

Figure 19

Comparison of Direct LAX-Related Employment Between the Demand Forecast and the EIS/EIR No Project Alternative, 1996-2015

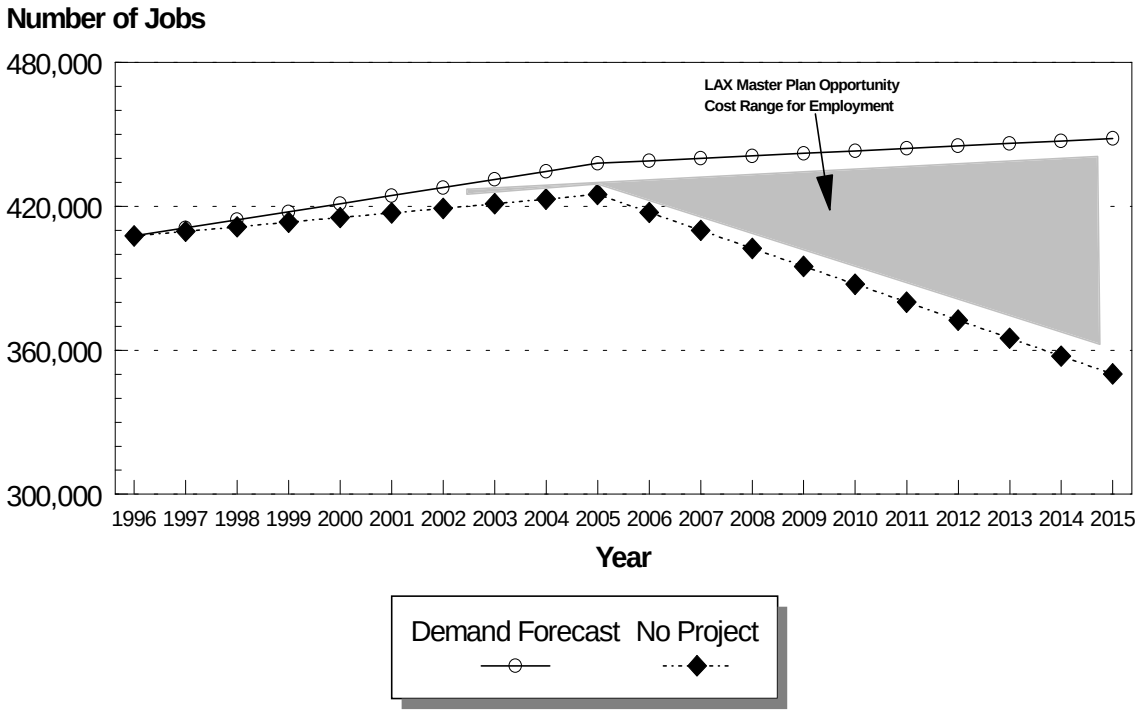
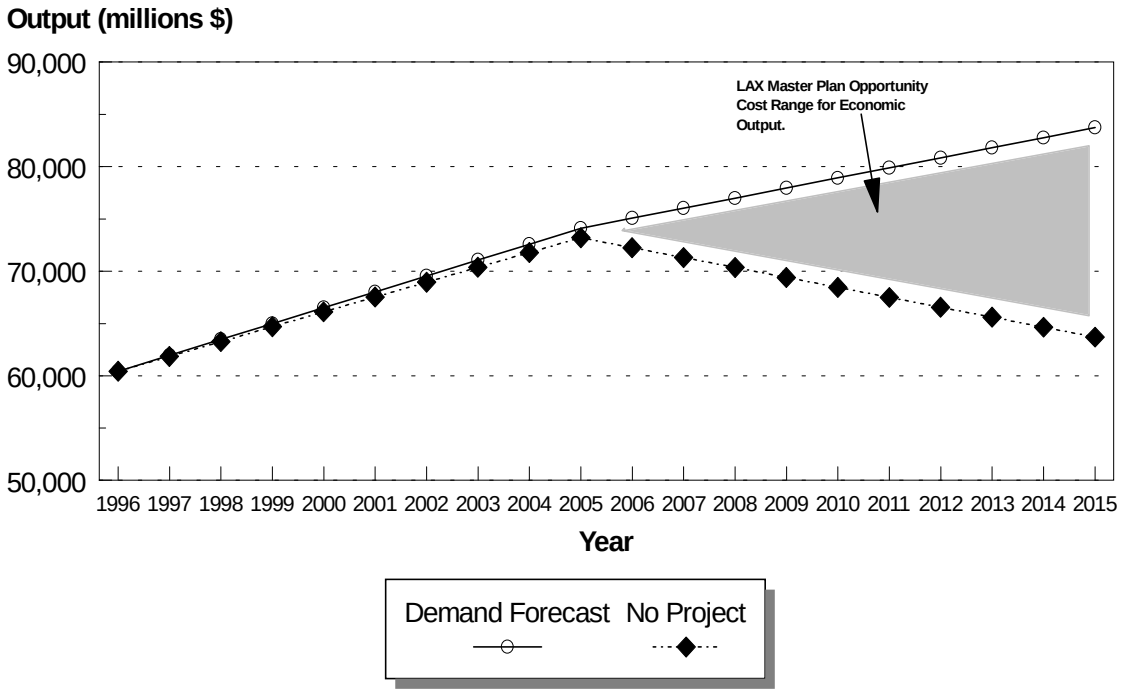


Figure 20

Comparison of Direct LAX-Related Output Between the Demand Forecast and the EIS/EIR No Project Alternative, 1996-2015 (1996 $)



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5. ECONOMIC IMPACTS OF LAX AND THE LAX MASTER PLAN EIS/EIR ALTERNATIVES

This Section presents projections of the economic impacts of each of the LAX Master Plan EIS/EIR Alternatives, using the estimation framework presented in the previous two Sections of this Report. The impacts are expressed in terms of employment and total economic output for the five-county Southern California region.

Estimates of population and households associated with on-site employment at LAX under each Alternative are also presented for each of two impact areas immediately around LAX, as defined for use in the Draft EIS/EIR. These estimates were made using the regional distribution of the households of employees working at LAX as of 1990, which was derived from a special data set available from the 1990 U.S. Census.

Construction-related economic impacts in Los Angeles County are also presented for each Alternative. These impacts were estimated from the REMI model and are based on construction cost estimates prepared by the LAX Master Plan project team. The cost estimate line items, excluding land acquisition, were linked with their corresponding industry sectors in the REMI model. The model was then used to produce year-by-year and cumulative estimates of total economic output and employment for the expenditures associated with each Alternative.

All dollar amounts of economic output in this Section are expressed in constant 1996 dollars, unless noted otherwise.

5.1 No Project Alternative

5.1.1 Description of the Alternative

This Alternative assumes that no new improvements would be implemented during the next 15 years, with the exception of currently planned and programmed projects at LAX and related regional transportation infrastructure. The airlines can be expected to change the air service provided at the airport as a result of the resulting capacity limitations. The fleet of aircraft would include a larger share of wide-body aircraft up to the capacity of the terminals. The schedule of operations would still show variations throughout the day but the peak period would be at or exceed the airfield's capacity. Congestion, delays, and passenger inconvenience would be common all year, not just during peak holiday periods.

This Alternative assumes that annual air passenger volumes would continue to increase to 71.2 MAP by 2005, from 58 MAP in 1996. But, as a result of capacity constraints, future annual passenger growth beyond 2005 would slow considerably, so that it reaches 78.7 MAP by 2015, or roughly 80% of forecasted demand. This Alternative also assumes that cargo volumes would increase to 3.1 ACT in 2005, from 1.9 ACT in 1996, but that no further ACT growth would occur between 2005 and 2015, due to operating constraints at LAX.

5.1.2 Construction Impacts

Because this Alternative does not include any future capital expenditures beyond those already programmed by LAWA and the City of Los Angeles, there are no marginal economic impacts associated with construction under this Alternative, as compared with the three "build" Alternatives.

5.1.3 Employment Impacts

Based on the per-MAP and per-ACT relationships developed through HR&A's analysis, it is estimated that this Alternative would support about 425,000 jobs in the five-county Southern California region in 2005, and about 350,000 jobs in 2015. The decline in total jobs over the planning period shows clearly that productivity increases (i.e., producing more economic output per worker) overwhelm net additional jobs associated with the very limited growth in MAP and ACT in this Alternative. This effect occurs in nearly every one of the manufacturing sectors, as shown in **Table 28**.

Table 28

Direct LAX-Related Jobs in the 5-County So. California Region, No-Project Alternative, by REMI Model Sector, 1996, 2005 and 2015

REMI Model Sector	Base Year 1996	No Action/No Project 2005	No Action/No Project 2015
Furniture Mfg.	5,688	5,275	5,037
Primary Metals Mfg.	3,438	3,043	2,431
Fabricated Metals Mfg.	10,889	9,672	7,984
Industrial Machinery Mfg.	38,992	36,840	24,348
Electronic Equipment. Mfg.	28,280	23,741	15,565
Transportation Equipment. Mfg.	53,278	52,578	49,463
Instruments Mfg.	51,340	44,585	32,327
Miscellaneous Mfg.	5,020	4,752	3,528
Food & Kindred Products Mfg.	1,559	1,552	1,284
Tobacco Products Mfg.	8	5	5
Textile Mill Products Mfg.	743	672	488
Apparel Mfg.	24,086	19,431	12,220
Paper Products Mfg.	1,597	1,626	1,293
Printing And Publishing	6,463	6,884	6,232
Chemical And Allied Prods. Mfg.	3,385	3,375	2,617
Rubber & Plastics Mfg.	6,653	7,347	6,006
Leather Mfg.	495	425	157
Local Interurban Passenger Transportation	7,476	8,582	7,479
Air Transportation	48,711	53,535	42,863
Eating/Drinking Establishments	33,990	43,601	41,876
Other Retail Trade	12,432	13,538	11,617
Hotels	31,369	46,680	43,213
Auto Repair	5,345	6,584	6,041
Amusement & Recreation	26,436	30,549	26,035
Regional Total	**407,670**	**424,968**	**350,110**
Los Angeles County Total	**327,683**	**347,710**	**294,237**
City of Los Angeles Total	**157,657**	**167,050**	**138,548**
Total Annual Passengers (millions)	**57.97**	**71.2**	**78.7**
Total Annual Cargo Tons (millions)	**1.9**	**3.1**	**3.1**

Source: HR&A, Inc.

5.1.4 Economic Output Impacts

Based on the per-MAP and per-ACT relationships developed through HR&A's analysis, it is estimated that, under this Alternative, with modest growth above 1996 levels, LAX would have a $73.2 billion direct impact on the Southern California economy in 2005, but this would decline to $63.7 billion in 2015. The pattern of decline would also occur for the Los Angeles County and City of Los Angeles economies, though at a smaller scale relative to the regional decline. These relationships, for the region, Los Angeles County and the City of Los Angeles, are shown in **Table 29**.

Table 29

Direct Economic Impact of LAX in the Southern California Economy, LA Master Plan EIS/EIR No-Project Alternative, 1996, 2005 and 2015 (in millions of 1996 $)

Geographic Area	1996	2005	2015
So. California Region	$60,439	$73,210	$63,697
Los Angeles County	$48,603	$60,567	$52,271
City of Los Angeles	$20,868	$26,050	$22,186

Source: HR&A, Inc.

5.1.5 Population and Households Impacts

Assuming that employees at LAX have household characteristics and residential location patterns that are similar in 2005 and 2015 to what they were in 1990, it is possible to estimate the number of households and related household population associated with on-airport employment[62] in 2005 and 2015 under the No-Project Alternative. As shown in **Table 30**, it is estimated that the No-Project Alternative would result in a net increase of about 1,156 on-airport jobs between 1996 and 2005, and a net decrease of about 9,273 on-airport jobs over the entire planning period, 1996-2015. This same general pattern – a net increase in population and households from 1996-2005, and then a net decrease between 1996-2015 – holds for both the City and County of Los Angeles as well as the entire Los Angels region. These estimates include the effects of labor (and related household and population) contractions in the underlying 1996 base year total, due to productivity improvements.

Table 30

Households and Population Impacts of On-Airport Employment at LAX
No-Project Alternative, 1996-2015

Analysis Area/Category	1996 Base Year	1996-2005 Growth	1996-2015 Growth
On-Airport Employment	58,966	1,156	-9,273
City of Los Angeles			
Employee Households	18,976	372	-2,984
Hhld. Population	56,783	1,113	8,930
Los Angeles County			
Employee Households	41,039	806	-6,463
Hhld. Population	117,541	2,304	-18,484
Los Angeles Region			
Employee Households	44,261	868	-6,961
Hhld. Population	126,657	2,483	-19,918

Source: HR&A, Inc.

5.2 Build Alternative A - Five Runways, North Airfield

5.2.1 Description of the Alternative

This alternative adds a new 6,700-foot Runway 24R on the north airfield approximately 400 feet north of the existing Runway 24R location. The existing Runways 24C and 24L would be relocated to be roughly 800 and 1,600, respectively, from Runway 24R. Runway 24L would also be extended to 12,000 feet. The terminal facilities would be expanded to the west with a new western entrance and landside terminal facilities. A people mover would provide passenger access from the new west short-term parking garage and the west terminal to the new concourses west of the Tom Bradley International Terminal (TBIT) and to the Central Terminal Area (CTA). Cargo facilities would be expanded in the southeast corner of the airport. Additional land would be acquired in that area to provide additional area for the cargo facility expansion.

Construction of the improvements included in Alternative A would enable LAX to accommodate 71.2 MAP by 2005. By 2015, completion of the Alternative A improvements would enable LAX to accommodate 97.9 MAP, or nearly all of forecasted demand. These improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons (ACT) in 2005 and 4.2 ACT by 2015, which is 100 percent of forecasted cargo demand for that year.

[62] "On-airport" employees are defined as those working at LAX and immediately surrounding locations within Census Tracts 2766.02, 2772.00, 2774.00, 2780.00, 2781.00 (LAX), 6014.00 and 6016.00.

5.2.2 Construction Impacts

Landrum & Brown estimates that the construction of this Alternative would total about $12.8 billion (1997 $) over the period 1996 to 2015. **Table 31** presents the component costs in this estimate.

Table 31

Order of Magnitude Cost Estimate for LAX Master Plan Alternative A (North Runway) (in millions of 1997$)

Cost Category	Amount
Airfield Facilities	
North Airfield	548
South Airfield	543
Subtotal	**1,091**
Terminal Facilities/Systems	
Central Terminal Area	734
West Terminal Area	4,104
Subtotal	**4,838**
Parking Facilities	**852**
Cargo Facilities	**513**
Ancillary Facilities	**970**
Land Acquisition/Relocation	**856**
Regional Transportation	
Roadways	2,071
Automatic People Mover	1,013
Transit	575
Subtotal	**3,659**
Total	**12,779**

Source: Landrum & Brown

This expenditure translates into an estimated 97,836 jobs[63] directly involved in construction of the improvements in Los Angeles County over the 16-year duration of the construction process. When the "multiplier" effect of these direct jobs is taken into account, the total employment impact in the County from the expenditure to construct LAX Master Plan Alternative A is 211,507 jobs.[64] The direct expenditure of $11.9 billion (1997 $) to construct Alternative A would also yield a total of $21.8 billion (1996 $) in total output in Los Angeles County. These results are summarized in **Table 32**.

[63] This is the number of individuals involved in the construction process, regardless of how long an individual is actually at work on the project.

[64] The "multiplier effect" includes indirect jobs (i.e., those related to purchases of goods and services by companies directly involved in the construction project) and induced jobs (i.e., those related to the re-spending of earnings by direct and indirect job holders).

Table 32

Summary of Employment and Economic Output Impacts in Los Angeles County from Construction of LAX Master Plan EIS/EIR Alternative A (individual jobs and millions of 1997 $)

Industry Sectors	Employment	Economic Output
All Sectors (includes Industrial/Commercial Buildings, Roads/Highways, etc.)	211,507	$21,836

Source: HR&A, Inc.

5.2.3 Employment Impacts

This Alternative would support about 425,000 jobs in the five-county Southern California region in 2005, and about 448,000 jobs in 2015. The incremental growth in MAP and ACT in this Alternative is sufficient to produce a net gain in jobs, despite the effects of productivity improvements on most categories of manufacturing employment over the planning period. The estimates for Alternative1 are presented in **Table 33**.

Table 33

LAX-Related Jobs in the 5-County So. California Region, Alternative A, by REMI Model Sector, 1996, 2005 and 2015

	Base Year	Alternative A	
REMI Model Sector	1996	2005	2015
Furniture Mfg.	5,688	5,275	5,342
Primary Metals Mfg.	3,438	3,043	2,578
Fabricated Metals Mfg.	10,889	9,672	8,466
Industrial Machinery Mfg.	38,992	36,840	25,822
Electronic Equipment Mfg.	28,280	23,741	16,506
Transportation Equipment Mfg.	53,278	52,578	52,457
Instruments Mfg.	51,340	44,585	34,283
Miscellaneous Mfg.	5,020	4,752	3,742
Food & Kindred Products Mfg.	1,559	1,552	1,363
Tobacco Products Mfg.	8	5	5
Textile Mill Products Mfg.	743	672	517
Apparel Mfg.	24,086	19,431	12,961
Paper Products Mfg.	1,597	1,626	1,371
Printing And Publishing	6,463	6,884	6,609
Chemical And Allied Prods. Mfg.	3,385	3,375	2,775
Rubber & Plastics Mfg.	6,653	7,347	6,370
Leather Mfg.	495	425	167
Local Interurban Passenger Transportation	7,476	8,582	11,019
Air Transportation	48,711	53,535	61,658
Eating/Drinking Establishments	33,990	43,601	61,472
Other Retail Trade	12,432	13,538	16,509
Hotels	31,369	46,680	66,752
Auto Repair	5,345	6,584	9,107
Amusement & Recreation	26,436	30,549	40,230
Total	**407,670**	**424,968**	**448,083**
Total Annual Passengers (millions)	**57.97**	**71.2**	**97.9**
Total Annual Cargo Tons (millions)	**1.9**	**3.1**	**4.2**

Source: HR&A, Inc.

5.2.4 Economic Output Impacts

Based on the per-MAP and per-ACT relationships developed through HR&A's analysis, it is estimated that, under this Alternative LAX would have a positive $73.2 billion direct impact on the Southern California

economy in 2005, and this would increase to $83.7 billion in 2015. The relative scale of the impact in Los Angeles County and City is more modest, but net positive. These relationships, for the region, Los Angeles County and the City of Los Angeles, are shown in **Table 34**.

Table 34

Direct Economic Impact of LAX in the Southern California Economy, LA Master Plan EIS/EIR Alternative A, 1996, 2005 and 2015 (in millions of 1996 $)

Geographic Area	1996	2005	2015
So. California Region	$60,439	$73,210	$83,726
Los Angeles County	$48,603	$60,567	$72,031
City of Los Angeles	$20,868	$26,050	$31,455

Source: HR&A, Inc.

5.2.5 Population and Households Impacts

As shown in **Table 35**, it is estimated that Alternative A would result in a net increase of about 1,156 on-airport jobs between 1996 and 2005, and a net increase of about 12,000 on-airport jobs over the entire planning period, 1996-2015. Within the City of Los Angeles, the employees added between 1996 and 2005 would be associated with about 370 households and household population of 1,113 people. Incremental on-airport employment over the entire planning period, the would be associated with about 3,000 households and about 8,993 persons Moving to Los Angeles County, the incremental on-airport employment over the 1996-2005 period would be associated with about 806 households and 2,300 people. Between 1996-2015, the incremental jobs would be associated with about 8,241 households and 23,570 persons. And finally, for the Los Angeles region as a whole, incremental on-airport employment between 1996-2005 would be associated with 868 employee households and almost 2,500 persons. For the entire planning period through 2015, incremental on-airport jobs would contribute 8,875 employee households and 25,398 persons.

Table 35

Household and Population Impacts of On-Airport Employment at LAX Alternative A, 1996-2015

Analysis Area/Category	1996 Base Year	1996-2005 Growth	1996-2015 Growth
On-Airport Employment	58,966	1,156	11,824
City of Los Angeles			
Employee Households	18,976	372	3,008
Hhld. Population	56,783	1,113	8,993
Los Angeles County			
Employee Households	41,039	806	8,241
Hhld. Population	117,541	2,304	23,570
Los Angeles Region			
Employee Households	44,261	868	8,875
Hhld. Population	126,657	2,483	25,398

Source: HR&A, Inc.

5.3 Build Alternative B: Five Runways – South Airfield

5.3.1 Description of the Alternative

This alternative adds a new 6,700-foot runway on the southside in the existing cargo area. The existing south runways would be relocated north so that the lateral spacing between the south inboard runway and the new runway would be 2,500 feet. This separation would provide for staggered approach capability on the south complex with Category 1 weather minimums (200-foot ceilings and 1-mile visibility). The terminal improvements are similar to the other Alternatives, except that the south CTA terminals would be reconfigured as the north terminal area is reconfigured in Alternative A. A people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The cargo facilities would be relocated to the area north of Century Boulevard in the Manchester Square community and in the Continental City/Imperial East area.

The annual passenger volume growth assumptions for Alternative B are identical to Alternative A (i.e., 71.2 MAP in 2005 and 97.9 MAP in 2015), and so are the assumptions about growth in airfreight cargo tonnage (i.e., 3.1 ACT in 2005 and 4.2 ACT in 2015).

5.3.2 Construction Impacts

Landrum & Brown estimates that construction of this Alternative would total about $14.8 billion (1997 $) over the period 1996 to 2015. **Table 36** presents the component costs in this estimate.

Table 36

Order of Magnitude Cost Estimate for LAX Master Plan Alternative B (in millions of 1997 $)

Cost Category	Amount
Airfield Facilities	
North Airfield	414
South Airfield	688
Subtotal	**1,102**
Terminal Facilities/Systems	
Central Terminal Area	600
West Terminal Area	4,382
Subtotal	**4,982**
Parking Facilities	**925**
Cargo Facilities	**900**
Ancillary Facilities	**999**
Land Acquisition/Relocation	**1,358**
Regional Transportation	
Roadways	2,130
Automatic People Mover	1,782
Transit	575
Subtotal	**4,487**
Total	**$14,753**

Source: Landrum & Brown

Construction on this scale will yield an estimated 109,944 jobs directly involved in construction of the Alternative B LAX improvements in Los Angeles County over the 16-year duration of the construction process. When the "multiplier" effect of these direct jobs is taken into account, the total employment impact in the County from the expenditure to construct LAX Master Plan Alternative B is 237,334 jobs.

The direct expenditure of $13.4 billion (1997 $) to construct Alternative B would also yield a total of $24.5 billion (1997 $) in total output in Los Angeles County. These results are summarized in **Table 37**.

Table 37

Summary of Employment and Economic Output Impacts in Los Angeles County from Construction of LAX Master Plan EIS/EIR Alternative B (individual jobs and millions of 1997 $)

Industry Sector	Employment	Economic Output
All Sectors (includes Industrial/Commercial Buildings, Roads/Highways, etc.)	237,334	$24,524

Source: HR&A, Inc.

5.3.3 Employment, Economic and Related Impacts

Because the estimates of economic impact are linked to each Alternative's annual passenger volume (MAP) and annual cargo tonnage (ACT) characteristics, and the MAP and ACT values for this Alternative are identical to those for Alternative A, all of the economic, employment and other related impacts of Alternative B are identical to those for Alternative A, as described above.

5.4 Build Alternative C: Four Runways

5.4.1 Description of The Alternative

This alternative maintains the existing four runway system with modifications to the two north airfield runways and to one runway in the south airfield. In the north airfield, Runways 24R and 24L would be relocated, widened, and extended. In the south airfield, Runway 25L would be relocated, and Taxiways B and C would be realigned and widened. Terminal facilities would be expanded to the west, and a people mover system would provide passenger access from a new long-term/rental car garage on the southwest corner of the airport, through the west short-term parking garage and west terminal to the new concourses and the CTA. The road system for moving air cargo would be improved with the construction of a continuous air cargo circulator roadway along the airport property boundary.

Alternative C improvements would enable LAX to accommodate 71.2 MAP by 2005, and 89.6 MAP by 2015, or roughly 91% of forecasted demand. These improvements would also enable LAX to handle 3.1 Airfreight Cargo Tons in 2005 and 4.2 ACT by 2015, or 100 percent of forecasted airfreight cargo demand, just as in Alternatives A and B.

5.4.2 Construction Impacts

Landrum & Brown estimates that construction of this Alternative would total about $11.4 billion (1997 $) over the period 1996 to 2015. **Table 38** presents the component costs in this estimate.

Table 38

Order of Magnitude Cost Estimate for LAX Master Plan Alternative C (in millions of 1997$)

Cost Category	Amount
Airfield Facilities	
North Airfield	594
South Airfield	289
Subtotal	**883**
Terminal Facilities/Systems	
Central Terminal Area	395
West Terminal Area	3,533
Subtotal	**3,928**
Parking Facilities	1,008
Cargo Facilities	756
Ancillary Facilities	483
Land Acquisition/Relocation	828
Regional Transportation	
Roadways	1,473
Automatic People Mover	1,436
Transit	643
Subtotal	**3,552**
Total	**$11,438**

Source: Landrum & Brown

This expenditure is associated with an estimated 87,123 jobs directly involved in construction of the Alternative C LAX improvements in Los Angeles County over the 16-year duration of the construction process. When the "multiplier" effect of these direct jobs is taken into account, the total employment impact in the County from the expenditure to construct LAX Master Plan Alternative C is 187,621 jobs. The direct expenditure of $10.6 billion to construct Alternative C would also yield a total of $19.4 billion (1997 $) in total economic output in Los Angeles County. These results are summarized in **Table 39**.

Table 39

Summary of Employment and Economic Output Impacts in Los Angeles County from Construction of LAX Master Plan EIS/EIR Alternative C (individual jobs and millions of 1997 $)

Industry Sector	Employment	Economic Output
All Sectors (includes Industrial/Commercial Buildings, Roads/Highways, etc.)	187,621	$19,414

Source: HR&A, Inc.

5.4.3 Employment Impacts

The employment impacts of Alternative C are the same as those of Alternatives A and B though the year 2005. By 2015, however, Alternative C yields smaller economic impacts than the other two "build" alternatives, because of its lower MAP and cargo totals. Alternative C would support just under 425,000 jobs in the five-county Southern California region in 2005, and then grow only slightly, to 425,369 jobs, in 2015. The estimates for Alternative C are presented in **Table 40**.

Table 40

**Alternative C LAX-Related Jobs in the 5-County So. California Region,
by REMI Model Sector, 1996, 2005 and 2015**

REMI Model Sector	Base Year 1996	Alternative C 2005	Alternative C 2015
Furniture Mfg.	5,688	5,275	5,662
Primary Metals Mfg.	3,438	3,043	2,737
Fabricated Metals Mfg.	10,889	9,672	8,989
Industrial Machinery Mfg.	38,992	36,840	27,418
Electronic Equipment Mfg.	28,280	23,741	17,526
Transportation Equipment Mfg.	53,278	52,578	55,699
Instruments Mfg.	51,340	44,585	36,402
Miscellaneous Mfg.	5,020	4,752	3,973
Food & Kindred Products Mfg.	1,559	1,552	1,447
Tobacco Products Mfg.	8	5	5
Textile Mill Products Mfg.	743	672	549
Apparel Mfg.	24,086	19,431	13,762
Paper Products Mfg.	1,597	1,626	1,456
Printing And Publishing	6,463	6,884	7,017
Chemical And Allied Prods. Mfg.	3,385	3,375	2,946
Rubber & Plastics Mfg.	6,653	7,347	6,764
Leather Mfg.	495	425	177
Local Interurban Passenger Transportation	7,476	8,582	10,151
Air Transportation	48,711	53,535	56,122
Eating/Drinking Establishments	33,990	43,601	56,654
Other Retail Trade	12,432	13,538	16,391
Hotels	31,369	46,680	49,797
Auto Repair	5,345	6,584	8,318
Amusement & Recreation	26,436	30,549	36,406
Total	**407,670**	**424,968**	**425,369**
Total Annual Passengers (millions)	**57.97**	**71.2**	**97.9**
Total Annual Cargo Tons (millions)	**1.9**	**3.1**	**4.2**

Source: HR&A, Inc.

5.4.4 Economic Output Impacts

As is the case with employment impacts, the economic output impacts of Alternative C are somewhat smaller than those of Alternatives A & B. Under Alternative C, LAX would have a $73.2 billion direct impact on the Southern California economy in 2005, and this would increase to $82.2 billion in 2015. The pattern for Los Angeles County and City is, again, more modest compared to Alternatives A & B, but net positive. These relationships, for the region, Los Angeles County and the City of Los Angeles, are shown in **Table 41**.

Table 41

**Direct Economic Impact of LAX in the Southern California Economy,
LA Master Plan EIS/EIR Alternative C, 1996, 2005 and 2015
(in millions of 1996 $)**

Geographic Area	1996	2005	2015
So. California Region	$60,439	$73,210	$82,175
Los Angeles County	$48,603	$60,567	$70,652
City of Los Angeles	$20,868	$26,050	$30,196

Source: HR&A, Inc.

5.4.5 Population and Households Impacts

As shown in **Table 42**, it is estimated that Alternative C would result in a net increase of about 1,156 on-airport jobs between 1996 and 2005, and a net increase of about 6,421 on-airport jobs over the entire planning period, 1996-2015. Within the City of Los Angeles, the employees added between 1996 and 2005 would be associated with about 370 households and household population of 1,113 people. Incremental on-airport employment over the entire planning period would be associated with about 1,600 households and about 4,900 persons Moving to Los Angeles County, the incremental on-airport employment over the 1996-2005 period would be associated with about 806 households and 2,300 people. Between 1996-2015, the incremental jobs would be associated with about 4,475 households and 12,799 persons. And finally, for the Los Angeles region as a whole, incremental on-airport employment between 1996-2005 would be associated with 868 employee households and almost 2,500 persons. For the entire planning period through 2015, incremental on-airport jobs would contribute 4,820 employee households and 13,792 persons.

Table 42

Households and Population Impacts of On-Airport Employment at LAX
Alternative C, 1996-2015

Analysis Area/Category	1996 Base Year	1996-2005 Growth	1996-2015 Growth
On-Airport Employment	58,966	1,156	6,421
City of Los Angeles			
Employee Households	18,976	372	1,633
Hhld. Population	56,783	1,113	4,883
Los Angeles County			
Employee Households	41,039	806	4,475
Hhld. Population	117,541	2,304	12,799
Los Angeles Region			
Employee Households	44,261	868	4,820
Hhld. Population	126,657	2,483	13,792

Source: HR&A, Inc.

5.5 Summary of the Economic and Employment Impacts of the Alternatives

Table 43 presents a comparative summary of the regional economic output estimates for the LAX Master Plan EIS/EIR Alternatives, for 1996, 2005 and 2015, by area of the region. **Table 44** compares the direct employment impacts of the Alternatives, also by year and area of the region.

Table 43

Summary of Direct Economic Output Impact of LAX in the Southern California Economy, By LAX Master Plan EIS/EIR Alternative and Area, 1996, 2005 and 2015 (in millions of 1996 $)

Geographic Area	1996	2005	2015
So. California Region			
No Action/No Project	$60,439	$73,210	$63,697
Alternatives A & B	60,439	73,210	83,726
Alternative C	60,439	73,210	82,175
Los Angeles County			
No Action/No Project	$48,603	$60,567	$52,271
Alternatives A & B	48,603	60,567	72,031
Alternative C	48,603	60,567	70,652
City of Los Angeles			
No Action/No Project	$20,868	$26,050	$22,186
Alternatives A & B	20,868	26,050	31,455
Alternative C	20,868	26,050	30,196

Source: HR&A, Inc.

Table 44

Summary of Direct Employment Impact of LAX in the Southern California Economy, By LAX Master Plan EIS/EIR Alternative and Area, 1996, 2005 and 2015

Geographic Area	1996	2005	2015
So. California Region			
No Action/No Project	407,670	424,968	350,110
Alternatives A & B	407,670	424,968	448,083
Alternative C	407,670	424,968	425,369
Los Angeles County			
No Action/No Project	327,683	347,710	294,237
Alternatives A & B	327,683	347,710	375,550
Alternative C	327,683	347,710	357,140
City of Los Angeles			
No Action/No Project	157,657	167,050	138,548
Alternatives A & B	157,657	167,050	185,829
Alternative C	157,657	167,050	173,726

Source: HR&A, Inc.

6. GEOGRAPHIC DISTRIBUTIONS OF EMPLOYMENT IMPACTS

This Section presents a disaggregation of the regional employment impacts presented in the preceding Section 5, by county and several subareas of Los Angeles County, including the City of Los Angeles and other cities and communities immediately adjacent to LAX. Within the City of Los Angeles, the estimates are further disaggregated by City Council District and Community Plan Area.

6.1 The Geographic Distribution Model

The geographic distribution model consists of a geographic component and an economic component, each of which is described below.

6.1.1 The Geographic Component

The geographic component of the model is based on a 1990 U.S. Census-based data set known as the Census Transportation Planning Packet (CTPP). This is a very detailed tabulation of journey-to-work data at the county level, generally provided as a part of the Census Bureau's STF-3A data series.

The CTPP data set used for this analysis contains a list of up to 1,000 Standard Industrial Classification (SIC) codes for each 1990 census tract within any county. For each census tract/SIC combination, the data set contains a figure for the estimated number of employees in that census tract/SIC combination in 1990. Census tract/SIC pairs for which employment is estimated to be zero are excluded from the data set. The data set contains over 265,000 census tract/SIC pairs for the five-county southern California region.

Using a correspondence table provided by the developers of the REMI model, HR&A collapsed the SIC-based CTPP data into the 49 market sectors in the REMI models that are being used for the LAX Master Plan. Based on these new data, an employment weight was assigned to each census tract for each sector. The weight is based on the ratio of employment in that census tract to the countywide total for each employment type. There is one set of weights for Los Angeles County, where the largest job impacts are predicted, and another for the combination of the other four counties (i.e., Orange, Riverside, San Bernardino and Ventura).[65]

The model also assumes that, within each county and county subarea, the 1990 distribution of employment by SIC will remain constant over time, through 2015. This assumption is based on HR&A's previous assessment of the likelihood of an employment shift between model areas (i.e., from one county to another). HR&A compared the percentage of regional employment by sector found in each model area in 1996 to that projected by the REMI models for 2015. This analysis indicated that no major intraregional shifts in the geographic location of employment by SIC are projected to occur in the relevant time period.

To seek further confirmation of this assumption, we interviewed several well know labor economists and economic geographers.[66] The consensus of these interviews is that, although some intraregional shifts will undoubtedly occur in the future, as businesses respond to changes in the factors that affect the costs of production and locations of labor and markets, there is no new accepted theory for predicting these changes, and therefore the 1990 distribution remains a reasonable basis for estimating the situation in 2015.

By keying the model to the unit of the census tract, the results can be aggregated and displayed for any geographic area or political subdivision that roughly corresponds with census tract boundaries, including counties, cities within counties, the City of Los Angeles City Council Districts and Community Plan Areas.

6.1.2 The Economic Component

Once the distribution model described above was developed, estimates of the direct job impacts of activity at LAX in 1996 were applied to the sectors indicated by the two-area HR&A Activity Translator model. As discussed in previous technical memoranda, these sectors are broadly grouped into three categories, including the air transportation sector, the passenger spending sectors and the cargo-related manufacturing sectors. The geographic distribution of jobs in these sectors is assumed to have the following characteristics:

- **Air Transportation Sector** impacts are assumed to take place at or immediately around LAX, and are assigned to census tract 2780.00 rather than distributed using the geographic model. Airport government jobs are also assigned to census tract 2780.00.[67]
- **Passenger Spending Sector** impacts fall into six distinct categories including parking and car rental services, hotel services, amusement and recreation services, eating and drinking places, retail sales and local interurban transportation (e.g., shuttle vans, taxicabs and buses). Jobs in the parking and car rental sector are assumed to take place at or immediately around LAX, and are assigned to census tract 2780.00. Jobs in the local interurban transportation sector are all assumed to be located within Los Angeles County, but are otherwise distributed within the County using the geographic

[65] This parallels the two REMI models for the LAX Master Plan economic impact analysis. The REMI model for Los Angeles County is "LA1" and the REMI model for the sum of the other four Southern California counties is "LA2."

[66] These include Prof. AnnaLee Saxenian, Ph.D. and Prof. Michael Tietz, Ph.D. at U.C. Berkeley and Prof. Peter Gordon, Ph.D. at U.S.C..

[67] These services are all assumed to take place (and be paid for) at or immediately around the airport, and not distributed throughout the region as are other impacts of airport activity.

model. Jobs in the remaining four passenger spending sectors are distributed to the two study areas (LA1 and LA2) based on data provided in HR&A's Activity Translator model. The geographic distribution model is used to distribute impacts *within* each of the two model areas.

- **The Manufacturing Sectors Affected by Cargo Transportation through the Region's Airports** category contains 17 manufacturing sectors which ship from the region by air. Nearly all manufacturing sectors found in the regional economy export at least some portion of their output by air (ranging from as little as 5% to as much as 86%). Raw materials sectors (e.g., lumber, stone and clay) were generally assumed not to ship by air. Jobs in these sectors are distributed to the two study areas (LA1 and LA2) based on data provided in HR&A's Translator model. The geographic distribution model is used to distribute impacts *within* each of the two model areas.

The total amount of employment in each sector and model area is multiplied by the employment weight for each census tract which contains that type of employment. The result is a distribution of direct jobs, by REMI sector, which mirrors the distribution of jobs (by sector) in the economy as of 1990.

In addition to a 1996 baseline distribution, two sets of distributions were prepared for each EIR/EIS Alternative: (1) total direct jobs in 2015; and (2) incremental job growth, 1996-2015.

6.2 The Geographic Distribution of Direct Jobs

Once the economic impact data are merged with the geographic component of the distribution model, the number of direct LAX-related jobs in 1994 and those for each EIR/EIS Alternative, 1996-2015 and in 2015, can be displayed at various geographic areas of interest.

6.2.1 Jobs Distribution by REMI Model Areas

Based on passenger and cargo volume parameters provided by Landrum & Brown, and the HR&A Activity Translator Model developed in Phase I, HR&A estimates that there were approximately 408,000 direct jobs throughout the five-county southern California region which were affected by, or dependent upon, the activity which occurred at LAX in 1996. About 48,710 (12%) of these jobs are in the air transportation and airport government sectors. An additional 109,600 (27%) of these jobs are in the various passenger spending sectors. The remaining 249,400 (61%) jobs are in the manufacturing sectors which rely heavily on LAX in order to move manufactured goods into and out of the regional economy. Of the total, about 59,000 (15%) are Airport jobs @ and are found at, or in the area immediately surrounding, LAX.

Using the Landrum & Brown passenger and cargo volume parameters for each EIR/EIS Alternative,[68] HR&A's method of categorizing Adirect@ jobs and applying the REMI models as described above, it is estimated that the total number of jobs associated with the EIR/EIS Alternatives in 2015 will range from about 425,000 to about 448,000, and between 122,000-144,000 incremental jobs between 1996 and 2015, as shown in **Table 45**. As in the demand forecast, about eighty percent of these jobs will be located in Los Angeles County and the balance in the remaining four counties.

[68] These assumptions are: 97.2 MAP for Alternatives A and B, 89.6 MAP for Alternative C (versus 98.0 MAP in the demand forecast), and 4.2 million tons of freight cargo in all three Alternatives (same as the demand forecast).

Table 45

**Total Direct LAX-Related Jobs in Southern California,
By REMI Model Area, 1996-2015 and 2015**

Geographic Area	Alternative A		Alternative B		Alternative C	
	Number	% of Total	Number	% of Total	Number	% of Total
Incremental Jobs 1996-2015						
LA1 (LA County)	131,042	90.8%	131,042	90.8%	112,632	92.6%
LA2 (Other 4 Counties)	13,353	9.2%	13,353	9.2%	9,049	7.4%
Total[1]	**144,395**	**100.0%**	**144,395**	**100.0%**	**121,681**	**100.0%**
Total Jobs in 2015						
LA1 (LA County)	375,550	83.8%	375,550	83.8%	357,140	84.0%
LA2 (Other 4 Counties)	72,533	16.2%	72,533	16.2%	68,229	16.0%
Total[1]	**448,083**	**100.0%**	**448,083**	**100.0%**	**68,229**	**100.0%**

[1] Totals may not sum precisely due to internal rounding.

Source: HR&A

6.2.2 Direct Job Impacts By County and City

Table 46, on the next page, shows the estimated distribution of 1996-2015 LAX-related employment growth by individual county and by major concentrations in cities within counties, for each EIR/EIS Alternative. **Table 47**, on the second following page, displays the estimates for the same geographic areas, but for total LAX Master Plan-related jobs in 2015 under each Alternative. The tables indicate that Los Angeles County is projected to capture between 83%-94% of incremental and total jobs, depending of the Alternative. A non-trivial number will also be created in Orange County (between 4%-10% of the regional total) under each Alternative. Within Los Angeles County, the City of Los Angeles is projected to capture roughly of every 10 incremental and total LAX-related jobs, regardless of the Alternative. The sum of jobs in the smaller incorporated cities and unincorporated communities immediately adjacent to LAX (i.e., the EIR/EIS primary impact area) will, taken together, capture about four percent of the incremental jobs (about 4,600-4900) and total jobs (about 15,000).

Table 46

Distribution Of Incremental Direct Job Impacts of the LAX Master Plan Alternatives, By County and City, 1996-2015

Geographic Area	Alternative A		Alternative B		Alternative C	
	Number	% of Total[3]	Number	% of Total	Number	% of Total
LA County						
City of LA	63,714	44.1%	63,714	44.1%	51,611	42.4%
Primary LAX Area[1]	4,880	3.4%	4,880	3.4%	4,640	3.8%
Other 2nd. LAX Area[2]	10,849	7.5%	10,849	7.5%	9,485	7.8%
Remainder of County	51,599	35.7%	51,599	35.7%	46,896	38.5%
Subtotal	**131,042**	**90.8%**	**131,042**	**90.8%**	**112,632**	**92.6%**
Orange County						
Anaheim	2,405	1.7%	2,405	1.7%	1,597	1.3%
Remainder of County	4,242	2.9%	4,242	2.9%	2,816	2.3%
Subtotal	**6,647**	**4.6%**	**6,647**	**4.6%**	**4,413**	**3.6%**
Riverside County	**3,132**	**2.2%**	**3,132**	**2.2%**	**2,206**	**1.8%**
San Bernardino Co.						
Ontario	822	0.6%	822	0.6%	566	0.5%
Remainder of County	1,525	1.1%	1,525	1.1%	1,051	0.9%
Subtotal	**2,347**	**1.6%**	**2,347**	**1.6%**	**1,617**	**1.3%**
Ventura County	**1,228**	**0.9%**	**1,228**	**0.9%**	**813**	**0.6%**
Total (5 Counties)[4]	**144,398**	**100.0%**	**144,398**	**100.0%**	**121,684**	**100.0%**

1 Includes the Cities of El Segundo, Hawthorne, Inglewood and the unincorporated communities of Del Aire and Lennox.

2 Includes Culver City, Gardena, Hermosa Beach, Lawndale, Lomita, Manhattan Beach, Redondo Beach, Santa Monica and Torrance and the unincorporated communities of Ladera Heights, Lomita, Marina Del Rey and View Park-Windsor Hills.

3 Totals may not sum precisely due to internal rounding.

Source: HR&A

Table 47

Distribution Of Total Direct Job Impacts of the LAX Master Plan Alternatives, By County and City, 2015

Geographic Area	Alternative A		Alternative B		Alternative C	
	Number	% of Total[4]	Number	% of Total	Number	% of Total
LA County						
City of LA	185,829	41.5%	185,829	41.5%	173,726	40.8%
Primary LAX Area[1]	14,720	3.3%	14,720	3.3%	14,481	3.4%
Other 2nd. Area[2]	28,519	6.4%	28,519	6.4%	27,153	6.4%
Remainder of County	146,482	32.7%	146,482	32.7%	141,420	33.3%
Subtotal	**375,550**	**83.8%**	**375,550**	**83.8%**	**357,140**	**80.4%**
Orange County						
Anaheim	10,472	2.3%	10,472	2.3%	9,983	2.3%
Remainder of Co.	33,325	7.4%	33,325	7.4%	31,625	7.4%
Subtotal	**43,797**	**9.8%**	**43,797**	**9.8%**	**41,563**	**9.8%**
Riverside County	**11,099**	**2.5%**	**11,099**	**2.5%**	**10,173**	**2.4%**
San Bernardino Co.						
Ontario	4,108	0.9%	4,108	0.9%	3,817	0.9%
Remainder of Co.	6,196	1.4%	6,196	1.4%	5,756	1.4%
Subtotal	**10,304**	**2.3%**	**10,304**	**2.3%**	**9,573**	**2.3%**
Ventura County	**7,334**	**1.6%**	**7,334**	**1.6%**	**6,920**	**1.6%**
TOTAL (5 Counties)[5]	**448,083**	**100.0%**	**448,083**	**100.0%**	**425,369**	**100.0%**

[1] Includes the Cities of El Segundo, Hawthorne, Inglewood and the unincorporated communities of Del Aire and Lennox.

[2] Includes Culver City, Gardena, Hermosa Beach, Lawndale, Lomita, Manhattan Beach, Redondo Beach, Santa Monica and Torrance and the unincorporated communities of Ladera Heights, Lomita, Marina Del Rey and View Park-Windsor Hills.

[3] Totals may not sum precisely due to internal rounding.

Source: HR&A

Table 48 provides a more specific breakdown for the cities and unincorporated communities immediately surrounding LAX to the north and south. Together, these communities accounted for about 10 percent of LAX-related jobs in 1996 in the five-county region. As in the other geographic areas, this area would experience a net decrease in employment over the 1996-2015 planning period under the No-Project Alternative, and a net increase under each of the three "build" alternatives.

Table 48

LAX-Related Employment in the South Bay and North Bay Cities and Communities For the LAX Master Plan EIS/EIR Alternatives, 1996, 2005 and 2015

City/Community	Base Year 1996	No Action/No Project 1996-2015	No Action/No Project 2015	Alternatives A & B 1996-2015	Alternatives A & B 2015	Alternatives C 1996-2015	Alternatives C 2015
South Bay Area							
Athens (unincorp.)	184	27	180	76	229	64	218
Del Aire (unincorp.)	49	10	50	30	70	23	64
El Camino Vlg. (unin.)	70	11	74	48	111	36	99
El Segundo	4,690	832	3,517	1,437	4,123	1,370	4,056
Gardena	2,923	563	2,592	1,276	3,305	1,104	3,133
Hawthorne	7,238	1,485	6,987	2,251	7,754	2,317	7,820
Hermosa Beach	235	45	262	162	380	124	341
Inglewood	1,762	358	1,786	1,021	2,448	823	2,251
Lawndale	178	43	160	84	201	75	192
Lennox	188	34	219	141	325	105	290
Lomita (unincorp.)	163	31	194	124	286	93	255
Manhattan Beach	1,701	392	1,709	1,003	2,320	825	2,142
Palos Verdes Estates	129	21	129	81	190	61	170
Rancho Palos Verdes	381	69	396	240	567	185	512
Redondo Beach	831	141	867	494	1,220	384	1,110
Rolling Hills	5	1	4	2	5	2	5
Rolling Hills Estates	60	10	63	41	94	30	84
Torrance	12,566	2,465	9,885	3,947	11,368	3,857	11,278
South Bay Total	**33,356**	**6,538**	**29,075**	**12,458**	**34,996**	**11,478**	**34,020**
North Bay Area							
Culver City	2,720	490	2,612	1,253	3,376	1,060	3,182
Marina Del Rey (L.A.Co,)	372	69	431	275	638	207	569
Palms/Mar Vista (L.A.)	156	27	156	92	221	71	201
Playa Del Rey (L.A.)	313	59	394	261	596	192	527
Santa Monica	3,667	689	3,884	2,230	5,425	1,756	4,951
Venice (L.A.)	447	84	484	282	682	220	620
Westchester (L.A.)	623	128	507	253	633	226	605
North Bay Total	**8,298**	**1,546**	**8,470**	**4,646**	**11,572**	**3,732**	**10,655**
No. Bay+ So.Bay Total	**41,654**	**8,084**	**37,545**	**17,104**	**46,568**	**15,210**	**44,675**
L.A. County Total	327,683	49,729	294,237	131,042	375,550	112,632	357,140
So. Bay Percent	10.2%	13.1%	9.9%	9.5%	9.3%	10.2%	9.5%
No. Bay Percent	2.5%	3.1%	3.9%	3.5%	3.1%	3.3%	3.0%
No. + So. Bay Percent	**12.7%**	**16.3%**	**12.8%**	**13.1%**	**12.4%**	**13.5%**	**12.5%**
Regional Total	407,670	46,422	350,110	144,395	448,083	121,681	425,369
So. Bay Percent	8.2%	14.1%	8.3%	8.6%	7.8%	9.4%	8.0%
No. Bay Percent	2.5%	3.3%	2.4%	3.2%	2.6%	3.1%	2.5%
No. + So. Bay Percent	**10.2%**	**17.4%**	**10.7%**	**11.8%**	**10.4%**	**12.5%**	**10.5%**

Source: HR&A, Inc.

Figure 21 on the following pages illustrates the 1996 LAX-related direct jobs distribution in 1996. **Figure 22** and **Figure 23** show the incremental (1996-2015) and total (2015) jobs distribution, respectively, for Alternative C. These distributional patterns are similar for Alternatives A and B.

6.3 Direct Job Impacts Within the City of Los Angeles

Within the City of Los Angeles, City Council Districts and Community Plan Areas (CPAs) are two subarea groupings that may be informative for impact analysis. Reaggregating the above data for the groups of census tracts that correspond with the boundaries of the 15 City Council Districts yields the results shown in **Table 49**. Council District 6 (Galanter), where LAX is located, will capture the largest share (between roughly 28%-40%) of incremental jobs (17,000-23,000) and total jobs (70,000-75,000). All of the other Council Districts will experience employment growth, ranging between 1,250 and 7,500 incremental jobs.

Table 49

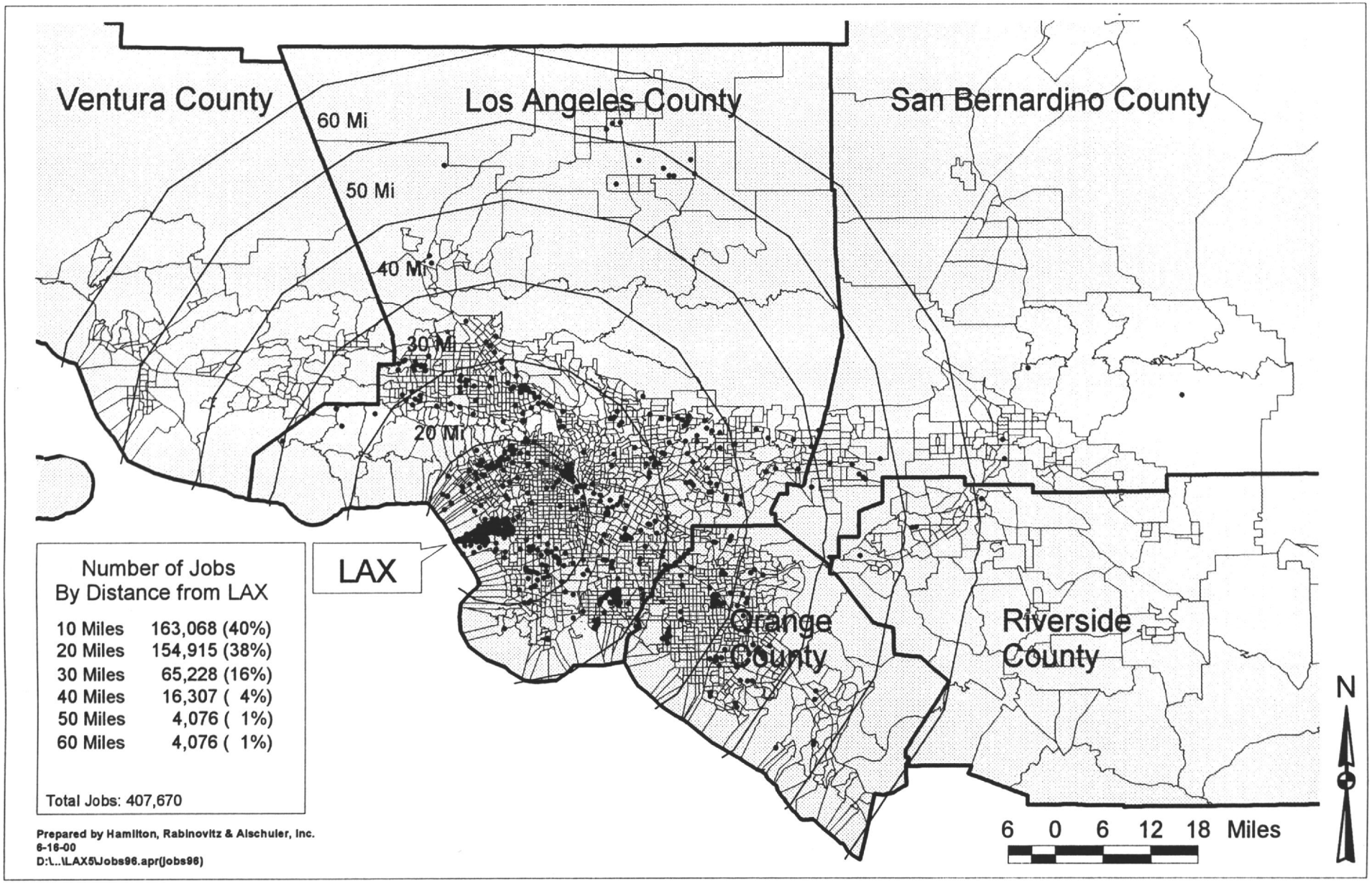
Distribution Of Incremental and Total Direct Job Impacts of The LAX Master Plan Alternatives,
By Los Angeles City Council Districts, 1996-2015 And 2015

City Council Districts	Alternative A		Alternative B		Alternative C	
	Number	% of Total[4]	Number	% of Total	Number	% of Total
1996-2015 Incremental Jobs						
1 Hernandez	1,260	2.0%	1,260	2.0%	1,004	2.0%
2 Wachs	3,506	5.5%	3,506	5.5%	3,293	6.4%
3 Chick	2,317	3.6%	2,317	3.6%	2,050	4.0%
4 Ferraro	2,874	4.5%	2,874	4.5%	2,294	4.4%
5 Feuer	7,525	11.8%	7,525	11.8%	5,620	10.9%
6 Galanter	22,715	35.7%	22,715	35.7%	16,919	32.8%
7 Padilla	1,625	2.6%	1,625	2.6%	1,625	3.2%
8 Ridley-Thomas	1,393	2.2%	1,393	2.2%	1,095	2.1%
9 Walters	5,407	8.5%	5,407	8.5%	4,535	8.8%
10 Holden	1,821	2.9%	1,821	2.9%	1,567	3.0%
11 Miscikowski	3,131	4.9%	3,131	4.9%	2,429	4.7%
12 Bernson	3,243	5.1%	3,243	5.1%	3,134	6.1%
13 Goldberg	2,597	4.1%	2,597	4.1%	2,057	4.0%
14 Pacheco	2,217	3.5%	2,217	3.5%	2,160	4.2%
15 Svorinich	2,086	3.8%	2,086	3.8%	1,829	3.5%
Total[1]	**63,717**	**100.0%**	**63,717**	**100.0%**	**51,611**	**100.0%**
2015 Total Jobs						
1 Hernandez	3,285	1.8%	3,285	1.8%	3,029	1.7%
2 Wachs	9,898	5.3%	9,898	5.3%	9,6487	5.6%
3 Chick	5,947	3.2%	5,947	3.2%	5,680	3.3%
4 Ferraro	7,102	3.8%	7,102	3.8%	6,521	3.8%
5 Feuer	17,456	9.4%	17,456	9.4%	15,551	9.0%
6 Galanter	75,446	40.1%	75,446	40.1%	69,650	40.1%
7 Padilla	5,042	2.7%	5,042	2.7%	5,043	2.9%
8 Ridley-Thomas	3,611	1.9%	3,611	1.9%	3,313	1.9%
9 Walters	17,089	9.2%	17,089	9.2%	16,217	9.3%
10 Holden	4,852	2.6%	4,852	2.6%	4,598	2.7%
11 Miscikowski	7,527	4.1%	7,527	4.1%	6,825	3.9%
12 Bernson	8,717	4.7%	8,717	4.7%	8,608	5.0%
13 Goldberg	6,386	3.4%	6,386	3.4%	5,846	3.4%
14 Pacheco	7,845	4.2%	7,845	4.2%	7,789	4.5%
15 Svorinich	5,626	3.0%	5,626	3.0%	5,370	3.1%
Total[1]	**185,829**	**100.0%**	**185,829**	**100.0%**	**173,726**	**100.0%**

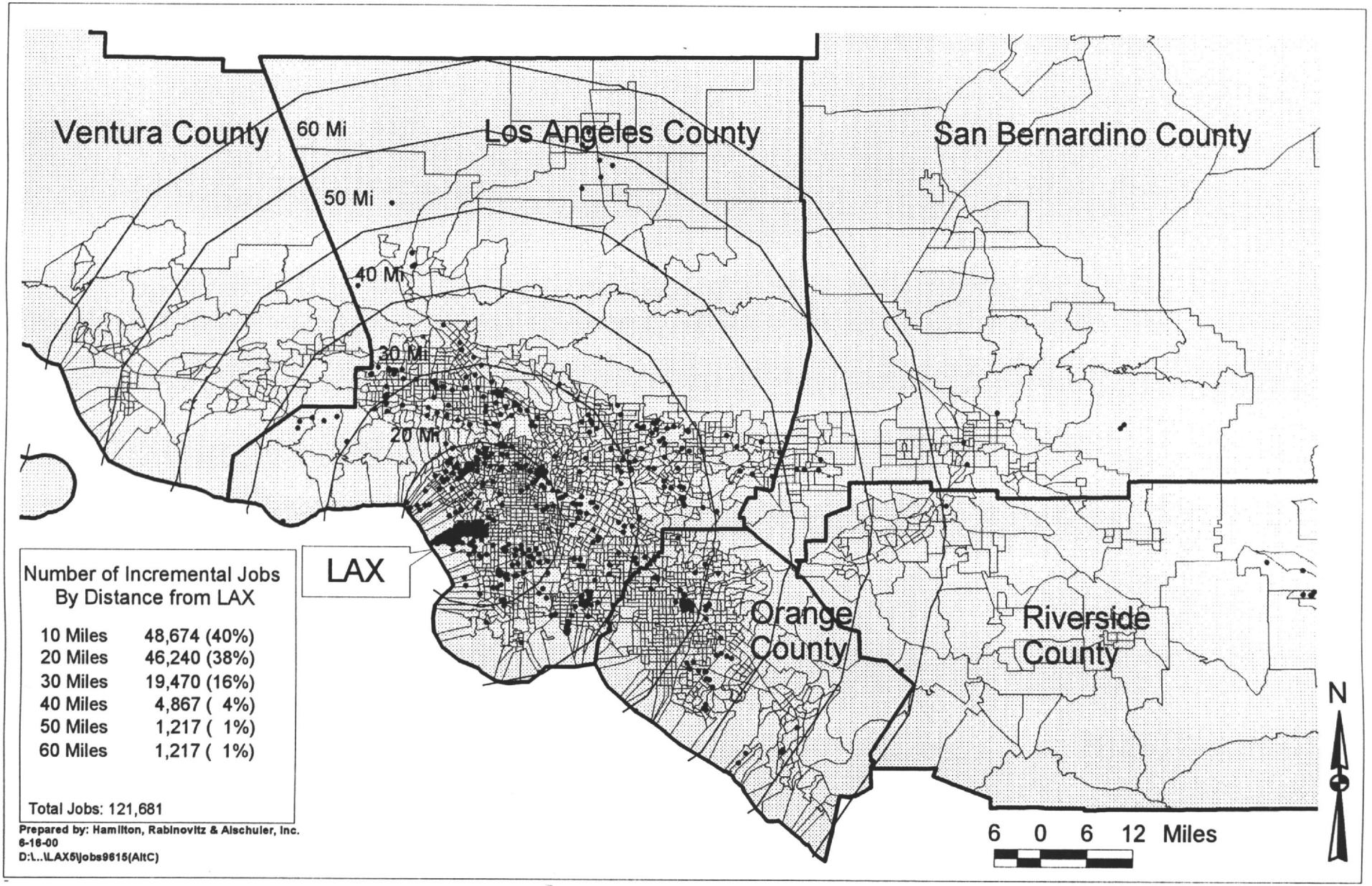
[1] Totals may not sum precisely due to internal rounding

Source: HR&A.

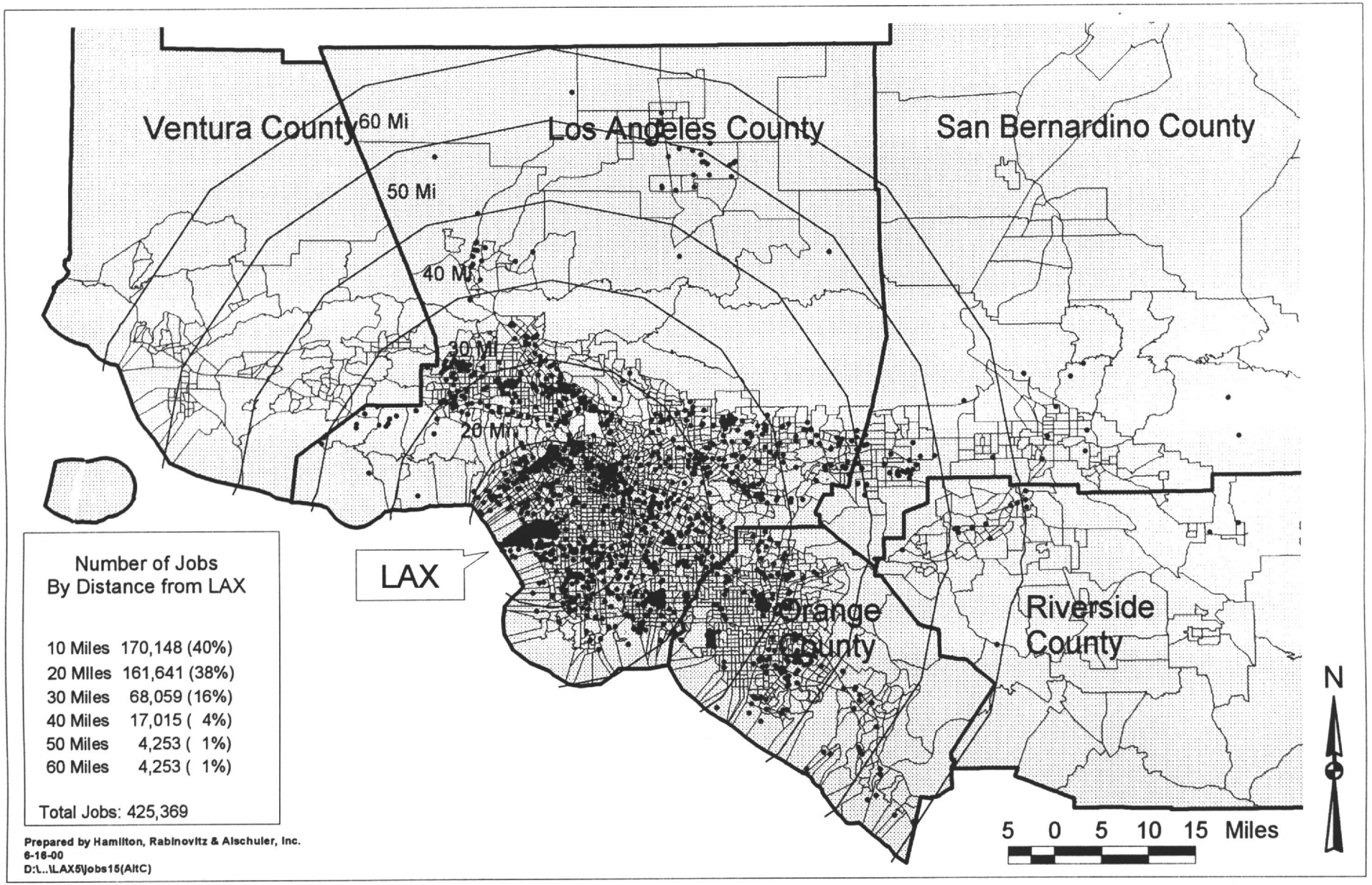
Table 50 and **Table 51** show that, among the City's 35 CPAs, the Western area, including the Westchester CPA around LAX, will capture about half of all incremental jobs (between 24,000-31,000 or 44-47%) and total jobs (89,000-96,000 or 49%-50%). The CPAs in the Metro-Southern area, particularly the Wilshire, Hollywood and Central City CPAs, have the next highest concentration, with over 30% of the jobs (between 17,500-21,000 incremental and 55,000-59,000 total). The balance of the jobs (about



Los Angeles International Airport Master Plan	Distribution of Total Direct LAX-Related Jobs in Southern California in 1996	Figure 21



Los Angeles International Airport Master Plan	Distribution of Incremental Direct Jobs in Southern California, 1996 - 2015, Alternative C	Figure 22



Los Angeles International Airport Master Plan	Distribution of Total Direct Jobs in Southern California in 2015, Alternative C	Figure 23

15,000 incremental and and 34,000 total, or 18%) will be located in the San Fernando Valley CPAs. Once again, the basic pattern of these relationships at the scale of Council Districts and CPAs resembles the other geographic distributions discussed in this section: an identical distribution of impacts for EIR/EIS Alternatives A and B, and noticeably smaller impacts for Alternative C.

Table 50

Distribution of Incremental Job Impacts Of the LAX Master Plan Alternatives, By City Of Los Angeles Community Plan Areas, 1996-2015

	Alternative A		Alternative B		Alternative C	
Community Plan Areas	**Number**	**% of Total[4]**	**Number**	**% of Total**	**Number**	**%of Total**
North Valley						
14 Arleta-Pacoima	466	0.7%	466	0.7%	464	0.9%
17 Sun Valley	1,370	2.2%	1,370	2.2%	1,332	2.6%
18 Sylmar	538	0.8%	538	0.8%	543	1.1%
25 Sunland-Tujunga	153	0.2%	153	0.2%	124	0.2%
16 Mission Hills-Panorama City	442	0.7%	442	0.7%	369	0.7%
19 Granada Hills	259	0.4%	259	0.4%	201	0.4%
21 Chatsworth-Porter Ranch	2,336	3.7%	2,336	3.7%	2,368	4.6%
22 Northridge	432	0.7%	432	0.7%	357	0.7%
Subtotal	**5,996**	**9.4%**	**5,996**	**9.4%**	**5,758**	**11.2%**
Metro-Southern						
1 NE Los Angeles	981	1.5%	981	1.5%	922	1.8%
2 Boyle Heights	1,230	1.9%	1,230	1.9%	1,240	2.4%
8 Silverlake-Echo Park	344	0.5%	344	0.5%	298	0.6%
3 SE Los Angeles	1,164	1.8%	1,164	1.8%	1,136	2.2%
5 South Central LA	930	1.3%	930	1.3%	730	1.4%
6 Wilshire	4,197	6.6%	4,197	6.6%	3,308	6.4%
7 Hollywood	4,139	6.5%	4,139	6.5%	3,208	6.2%
9 Westlake	860	1.3%	860	1.3%	661	1.3%
10 Central City	4,069	6.4%	4,069	6.4%	3,239	6.3%
11 N&E Central City	431	0.7%	431	0.7%	390	0.8%
33 Wilmington-Harbor City	586	0.9%	586	0.9%	500	1.0%
34 San Pedro	421	0.7%	421	0.7%	333	0.6%
35 Harbor Gateway	879	1.4%	879	1.4%	817	1.6%
Subtotal	**20,232**	**31.8%**	**20,232**	**31.8%**	**16,784**	**32.5%**
Western						
4 West Adams-Baldwin Hills	1,104	1.7%	1,104	1.7%	885	1.7%
28 Palms-Mar Vista	779	1.2%	779	1.2%	655	1.3%
29 Venice	374	0.6%	374	0.6%	290	0.6%
30 Westchester-Playa Del Rey	21,765	34.2%	21,765	34.2%	16,420	31.8%
26 Westwood	1,103	1.7%	1,103	1.7%	813	1.6%
27 West LA	3,595	5.6%	3,595	5.6%	2,687	5.2%
31 Brentwood-P. Palisades	725	1.1%	725	1.1%	539	1.0%
32 Bel Air-Beverly Crest	431	0.7%	431	0.7%	317	0.6%
Subtota	**29,876**	**46.9%**	**29,876**	**46.9%**	**22,607**	**43.8%**
South Valley						
12 Sherman Oaks-Studio City	1,216	1.9%	1,216	1.9%	907	1.8%
13 North Hollywood	952	1.5%	952	1.5%	813	1.6%
15 Van Nuys-No. Sherm. Oaks	1,549	2.4%	1,549	2.4%	1,382	2.7%
20 Canoga Park-Winnetka	2,070	3.2%	2,070	3.2%	1,812	3.5%
23 Reseda-W. Van Nuys	1,041	1.6%	1,041	1.6%	930	1.8%
24 Encino Tarzana	783	1.2%	783	1.2%	618	1.2%
Subtotal	**7,610**	**11.9%**	**7,610**	**11.9%**	**6,462**	**12.5%**
Total	**63,714**	**100.0%**	**63,714**	**100.0%**	**51,611**	**100.0%**

Source: HR&A

Table 51

Distribution of Total Job Impacts of The LAX Master Plan Alternatives, By City Of Los Angeles Community Plan Areas, 2015

Community Plan Areas	Alternative A		Alternative B		Alternative C	
	Number	% of Total[4]	Number	% of Total	Number	% of Total
North Valley						
14 Arleta-Pacoima	1,513	0.8%	1,513	0.8%	1,512	0.9%
17 Sun Valley	3,999	2.2%	3,999	2.2%	3,961	2.3%
18 Sylmar	1,707	0.9%	1,707	0.9%	1,714	1.0%
25 Sunland-Tujunga	384	0.2%	384	0.2%	355	0.2%
16 Mission Hills-Panorama City	1,134	0.6%	1,134	0.6%	1,060	0.6%
19 Granada Hills	617	0.3%	617	0.3%	560	0.3%
21 Chatsworth-Porter Ranch	6,494	3.5%	6,494	3.5%	6,529	3.8%
22 Northridge	1,071	0.6%	1,071	0.6%	996	0.6%
Subtotal	**16,919**	**9.1%**	**16,919**	**9.1%**	**16,687**	**9.6%**
Metro-Southern						
1 NE Los Angeles	3,026	1.6%	3,026	1.6%	2,968	1.7%
2 Boyle Heights	4,511	2.4%	4,511	2.4%	4,522	2.6%
8 Silverlake-Echo Park	900	0.5%	900	0.5%	853	0.5%
3 SE Los Angeles	5,110	2.7%	5,110	2.7%	5,082	2.9%
5 South Central LA	2,452	1.3%	2,452	1.3%	2,253	1.3%
6 Wilshire	10,311	5.5%	10,311	5.5%	9,424	5.4%
7 Hollywood	10,058	5.4%	10,058	5.4%	9,127	5.3%
9 Westlake	2,121	1.1%	2,121	1.1%	1,922	1.1%
10 Central City	11,459	6.2%	11,459	6.2%	10,629	6.1%
11 N&E Central City	1,636	0.9%	1,636	0.9%	1,594	0.9%
33 Wilmington-Harbor City	1,545	0.8%	1,545	0.8%	1,459	0.8%
34 San Pedro	1,058	0.6%	1,058	0.6%	971	0.6%
35 Harbor Gateway	2,491	1.3%	2,491	1.3%	2,429	1.4%
Subtotal	**56,678**	**30.5%**	**56,678**	**30.5%**	**53,235**	**30.6%**
Western						
4 West Adams-Baldwin Hills	2,929	1.6%	2,929	1.6%	2,710	1.6%
28 Palms-Mar Vista	1,944	1.0%	1,944	1.0%	1,820	1.0%
29 Venice	904	0.5%	904	0.5%	821	0.5%
30 Westchester-Playa Del Rey	73,174	39.4%	73,174	39.4%	67,813	39.0%
26 Westwood	2,538	1.4%	2,538	1.4%	2,248	1.3%
27 West LA	8,410	4.5%	8,410	4.5%	7,502	4.3%
31 Brentwood-P. Palisades	1,689	0.9%	1,689	0.9%	1,504	0.9%
32 Bel Air-Beverly Crest	997	0.5%	997	0.5%	883	0.5%
Subtotal	**92,586**	**49.8%**	**92,586**	**49.8%**	**85,302**	**49.1%**
South Valley						
12 Sherman Oaks-Studio City	2,825	1.5%	2,825	1.5%	2,515	1.4%
13 North Hollywood	2,512	1.4%	2,512	1.4%	2,374	1.4%
15 Van Nuys-No. Sherman Oaks	4,160	2.2%	4,160	2.2%	3,997	2.3%
20 Canoga Park-Winnetka	5,297	2.9%	5,297	2.9%	5,040	2.9%
23 Reseda-W. Van Nuys	2,940	1.6%	2,940	1.6%	2,830	1.6%
24 Encino Tarzana	1,911	1.0%	1,911	1.0%	1,745	1.0%
Subtotal	**19,647**	**10.6%**	**19,647**	**10.6%**	**18,502**	**10.7%**
Total	**185,829**	**100.0%**	**185,829**	**100.0%**	**173,726**	**100.0%**

Source: HR&A

7. CONCLUSION

Today, the five-county Southern California region would be the world's 12th largest economy were it a separate nation. The region is becoming increasingly integrated with the world economy as international trade flourishes. International trade now accounts for about one-quarter of the region's total economic output.

There can be no doubt that adequate transportation infrastructure -- highway, rail and air -- is critical to facilitating the region's successful participation in the global economy. Airport capacity, particularly for

international passengers and airfreight cargo, is particularly essential because of its physical reach and speed. Even as all of the other airports in the region continue to add capacity, LAX will still be dominant, particularly for international travel, the fastest growing segment of the market, due to the overpowering influence of LAX's network characteristics.

In 1996, the base year for the analysis reported here, LAX was directly related to $60 billion[69] in total economic output and about 408,000 jobs, or one out of every 20 jobs in the regional economy. The total includes about 59,000 jobs at LAX, with the balance in a wide range of passenger spending-related jobs and airfreight cargo-related manufacturing jobs in other locations. When the multiplier effect of these direct impacts is taken into account, LAX's impact in the region swells to $110 billion and 932,000 jobs. Most of this impact occurs in the City and County of Los Angeles, and more particularly, within a 20-mile radius around LAX.

If facilities at LAX could be expanded to accommodate its share of future regional air transportation demand by the year 2015, LAX would contribute $84 billion in direct output and 448,000 jobs to the regional economy, including 71,000 jobs at LAX. Taking the multiplier effect into account, LAX's impact could be $127 billion in total economic output and 852,000 jobs by 2015. Compared with a 2015 scenario in which LAX does not expand beyond its annual passenger and cargo volumes as of 1996, there would be a direct cost to the regional economy of $24 billion in lost economic output and about 145,000 foregone jobs. This represents the maximum likely scale of economic opportunity that could be captured by adoption of the LAX Master Plan.

The analysis in this Report demonstrates that a more realistic No-Project scenario (i.e., incremental passenger growth to 78.7 MAP and 3.1 ACT by 2015), based on airline operating adjustments and currently planned improvements only, will result in modest net output and employment gains by 2005. But by 2015, the effects of constrained LAX capacity would yield just slightly more economic output and actually fewer LAX-related jobs in the region (and the City and County of Los Angeles) than were there in 1996, as technology and other factors raise the level of output per worker.

On the other hand, all three of the LAX Master Plan EIS/EIR build alternatives, though they fall somewhat short of accommodating all of LAX's projected share of demand for air transportation services by 2015, contribute enough new output and related jobs to overcome future productivity-related job losses to yield a net positive economic impact, both for output and jobs. Alternatives A and B, which have the identical annual passenger and annual airfreight tonnage characteristics, yield the highest direct output ($84 billion) and direct jobs (448,000) among the LAX Master Plan EIS/EIR's three build Alternatives. From a strictly economic perspective, these Alternatives, and Alternative C to a somewhat lesser extent, would enable LAX to help the greater Los Angeles region continue playing a very major role on the world economic stage.

[69] All dollar amounts are expressed in constant 1996 dollars.

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Glossary, Abbreviations and Acronyms

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GLOSSARY OF TERMS

Term	Description
Air Transportation Sector	The sector of the economy that includes all of the services generally associated with the operation and use of an airport, including passenger and cargo related air transportation services.
Airfreight Cargo	A category of merchandise transported by air. Airfreight cargo consists of both air express and traditional air freight, and is one component used to calculate Annual Air Cargo Tonnage.
Demand Forecast	A baseline forecast of LAX's impact on the regional economy (measured in terms of employment and total economic output), under the assumption that LAX would operate at a level of activity sufficient to satisfy 100 percent of its share of total demand for air transportation services in the year 2015 (see also *Fixed Activity Forecast*).
Direct Economic Impact	The total employment and total economic output directly related to the operation of LAX, derived from total passenger and cargo activities and the employment related to these activities, both on and off the LAX property.
Econometric Analysis	The use of statistical and mathematical techniques to analyze economic data and make forecasts of future economic activity. Econometric analysis is "dynamic" in that econometric models can measure how relationships between industries and other variables change over time.
Economic Base	A region's economy is comprised of "basic" and "non-basic" industrial sectors. "Basic" industries (or "economic base") are those that export goods and services outside the region and thus bring new income into the region (i.e., aircraft, motion pictures, computer services). "Non-basic industries are those goods and services that are sold inside the region to serve the existing population.
EIS/EIR Alternatives	The various "build" and "no-build" scenarios for the future development of LAX, as specified in the LAX Master Plan EIS/EIR.
Employment	Based on the Bureau of Economic Analysis concept of "place of work." It includes full-time and part-time employees, as well as the self employed, unless otherwise indicated. Employment estimates of the LAX Master Plan EIS/EIR Alternatives were derived from the REMI model's output-employment relationships, adjusted for productivity improvements over time. Estimates of construction-related employment for the Alternatives were derived from the REMI model, based on projected construction expenditures by category of expenditure.
Fixed Activity Forecast	A baseline forecast of LAX's impact on the regional economy (measured in terms of employment and total economic output), under the assumption that LAX is constrained to its 1995 passenger and airfreight cargo activity levels between 1995 and 2015 (see also *Demand Forecast*).
Indirect Economic Impact	The economic impacts not included in the exogenous (direct) change entered through policy variables in the REMI Model. In general, this is the sum of all induced impacts (see definition below) and "intermediate" effects. When differentiated from "direct" and "induced" impacts, "indirect" impacts refer to economic effects resulting from the purchase of inputs for the production of "direct" impact goods.
Induced Impact	The economic impacts resulting from the re-spending of wages related to direct and indirect impacts.

Industry; Industrial Sector	A category of business activity defined by its Standard Industry Classification (SIC).
Input-Output Analysis	A method of estimating economic activity that describes the quantitative relationship between changes in demand (increases and decreases) within an economy for a specified time period, usually a single year.
Just-in-Time	A system of production and logistics in which products are delivered "just in time" to be assembled in to finished goods and delivered "just in time" to be sold and delivered to customers. The purpose of the approach is to reduce inventory-carrying costs and ultimately improve production throughput
Passengers	Persons who purchase tickets to travel by air. For the purposes of forecasting the economic impacts related to LAX, passengers include those who enplane or deplane at LAX, and passenger types includes business travelers, residents of the region, those traveling on flights that connect at LAX, and visitors to the region
Passenger Spending Sectors	Sectors of the economy, other than air transportation, in which local and non-local passengers who enter the region as a consequence of air transportation services at LAX, spend money in the region. These sectors include, for example, car rental agencies, hotels, eating and drinking establishments and amusement and recreation services.
17 Manufacturing Sectors	A set of 17 manufacturing sectors with a significant portion of their output related to airfreight cargo activity at LAX. Each of these sectors produces goods for export by air.
Southern California Region	In this Report, a five-county region of Southern California that includes the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura. This is similar to the SCAG region, minus Imperial County.
Standard Industry Classification	The U.S. government's system of classifying industries by type of business activity with code numbers. This Report utilizes the 1986 version of the SIC codes for consistency with historical regional and national employment and economic data. The SIC system was recently revised and is now known as the North American Industry Classification System, including industries in the U.S., Mexico and Canada.
Total Economic Output	The total value (in dollars) of goods and services produced in a given region or in a given sector. It can also be thought of simply as total sales or spending. In this Report, the total economic output related to the operation of LAX was calculated as the sum of total passenger- related output and total cargo-related output. Output values were generated from the REMI model in constant 1987 dollars, which were adjusted to constant 1996 dollars using the REMI model's Personal Consumption Expenditure inflation factors.

ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Explanation
ACT	Airfreight Cargo Tons
BUR	Burbank-Glendale-Pasadena Airport
CEQA	California Environmental Quality Act
CCSCE	Center for the Continuing Study of the California Economy
CPA	Community Plan Area (City of Los Angeles)
CTA	Central Terminal Area
CTPP	Census Transportation Planning Packet
EIR	Environmental Impact Report (CEQA)
EIS	Environmental Impact Statement (NEPA)
I-O	Input-Output (analysis or model)
JIT	Just-in-Time
FAA	Federal Aviation Administration
L&B	Landrum & Brown, Inc.
LAW	Los Angeles World Airports (formerly City of Los Angeles Department of Airports)
LAX	Los Angeles International Airport
LGB	Long Beach Airport
MAP	Millions of Annual Passengers
NEPA	National Environmental Policy Act
ONT	Ontario International Airport
Pax	Passengers
PMD	Palmdale
REMI	Regional Econometric Models, Inc.
RIMS II	Regional Input-Output Modeling System (199
SIC	Standard Industrial Classification
SCAG	Southern California Association of Governments
SNA	John Wayne
TBIT	Tom Bradley International Terminal
UCLA	University of California, Los Angeles

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Appendices

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Appendix A: Calculation Factor Details

Table 52

Passenger and Cargo Factor Details for the LAX Demand Forecast

Area	1996	2005	2015
So. Calif. Region			
Total Enonomic Output	$ 60,439	$ 74,107	$ 83,742
Total Output/MAP	$ 1,043	$999	$855
Passenger Output	$ 11,639	$ 14,621	$ 18,670
Pax Output/MAP	$ 201	$ 197	$ 191
Cargo Output	$ 48,800	$ 59,486	$ 65,072
Cargo Output/Ton	$ 25,684	$ 9,189	$ 15,597
Los Angeles County			
Total Enonomic Output	$ 8,603	$ 1,312	$ 72,917
Total Output/MAP	$ 838	$ 826	$ 744
Passenger Output	$ 360	$ 2,097	$ 16,257
Pax Output/MAP	$ 161	$ 163	$ 166
Cargo Output	$ 9,243	$ 9,215	$ 56,660
Cargo Output/Ton	$ 20,654	$ 5,876	$ 13,581
City of Los Angeles			
Total Enonomic Output	$ 0,868	$ 26,370	$ 31,842
Total Output/MAP	$ 360	$ 355	$ 325
Passenger Output	$,019	$ 5,203	$ 7,099
Pax Output/MAP	$ 69	$ 70	$ 72
Cargo Output	$,849	$ 21,168	$ 24,743
Cargo Output/Ton	$ 8,868	$ 6,828	$ 5,931
Activity Assumptions			
LAX MAP	57.970	74.200	97.960[1]
LAX Cargo Tons	1.900	3.100	4.172[1]
LAX Direct Jobs	407,670	437,958	448,316
Region Jobs			
LAX Passenger Jobs	165,760	216,059	266,980
LAX Cargo Jobs	241,910	221,899	181,336
Region Total	407,670	437,958	448,316
LA County Jobs			
LAX Passenger Jobs	133,237	181,057	223,729
LAX Cargo Jobs	194,446	185,951	151,960
LA County Total	327,683	367,009	375,689
LA City Jobs			
LAX Passenger Jobs	64,104	89,664	110,797
LAX Cargo Jobs	93,553	92,088	75,254
LA City Total	157,657	181,753	186,051

[1] 2005 and 2015 MAP and cargo tons are based on the Demand Forecast, per Landrum & Brown.

Sources: HR&A, Inc.

Table 53

Factor Details for the LAX Master Plan EIS/EIR Alternatives

	No Project		Alt. A		Alt. B		Alt. C	
	2005	2015	2005	2015	2005	2015	2005	2015
So. Calif. Region[1]								
Total Economic Output	$ 73,210	$ 63,697	$ 73,210	$ 83,726	$ 73,210	$ 83,726	$ 73,210	$ 82,175
Total Output/MAP	$ 1,028	$ 809	$ 1,028	$ 855	$ 1,028	$ 855	$ 1,028	$ 917
Passenger Output	$ 13,772	$ 15,035	$ 13,772	$ 18,657	$ 13,772	$ 18,657	$ 13,772	$ 17,105
Pax Output/MAP	$ 193	$ 191	$ 193	$ 191	$ 193	$ 191	$ 193	$ 191
Cargo Output	$ 59,485	$ 48,663	$ 59,485	$ 65,070	$ 59,485	$ 65,070	$ 59,485	$ 65,070
Cargo Output/Ton	19,066	15,597	$ 19,066	15,597	$ 19,066	$ 15,597	$ 19,066	15,597
Los Angeles County								
Total Economic Output	$ 60,567	$ 52,271	$ 60,567	$ 52,271	$ 60,567	$ 52,271	$ 60,567	$ 70,652
Total Output/MAP	$ 851	$ 664	$ 851	$ 664	$ 851	$ 664	$ 851	$ 789
Passenger Output	$ 11,394	$ 12,338	$ 11,394	$ 11,648	$ 11,394	$ 11,648	$ 11,394	$ 14,706
Pax Output/MAP	$ 160	$ 157	$ 160	$ 119	$ 160	$ 119	$ 160	$ 164
Cargo Output	$ 49,212	$ 39,934	$ 49,212	$ 40,624	$ 49,212	$ 40,624	$ 49,212	$ 55,946
Cargo Output/Ton	$ 15,773	$ 12,799	$ 15,773	$ 9,737	$ 15,773	$ 9,737	$ 15,773	$ 13,410
City of Los Angeles								
Total Economic Output	$ 26,050	$ 22,186	$ 26,050	$ 31,455	$ 26,050	$ 31,455	$ 26,050	$ 30,196
Total Output/MAP	$ 366	$ 282	$ 366	$ 321	$ 366	$ 321	$ 366	$ 337
Passenger Output	$ 4,900	$ 5,237	$ 4,900	$ 7,009	$ 4,900	$ 7,009	$ 4,900	$ 6,285
Pax Output/MAP	$ 69	$ 67	$ 69	$ 72	$ 69	$ 72	$ 69	$ 70
Cargo Output	$ 21,166	$ 16,950	$ 21,166	$ 24,445	$ 21,166	$ 24,445	$ 21,166	$ 23,911
Cargo Output/Ton	$ 6,784	$ 5,433	$ 6,784	$ 5,859	$ 6,784	$ 5,859	$ 6,784	$ 5,731
Activity Assumptions								
LAX MAP	71.2	78.7	71.2	97.9	71.2	97.9	71.2	89.6[2]
LAX Cargo Tons	3.12	3.12	3.12	4.172	3.12	4.172	3.12	4.172[2]
LAX Direct Jobs	424,968	350,110	424,968	448,083	424,968	448,083	424,968	425,369
Region Jobs								
LAX Passenger Jobs	203,069	214,499	203,069	266,747	203,069	266,747	203,069	244,033
LAX Cargo Jobs	221,899	135,611	221,899	181,336	221,899	181,336	221,899	181,336
Region Total	424,968	350,110	424,968	448,083	424,968	448,083	424,968	425,369
LA County Jobs								
LAX Passenger Jobs	166,152	180,268	166,152	223,568	166,152	223,568	166,152	204,890
LAX Cargo Jobs	181,558	113,969	181,558	151,982	181,558	151,982	181,558	152,250
LA County Total	347,710	294,237	347,710	375,550	347,710	375,550	347,710	357,140
LA City Jobs								
LAX Passenger Jobs	79,824	84,883	79,824	110,625	79,824	110,625	79,824	99,666
LAX Cargo Jobs	87,226	53,665	87,226	75,204	87,226	75,204	87,226	74,060
LA City Total	167,050	138,548	167,050	185,829	167,050	185,829	167,050	173,726

[1] Output in constant 1996 $.

[2] 2005 and 2015 MAP and cargo tons are based on the Demand Forecast, per Landrum & Brown.

Sources: HR&A, Inc.

Appendix B: Case Studies

Motion Picture-Multimedia Firm Case Studies

Echo Entertainment

Echo Entertainment is a small production company located in the San Fernando Valley. Echo produces sports programs for television and "coming attraction" segments for motion picture feature films. The company maintains 10 full-time employees and contracts with free-lance film crews on location. Free-lance crews are hired from the vicinity of the location shoot. This sort of contracting allows production companies that deal with changing location sites to lower overall operation costs in terms of personnel and cargo transportation.

Last year Echo's sales totaled over $5 million. Ninety percent of those revenues are derived from sports productions. The company projects a 10 percent annual increase in total business over the next five years. Increases in business are generally attributed to two factors: a.) growth in movie production and b.) growth in the number of cable television channels available to viewers. At an estimated 439 films, Movie production in Southern California last year was double that of 1991. This increase has meant a numerous new opportunities for Echo to produce "coming attractions" segments and sports programs to feed the ever increasing cable television market for worldwide distribution of U.S. produced entertainment products.

On site shoots require that an average of two to three employees of Echo fly to a given production site and return to Los Angels at least once each week. As mentioned earlier, Echo hires its crew at the production site and thus mitigates costs associated with transporting an 18-24 member crew on a weekly basis.

All of the major equipment and components associated with production are also leased at the shoot location.

Echo also transports two final products from its facility. "Coming attraction" films are transported to local "dub" houses via messengers. The "dub" houses then assume the responsibility of transporting the final product to the appropriate clients. Sports films are transported to out of state networks using Federal Express. The number of shipments averages 1-2 per week. Each shipment totals less than 1 cubic foot. Shipments are repetitive and have no discernible boom times or cycles throughout the year.

Echo perceives no problems with the airport accommodating its freight shipments. However, the company's personnel could be better served by carriers that serve a greater number of locations with fewer take-off delays.

The company chooses LAX over Burbank airport, even though the latter is geographically more convenient, because of the greater availability of direct flights to a wide range of destinations.

White Sneakers Incorporated

White Sneakers is a motion picture production company, specializing in both animated and live action films. The company produces an average of two films per year, with annual sales averaging about $1.5 million. The company maintains a core staff of 12 employees, and hires a free-lance production crew (40-65 people) for each film.

After the recession of the early 1970s, the major studios reduced their permanent work-forces and in some cases sold production facilities in order to reduce fixed capital stock. This production is carried out by a myriad of independent production companies, like White Sneakers, either with or without a major studio affiliation. Their scale of output is limited and the scope of their activities is relatively narrow. The production process is no longer carried out within the firm but instead has moved to the external market, carried out through a series of transactions linking firms and individuals in specific production projects.

White Sneakers projects an average annual increase of 5 percent increase in business within the next five years. Growth is attributed to diversifying their services, including scriptwriting and production of movies for television. The technological revolution in entertainment has dissolved the boundaries that previously separated film and television. Specialized companies can now reduce their risks by marketing their services across these sectors. The major studios (Warner Brothers, Viacom, HBO, Nickelodeon, et al.) continue to dominate financing and distribution, however, retaining effective control over product definition and marketing.

Given that financing for most production projects is dominated by the major networks, executives (numbering 1 or 2) from White Sneakers must fly to New York (the hub of network upper-management) to negotiate contracts. The executives fly from LAX an average of twenty times per year. LAX is preferred over Burbank because of the availability of direct flights.

In addition, production companies are also increasing their number of trips to the East Coast and overseas to secure European joint ventures. In an attempt to force a streamlining of production costs, major networks are becoming increasingly conservative in the capital they will lay out for production. This has forced production companies like White Sneakers to pursue joint ventures in an attempt to fund projected capital deficits.

Unlike the first case, for each project not filmed locally, White Sneakers transports a local cast and crew (40-60 people) from Los Angeles to the filming location. Typically, cast and crew members remain on site for the duration of the project. The production equipment and components are also transported by air and normally consist of some 10 cases, each 3 cubic feet.

Transportation schedules for movie production are typically repetitive. Non-local site production for television and its consequent air service demand, however, usually peaks from June to September.

White Sneakers perceives no problems with the airport accommodating its crew and cargo, with the exception of take-off delays. In fact, a carrier will often transport the cast and crew at no charge in exchange for an endorsement during the film's credits.

Soundelux

Soundelux, located in Hollywood, records, edits, designs, dubs and mixes sound for feature films. The final product is then distributed by the major studios, e.g. Warner Brothers, Disney, Paramount, etc. Soundelux is comprised of seven divisions. In Orlando, Soundelux specializes in editing and design. Soundelux Systems in Orlando deals specifically with fabrication for theme parks. Mind's Eye in San Raphael, California manufactures books on tape. Two Soundelux facilitates in Northern California include Sound Media Labs, which works with multimedia product development, and Modern Music, which specializes in video tapes; Hollywood Edge in Los Angeles focuses on compact disc music.

Last year the company had $30 million in sales and employed 120 people. The company is currently expanding its facilities in order to accommodate growth in its business. Currently, Soundelux contracts with an average of five feature films per year. The company's major competitors in Los Angeles include Todd-AO Studios, Weddington Sound, and Sound Storm.

Soundelux receives the “daily shoot” of a film each evening. It has a three to five hour turn- around time to process the sound for the segment and return it to the production company. Typically, Soundelux receives four to five daily air cargo shipments, each less than one cubic foot. These shipments typically arrive at night. Outbound shipments average four to five daily, but are slightly larger, each about two cubic feet and weighing approximately 35 pounds.

Shipments are repetitive with no discernible peak times. Within the next five years Soundelux expects the number of its shipments to increase, but not the weight of the cargo. In order to save on transportation costs, Soundelux and other major sound competitors are beginning to use magneto optical formats, which hold a wealth of data on a small disc. These specialized formats stand in sharp contrast to what is now industry standard, 2 inch 24-track tapes.

Soundelux uses two cargo handlers (freight forwarders) which specialize in motion picture media: Network and Reels on Wheels. Network itself is described in detail below.

Soundelux perceives no problems with the airport accommodating its shipments. When direct flights are not available, the freight forwarder books the cargo on connecting flights.

Vortex Media Arts

Vortex Media Arts produces family interactive entertainment. Like other multimedia companies, Vortex thrives on the pre-existing and well-developed base of knowledge and skill in California. It draws upon the resources and capabilities of both the Silicon Valley and Hollywood. As mentioned earlier, multimedia firms like Vortex have emerged in Southern California mainly as an appendage to the Hollywood entertainment complex and the plethora of "publishers" agglomerated in Northern California. Publishers in this instance means firms that supply high-technology support to the developers of multimedia outputs. For example, Vortex will design an interactive software based on a television or motion picture title, i.e. "The Simpsons". Vortex then works with a publisher in the Silicon Valley that prepares the technical aspect of the video.

Last year Vortex had $3 million in annual sales and employed 45 people. The company expects it sales to increase and is moving to a larger facility to accommodate its growing operations. Vortex projects a 5% annual average increase over the next five years. Growth is attributed to the vitality of the industry.

Vortex has decreased its domestic air shipments and increased its overseas air shipments in the last few years. Now that all departments of the company are on a network, all changes/manipulation of the software are sent to the publishers in Northern California via modem. Two years ago, before installation of the network, Vortex would send edits mandated by the publisher daily via Federal Express. Today, Vortex ships an average of one two-pound package ("golden-master" and documents) daily via Federal Express.

Vortex will increase shipments overseas within the next five years. Within the next year it will ship approximately one 50 pound container to Korea daily via LAX. Multimedia technologies have prompted major transformations in some of the traditional entertainment industries of Southern California. For example, these technologies have revitalized the animated film industry of Los Angeles, which by the mid-1980s seemed to be waning rapidly (Scott, 1984). The small cadre of animators in Southern California are now in peak demand and must be paid high salaries. This has prompted companies like Vortex to contract with low-cost animators in Korea and other overseas locals.

Shipping schedules are repetitive with a peak in the second half of the second quarter and third quarter, in an attempt to get products to market before the surge in Christmas retail sales.

Vortex has perceived no problems with the airport accommodating its shipments. The company has just begun contracting business with Korean animators, so it has yet to concretely experience how LAX is meeting its international cargo transportation needs.

V.D.I.

VDI performs video duplication and translation into different formats. Business is expected to increase twenty percent over the next five years. Growth is attributed to a boom in international film and video rentals . And, expanding overseas business produces new kinds of high-technology work in California. TV shows must be adapted to European and Asian television screens that define the picture more precisely--across 625 lines, compared to the 525 for the U.S. system.

VDI has three divisions, in Culver City, Hollywood and Tulsa, Oklahoma. The Hollywood division employs 100 people with annual sales for 1994 at $15 million. The Culver City location performs post production editing. The Tulsa facility also performs video duplication.

VDI has two major competitors in Southern California: Dubs Inc. located in Hollywood and Allpost in the San Fernando Valley.

VDI ships 99 percent of its cargo through LAX. Freight going to San Francisco, San Diego and Las Vegas (about 1 percent of total shipments) is shipped from Burbank Airport.

About five percent of total shipments are to overseas destinations and Canada. These shipments are expected to increase.

Because the company has about a twenty-four hour turn-around time, finished products are shipped out daily. Outbound shipments average 500 per week at 2 pounds each. Inbound shipments average 100 per week at 2 pounds each. Packages are usually sent by UPS, Federal Express or Airborne Express.

A freight forwarder, Network, handlesthe freight from the studios to the duplication facility.

VDI has perceived no problems with LAX accommodating its shipments. Network, the freight forwarder, handles any cargo delays by placing cargo intended for direct transfer on connecting flights. This of course increases lead times.

Network Courier

Network, located in Los Angeles, provides courier services to the motion picture industry. Network uses its own truck fleet to pick up cargo from film laboratories (i.e. Soundelux) and then books the cargo on direct flights to one of the thirty film depots throughout the country. Typically film flows from the laboratory, to the film depot, to the theater. At the film depot, the film is wound onto a reel and placed in a canister and prepared for shipment to the theater. Because film production often runs on a tight time schedule, the timeliness with which Network picks up the product and forwards it to the depot is critical to the film remaining on schedule and being received by the theaters in time for showing.

Network has 12 offices throughout the United States with annual sales of $28 million. The Los Angeles office employs 50 people. Three-hundred people are employed throughout the other eleven offices.

Network books outbound cargo on direct flights, when available. It books approximately 1,000 outbound shipments per week through LAX. The average weight of each outbound shipment is twenty-five pounds, and 60 inches in length.

Network receives approximately 325 inbound shipments per week through LAX. The average weight of each shipment is 25 pounds, and 60 inches in length. Most inbound cargo is picked up and delivered to the airport by Network's truck fleet.

Shipping schedules are repetitive with no discernible peak times. This is radically different than shipping schedules five years ago, which had clear peak and trough months.

Network has not perceived any problems with the airport accommodating its shipments. However, the company would be better served by greater availability of direct flights to various locations. And, the availability of cargo space shrinks in December and January, which requires some maneuvering on Network's part to get the cargo to the depot on time.

Castle Rock Entertainment

Castle Rock is a division of Columbia Pictures. It produces an average of 10 feature films per year. Castle Rock's annual average sales are in excess of $80 million and the company employs 150 people.

The corporate side of Castle Rock uses LAX primarily for transporting executives to financial centers on the East Coast to secure financing or to the production sites to oversee the shoot. The production side of the company uses LAX to transport crews and cargo to the shoot location and to ship promotional materials to prospective buyers. More than ten people from the corporate side of Castle Rock depart from LAX weekly.

The logistics of the production side of the company can be broken down into two categories, publicity and filming. Publicity materials, including promotion items such as hats and T-shirts, are shipped daily. Castle Rock ships an average of twenty packages, less than five pounds each, of promotional materials via Federal Express daily. It receives an average of 35 packages, less than 5 pounds each, daily. Inbound shipments include materials from promoters and publicity documents.

Castle Rock typically transports the upper echelon management crew from Los Angeles to the filming location for each feature film. This core crew numbers from twenty to forty-five people, depending on the film. Lower echelon crew members, such as grips and assistants, are often hired at the location of the shoot. Typically, the management crew will ship its core equipment to the location site and lease other components from that location. The average cargo transported per flight includes 5 cameras and components weighing approximately 1,000 pounds.

Shipping schedules are repetitive with no discernible peak times.

Castle Rock has perceived no problems with LAX accommodating its shipments. However, a greater availability of direct flights to more destinations would be a time saving option for traveling executives.

Most promotional materials and documents are handled by Federal Express, which has always been timely in its deliveries.

Electronics Manufacturing Firms Case Studies

Pacesetter

Pacesetter, located in Sylmar, specializes in cardiac rhythm management products, i.e. defibrillators (pacemakers) and associated components.

There are six other manufacturing facilities in the U.S., all are subsidiaries of St. Jude Medical Inc. The company had $350 million in annual sales last year and the Sylmar facility employs 1,100 people. Pacesetter projects that sales will increase an annual average of 15% over the next five years.

Pacesetter's major competitors are Medtronics in Minneapolis and Intermedics in Houston. It has approximately 400 major suppliers, one-third of which are local.

Pacesetter ships eight, four cubic feet pallets per day to its various distribution centers via Federal Express. Most inbound shipments are received by surface carriers.

Turn-around time is less than 48 hours. This is not because of JIT but rather because the battery in the defibrillator is activated before sterilization and packaging. The product is then shipped to a number of distribution sites throughout the U.S., Europe and Asia.

Pacesetter is now moving to a centralized distribution system. Memphis will be the central distribution site for the U.S., England will be the central distribution site for Europe, and Singapore will service Asian customers. Memphis was chosen as the US parts-bank site because of the availability of a cargo airport. Hospitals are the end-users of all products. Pacesetter is implementing the centralized distribution strategy to reduce capital requirements, achieve global inventory flexibly, and lower costs by holding smaller inventories.

Pacesetter has an exclusive contract with Federal Express which handles all logistics with the airport. Consolidated distribution and shipping has allowed them to cut costs and cycles times. The company has perceived no problems with the airport accommodating its shipments.

Rerouting to other airports via surface would raise their total costs. More importantly, rerouting would have a significant impact on the life of the product, which is stamped with a “Use Before” date at the end of the manufacturing process before sterilization and packaging.

Densitron Corporation

Densitron, located in Torrance, distributes technically advanced components or subsystems for the electronic industry. It imports LCD displays and solenoids, modifies them by attaching a value-added feature, and then distributes the final product to U.S. and Canadian customers. Densitron ships its products primarily to OEM’s (Original Equipment Manufacturers) of medical equipment and computer products.

Densitron is a subsidiary of Digitron. Densitron had $20 million in annual sales last year and employs 35 people. There are two other Densitron facilities in the U.S. and eight other in Europe and Asia.

The company anticipates a 15 percent annual average increase in inbound shipments over the next five years. Shipments have increased 20 percent since 1994. Growth is primarily in computer industrial sales, i.e. digital displays for gas pumps, touch order-displays in fast food restaurants, etc.

Densitron receives the majority of its products from Taiwan, Japan and England. There are approximately six local suppliers. Densitron's major competitors include American, Shelly's, IEE, Babcock, Seiko, and Sharp.

All outbound shipments are handled by surface transportation. This facility handles only the western US, so surface transport is able to meet turn-around times.

The number of inbound shipments average five weekly. Each shipment consists of 25-30 cartons with a total average volume of 275 kilograms. Shipments must arrive by noon in order to allow for transport to the plant by business closing. Inbound shipments are carried by Korean and China Air. Federal Express is used occasionally for urgent shipments of the final product to the customer. A freight forwarder, Daher Golden Eagle, transports the inbound shipments from LAX to the facility. As noted above, Densitron receives the majority of its products from Taiwan, Japan and England, but there are also approximately six local suppliers.

The proliferation of Just-in-time inventories as the industry standard has increased the frequency of Densitron's shipments by 50 percent since 1985. At that time, only 10 percent of Densitron's customers used JIT. Currently, 75 percent of its customers subscribe to JIT. The company keeps inventory for a maximum of thirty days, with a five day turn around time from point of manufacture to distribution. Shipping schedules are repetitive with no discernible peak times.

Densitron reports that from their perspective, there are not enough flights available from December to early February, causing significant inbound freight processing lags.

Many companies in the industry use consolidated shipments because they are lower cost. They provide a savings approaching 2/3 over direct flights. During peak airport travel periods, Densitron instead incurs the cost of shipping direct.

Novacap

Novacap, located in Valencia, is a worldwide supplier of ceramic chip capacitors for surface mount applications and other specialty products including thin profile chips, perforated components, and custom chip sizes. It is a subsidiary of Dover Technologies in New York.

Last year Novacap approached $20 million in sales and employed 240 people. It has 150 suppliers, the majority of which are located on the east cost and supply raw materials.

Novacap anticipates annual average growth of 15 percent over the next five years. Growth is attributed to the economic development in the Pacific Rim.

Most inbound materials are transported surface because of their considerable weight.

Novacap averages 200 outbound shipments weekly, 40 percent of which are by air. The average weight of a shipment is 20 pounds (product literature is significantly heavier than the actual product). Shipping schedules are repetitive with no discernible peak times. Transway Freight System and U Freight handle all cargo logistics.

All personnel flights (2-3 per month) and cargo headed for Northern California depart from Burbank Airport.

Novacap perceives no problems with the airport accommodating its shipments. If no direct flights are available, U Freight will book the cargo on indirect flights. This causes longer lead times by several hours.

Gamma-F Corporation

Gamma-f, located in Torrance, specializes in microwave components for microwave industry applications. It provides a range of capabilities for the production of precision microwave products including electrical/mechanical design, fabrication, and electrical testing. The majority of Gamma-f's customers are located in the US, with about 20 percent of business deriving from Europe and Asia.

Last year Gamma-f had $7 million in annual sales and employed 43 people. It is a subsidiary of Vertex Communication Corporation located in Texas. Gamma-f expects its sales to increase over the next five years. Growth is attributed to a stable US market (the U.S. is the largest manufacturer of antennas) for this product and increasing international sales.

Most inbound shipments are surface. Outbound shipments are by air and average 25 per week. Each shipment is approximately 2'x4' and weighs and average of 30 pounds. Shipments are carried by Federal Express and UPS. All international customers demand air shipments in order to shorten lead times. Shipping cycles are repetitive, yet tend to peak during the end of each month.

Gamma-f perceives no problems with the airport accommodating its shipments.

Kavlico Corporation

Kavlico Corporation is a supplier of pressure, position, force sensors and related systems. The company is capable of producing low cost, high volume sensors and low volume highly sophisticated custom designed units. Kavlico is one of the largest manufacturers of electromagnetic position transducers in the world.

The company had average annuals sales approximating $ 80 million and employs 1400 people. It has 250 suppliers, 80 percent of which are local. Most customers are domestic, with approximately 10 percent of business deriving from international sales.

Kavlico expects its business to increase within the next five years by at least fifty percent. Increases are attributed to diversified production, i.e. heating and ventilating sensors, and an increase in international business.

Most inbound shipments arrive via surface. Outbound shipments are by air and average 30 per week. Each shipment averages 20 pounds and one cubic foot. End-users are mainly aerospace OEMs and automotive manufacturers.

Most of these customers apply JIT inventories which has entailed an increase in frequency of shipments over the last ten years.

Shipping schedules are repetitive with no discernible peak times. Freight forwarders (Emery and Airborne Express) transport the cargo.

Kavlico perceives no problems with the airport accommodating its shipments.

Cut Flower Industry Case Studies

Mayesh Wholesale Florist

Mayesh is a wholesale distributor of cut flowers. The company imports half of its flowers from foreign suppliers in Columbia, Ecuador, Holland, France, Singapore and a number of other flower growing countries. The other half of its blossoms are provided by local suppliers in the Carpinteria and San Diego growing regions.

Mayesh approached $ 2 million in annual sales last year and has 30 employees. Flowers are shipped surface to markets and florists in Van Nuys, Los Angeles, Orange County, Torrance, and Carlsbad.

Mayesh expects its shipments to increase an annual average of 2-5% over the next five years. Its major competitors in Los Angeles County include: Milano, Holland Flowers, and Quality Flowers.

Mayesh averages 20 to 50 inbound shipments per week from overseas suppliers. Each shipment averages between 700 to 2,500 kilos. All flowers that are distributed, that is, all outbound shipments, are transported via surface. Mayesh maintains its own truck fleet for this purpose. Flowers are shipped surface to customers because of their close proximity.

Mayesh would prefer a greater number of direct flights from foreign countries. Delays associated with indirect flights greatly effects the quality of its highly perishable products. With flights that can't fly directly to LAX, Mayesh must hire USDA inspection workers to inspect the product when it first lands in the U.S. This is a typical scenario for 90% of the flights originating in Ecuador; brokers are hired in Houston (a typical connection) to inspect the product. This is an added expense to the company that performs its own brokerage duties in Los Angeles.

Brand Flowers

Brand flowers, founded five years ago, sells flowers to wholesalers. The company grows its flowers in Carpinteria and Nipomo. They broker 15% of their flowers from other suppliers, ten percent of which are shipped through LAX. The company expects $6.5 million is sales this year and employs 85 people.

Brand expects its sales to increase an annual average of 15% per year. Growth is attributed to technology and hybridization that enables domestic growers to compete globally.

Brand receives an average of two inbound shipments per week through LAX. The average weight of each shipment is 300 pounds. Outbound shipments are significantly higher, averaging 20 per day through LAX. The average weight of outbound shipment is about 300 pounds.

Outbound shipments typically are leave in the late afternoon and at night. Inbound shipments arrive early morning.

Brand uses two freight forwarders that specialize in floral transportation, Air Fresh Trucking and West Coast Trucking, both located in Oxnard.

Brand would be better served by a greater number of direct flights. For outbound shipments, longer flight schedules affect the shelf life of the product. And, indirect flights mean that Brand must incur higher operating costs by hiring brokers to inspect the shipment at the port of entry.

Brand would also be better served by docks at LAX that are specifically located/designed to service perishable goods. Both San Francisco and San Jose Airports have specific freight docks for highly perishable items.

Apparel Industry Case Studies

Guess ?, Inc.

Guess derives its revenue from the sale of Guess fashion products through its wholesale and retail operations. In 1992, the company decided to focus its wholesale operation on the sale of its core men's and women's product lines, which primarily include denim and other cotton clothing. Last year the company exceeded $500,000,000 in annual sales and employs approximately 1,100 at it corporate headquarters in Los Angeles. Typically Guess designs apparel, cuts the fabric on the premises and then contracts out the sewing to other firms.

Approximately four years ago Guess embarked on a new market direction. Sales volume for the once-hot core junior business cooled, so Guess expanded the label's distribution from the better sportswear market to more moderate retailers. This move led to overall sales gains.

During the past eighteen months Guess has counted on an invigorated junior line and international distribution to provide growth. International sales could account for as much as 25 percent of Guess business by the end of this year. It currently accounts for 5 to 10 percent of sales. Guess has licensed stores in Colombia, Brazil, Argentina, Monaco, Canada, Italy, Saudi Arabia, Lebanon, Kuwait, Australia, Panama, Venezuela, Guatemala and Costa Rica. Guess has 32 stores in Mexico and plans four more stores in Australia this year. The company has targeted Asia, Latin America, the Middle East and Europe for aggressive retail expansion this year.

This significant overseas expansion signals a tremendous amount of air-freight flowing from Los Angeles to other ports-of-call.

Guess receives an average of 8 inbound shipments per week, ranging anywhere from 10- 400 kilos. Lighter shipments are generally samples from overseas manufacturers. Most inbound shipments are assembled goods from Asia.

Most fabric comes from domestic suppliers in the South and is moved to Southern California by truck. Approximately ten percent of the fabric is flown in from Italy for the Guess Collection line.

Most outbound shipments are move through LAX. Outbound shipments average 7 per week and weigh and average of 1,500-2,000 kilos. The top three markets these air shipments are bound for include Singapore, Hong Kong and the Middle East.

Inbound and outbound freight is shipped throughout the day, and shipping schedules tend to be repetitive without discernible peak times.

Typically customers buy products at the point of manufacture so they, the customer, are responsible for the freight forwarding and shipping.

Given Southern California’s tremendous manufacturing base, much of which produces products which are exported through LAX, it is not unusual for freight to be delayed in order to accommodate perishable items, which represent first priority (highest shipping cost) cargo.

Carol Little

Carol Little is one of Southern California's largest fashion companies. Carol Little specializes in the design and manufacture of women's and children's outerwear. Last year the company had annual sales of $500 million and employs 1,100 people in Los Angeles.

The company expects its shipments to increase within the next five years. Growth is attributed to a healthy domestic market.

Carol Little ships an average of 1,000 cartons per day to domestic retailers. The average weight per carton is 35 pounds. Approximately 40% of these outbound shipments flow through LAX to locations throughout the U.S. Air transport is used for long distances or when stock is in high demand.

Carol Little assembles most of its goods in Mexico, Guatemala and Asia. Goods cut and assembled in Mexico are repatriated to Los Angeles by truck for finishing and distribution. Guatemala also sews cut fabric. Cut fabric shipments to Guatemala are shipped through LAX and average 1 shipment per week averaging 100 pounds. Sewed goods from Guatemala are then shipped back to Los Angeles at the same rate.

Goods cut and assembled in Asia typically return to Los Angeles via LAX and average 10 containers per week. Average weight per container depends on the type of garment and the manner in which it is packed -- hung or folded.

Carol Little has perceived no problems with the airport accommodating its shipments. It prefers to receive assembled products in the morning in order to distribute them that day. Sometimes freight lags are apparent during the holiday season.

Processed Foods Industry Case Studies

Certified Grocers

Certified Grocers is a whole sale distributor supplying groceries to all grocery stores in the Western U.S. that don't have their own distribution facilities. Last year the company approached $12 billion in annual sales and maintains 2,000 employees. Certified has some 500 processed food suppliers most of which are local.

The company expects its shipments to end-users to increase by four fold within the next five years. Growth is attributed to an increased demand for fresh produce, delicatessen items, frozen fruits and vegetables in the Pacific-Asian region. Since Certified receives over 30,000 product items, there is a rapid turn over of inventory from the time the good is supplied to the warehouse.

Certified's major competitors for these services are Fleming in northern California, United Grocers in Oregon, and Associated Grocers in Seattle.

The majority of Certified's inbound shipments arrive at the warehouse by surface transport due to the close proximity of food processing plants and growers. A portion of outbound shipments to customers in the Pacific-Asian region are shipped via air. These shipments average twelve per week at 3,000 pounds each. Typically this freight is prepared for shipment during the day and departs on an evening flight.

Shipping schedules are repetitive except for seasonal fruits and vegetables which have boom times, i.e. stoned fruit reaches peak delivery April through July.

LAX goes into over capacity during the holiday season, December through January, causing freight lags. And, cargo availability is constrained during the peak fruit season, April through July.

Uni-World Seafood

Uni-World is a world-wide distributor of fresh and frozen seafood products. Seventy-five percent of the end-users to whom the firm sells are restaurants. The remaining twenty-five percent of its products are sold to grocery stores.

Uni-World employs 35 people and has annual sales of over $15 million. The company expects its shipments to increase 10-15% over the next five years. Growth is attributed to changing consumer tastes leading increased demand for seafood products. Uni-World's major competitors are Santa Monica Seafood and American Fish.

Approximately one-third of Uni-World's product is frozen and obtained from local suppliers. The remaining products it distributes are fresh, half of these are imported to Southern California by air from Vancouver via LAX, Chile via Miami, Boston, and Houston. The other half of Uni-World’s fresh food products are provided by local brokers. Such brokers are typically for low volume specialty items like Mahi-Mahi and sea bass.

Uni-World ships an average of 1,500 pounds of air-freight per week. The size of the pallet depends on the weight and product. For larger shipments, averaging 2,400 pounds an “LD3” air freight container is used.

Auto Parts and Components Case Studies

Mazda Motors of America

Mazda Motors of America is the corporate headquarters of Mazda Motors. It is the U.S. vehicle and parts distribution organ of the company that ships vehicles and parts. Last year, the company exceeded $7.5 billion in annual sales, and currently employees 500 people. Mazda Motors has 12 facilities in California.

Mazda expects its sales and shipments to increase within the next five years -- by an average of 5 % per year. Its major competitors in the Southern California include Toyota, Honda and Nissan.

Mazda’s automobiles are generally shipped to the U.S. by sea. Approximately 80% of inbound shipments of parts and components are moved from Japan to Mazda’s Irvine headquarters via air. These air shipments average 15 per week through LAX and weigh an average of 6,500 kilos.

Outbound shipments are higher because some stock accumulates at the Irvine warehouse

and is moved to parts distribution centers when their stock is low. Outbound shipments average 75 per week and weigh and average of 6,500 kilos per shipment.

The frequency of inbound and outbound shipments has been affected by the just-in-time concept, which has become a trademark of the Japanese automobile industry. Increases in the frequency of shipments attributed to JIT however are difficult to assess because they are masked by increased shipments attributed to Mazda's fairly new centralized distribution efforts. The latter has reduced inventories in the various PDC's by 40%, resulting in savings totaling over $80 million. A portion of this freed up capital is then reinvested into transportation so that inventory from Irvine can be shipped via air to most PDCs, which enables Mazda to further cut cycle times. Shipping schedules are typically repetitive with no discernible peak times.

Mazda's ability to get parts to PDCs in a timely manner is dictated by airline flight schedules. The company typically experiences cargo lags during the holiday season which are out of its control. Transportation logistics are handled primarily by Mazda's freight forwarders, Nippon and NNR.

Toyota Motor Sales, U.S.A., Inc.

Toyota Motor Sales, U.S.A. is the corporate headquarters for Toyota Motors and is responsible for the movement of vehicles from the point of manufacture to the customers as well as the distribution of spare parts and components. The operational logistics of Toyota's parts distribution network are currently being transformed.

U.S. dealers have long been able to order service parts from one of 12 U.S. parts distribution warehouses. Toyota's systems, however, operated without central U.S. management. The U.S. parts centers largely had to fend for themselves to stock replacement parts. Warehouse like those in Aurora, Ill., or Kansas City, Mo., had to keep up with available domestic replacement parts on their own, or take the parts offered by the central parts network in Japan. In October 1996, Southern California will become the location of Toyota's central clearing-house, gathering parts from Japanese, U.S. and Canadian plants and distributing them to PDCs around the nation.

Toyota's central clearing-house is being built in Ontario, California. This location was chosen because Toyota has owned land there for a number of years. Ontario Airport will be used to ship cargo to the PDC's from the clearing-house. The Los Angeles PDC, which will receive goods by truck from Ontario, will ship cargo by air through LAX to dealers in the western United States. Currently an average of 200 outbound shipments per year flow through LAX. The average weight of each shipment is approximately 130 pounds. In time, the number of shipments through LAX will increase, as capital savings from lower inventories are reinvested in air transportation so that parts can be delivered to dealers more quickly.

Toyota's Lexus facility, located in Los Angeles, generates a significantly higher amount of freight flowing through LAX. The Lexus luxury image requires that cycle times for spare parts from PDC's to dealers must remain short. Parts must therefore be transported by air in most instances. Lexus' U.S. market share is growing astronomically, and achieved a 30% growth rate in 1995.[70]

Toyota has perceived no problems with the airport accommodating its shipments. It does use a freight forwarder, which schedules flight and transport logistics.

[70] A 30% increase in market share indicates a growth from, for example, a 10% share to a 13% share (30% growth rate), rather than from 10% to 40% (30 points of growth).