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Preface and Acknowledgments

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Executive Summary

This report presents statistical information on passenger and cargo traffic, aircraft activity and delays at California airports. Five main topics are considered: passenger enplanements, air travel origin and destination (O-D) patterns, air cargo activity, aircraft operations, and airport delays. In most cases, we present data for the state as a whole, major regions within the state, and major airports within each region. Most of the data are compiled on an annual basis for the years from 1980 to 2000. The report concludes with a discussion of the changes in activity in the California aviation system since the events of September 11, 2001, and some of the implications of these changes.

As of September 1998, there were 260 public-use airports in California, of which 230 were publicly owned. The California Aviation System Plan Inventory Element classifies airports into a number of *Functional Categories*, based on the services provided by each airport and the role that it plays in the aviation system. This system follows the FAA practice of classifying air carrier airports as either Commercial or Primary, based on the level of enplanements, and general aviation airports as either General Aviation or Reliever, depending on whether the airport is eligible to receive funding as a reliever airport under the FAA Airport Improvement Program. Within these categories, airports are classified by the California functional classification as Metropolitan, Regional, Community or Limited Use airports. As of September 1998, there were 28 Commercial or Primary airports in the state, 18 Metropolitan airports, 70 Regional airports, 103 Community airports, and 39 Limited Use airports. There were also two joint use military airports supporting commercial air service.

Enplanement activity in California is heavily concentrated, with a handful of airports accounting for the vast majority of the state total. The concentration has increased between 1980 and 2000, during which time California's enplanement growth mirrored national trends. However, within the multiple airport systems of the San Francisco Bay Area and Southern California there is evidence of dispersion, as San Francisco International (SFO) and Los Angeles International (LAX) airports have lost market share to their smaller competitors.

Analysis of the O-D travel patterns of air passengers in the state reveals that the Northeast U.S. and California intrastate markets are the largest sources of California passenger traffic, while

on a per-capita basis the state of Nevada and the Pacific region (including Hawaii, Guam and Pacific Territories) generate the most air travel in California. Analysis of recent trends shows that the Northwest regional market (Alaska, Idaho, Montana, Oregon, Washington, and Wyoming) is growing the most rapidly, followed by the Mountain (Colorado and Utah), Nevada and Northeast (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia) regional markets. There are marked airport-to-airport differences in the market composition of passenger traffic, with SFO and LAX dominating long-haul markets to the Northeast and Pacific regions and the other airports being far more competitive in shorter-haul markets such as Nevada, the Northwest and the Southwest (Arizona and New Mexico).

The growth of air cargo at the twelve top cargo airports[1] in California has been very fast. The average annual growth rate in the total weight of air cargo at the twelve airports during the ten years from 1990 to 2000 was about seven percent. However, the growth was much stronger during the period from 1990 to 1996 than during the last four years. Six out of the twelve airports experienced an increase in air cargo higher than 100 percent during the ten-year period. In particular, air cargo at Orange County, Oakland and San Diego airports grew 778 percent, 213 percent, and 142 percent respectively over the ten-year period. The average annual growth rate for Orange County Airport was almost 50 percent during the first six years but then air cargo declined by 21 percent from 1996 to 2000. At the regional level, the air cargo traffic in all four major regions of the state grew by 96 percent over the ten years, while cargo traffic in San Diego and Sacramento regions grew faster than that in Southern California and the Bay Area.

When aircraft operations (counting both take-offs and landings) are considered, several contrasts with the passenger traffic results are found. Operations are far less concentrated, reflecting the large amount of general aviation activity occurring outside California's largest urban areas. Also, while passenger traffic growth has been strong, the number of aircraft operations has generally declined since 1980, both for California as a whole and for the two largest metropolitan regions. However, this decline ended in recent years, with statewide operations increasing in 1999 for the first time since 1990 and remaining fairly steady in 2000. Operations have increased at the

[1] Of the twelve top cargo airports in 2000, only eleven were in operation as public use airports in 1996. Mather Airport in Sacramento (the former Mather Air Force Base) opened as a public use airport in 1998.

state's largest three airports, LAX, SFO, and San Diego International, but in all cases operations growth is considerably less than enplanement growth.

Long Beach and Sacramento airports had the greatest increase in passengers per operation, about 74 percent and 64 percent, respectively. Oakland airport experienced the smallest change, increasing from 41 passengers per operation in 1980 to 49 passengers per operation in 2000. At Los Angeles International the average passengers per operation went from 70 to 84 and at San Francisco International from 69 to 95, the highest ratio of all the airports.

Delays at California airports are growing and creating a more severe problem. Of the California airports, SFO had the worst on-time records for the years 1997-1999. The performance varied by year with on-time percentages between 69 and 78. SFO's arrivals were generally more often late than the departures. LAX had approximately 77 percent of the flights on time. Most other airports had usually over 80 percent of the flights on time. The average arrival and departure delay was less than 10 minutes, except at SFO where the average delays were several minutes more. Cancellations followed the same pattern with SFO having the most cancelled flights. In 1998, 4.3 percent of SFO's flights were cancelled. Other airports usually had one to three percent of their flights cancelled, larger airports having higher percentages than small ones.

The distribution of the arrival delays is wider than that of departure delays, with a clear difference between SFO and LAX, especially during the summer (August). While 90 percent of LAX arrivals are within 40 minutes of the scheduled time, at SFO only 79 percent of flights arrive within 40 minutes of the scheduled time, with 90 percent arriving within 87 minutes of the scheduled time.

The terrorist attacks in New York City and Washington D.C. that occurred on September 11, 2001, have had some major impacts on the aviation system in California. Previous to September 11, passenger traffic in California was actually up slightly from the previous year. But for September of 2001, passenger traffic levels at California airports in the study dropped 33 percent. For the same airports, traffic levels were down 24 percent for October of 2001. These drops varied from airport to airport. For example, Monterey Peninsula Airport (MRY) experienced the largest drop at 40 percent for September, while Oakland International Airport

(OAK) experienced the smallest drop at 23 percent. By December, the drops in traffic from the previous year varied from 3.3 percent at Oakland to 27 percent at Redding.

After the initial drops seen at the end of 2001, the systemwide traffic levels have shown a steady recovery toward levels of the previous year. By March of 2002, traffic systemwide was down just 11 percent from 2001. Like the drops in traffic, the subsequent recovery has not been the same across all airports in the system. For example, Los Angeles (LAX) and San Francisco (SFO) have been slower to recover from the initial drops than some of the other smaller airports, although by March of 2002, passenger traffic at these airports was only three or four percent below levels for the rest of the system. Some airports, like Oakland and Sacramento International, had already recovered by March to reach traffic levels of the previous year. It is worth noting that general aviation activity at smaller airports has been much less negatively impacted since September 11th than commercial activity and nationwide trends even hint that there may have been increases in demand for both business aviation and charter services in the aftermath of September 11th.

In contrast to passenger traffic, air freight traffic does not appear to be significantly affected in the aftermath of September 11, 2001. While air freight traffic in the last half of 2001 was significantly lower than the corresponding period of the previous year, this may be attributed to trends that began well before September 11th resulting from a slowdown in the general economy. In general, air freight traffic in California was down 16 percent for August, 22.5 percent for September, and just 15 percent for October compared to the previous year. This 15 percent reduction remained relatively unchanged through December.

As was the case with passenger traffic, recovery has varied across airports. San Diego International Airport (SAN) actually experienced an increase of 33 percent in air freight traffic for December of 2001 compared to the previous year while SFO and LAX both experienced decreases amounting to 34.8 percent and 17 percent, respectively, for December of 2001 compared to the previous year. This relative growth has continued through March of 2002, when air freight traffic reached levels that were only five percent below levels for the previous year.

Airport ground access traffic volumes and mode use have been impacted as a result of new parking regulations and changes in passenger travel patterns. The result has been an overall drop in the use of parking at airports and consequent drops in revenue collected by airports from

parking. Also, there have been shifts in the types of parking that are used most at airports since September 11, 2001. At Oakland , for example, since September 11th, there has been a significant reduction in the use of hourly (short-term) parking facilities and a corresponding increase in the use of daily (long-term) parking facilities. Similar patterns have been seen at other California airports.

All forms of aviation activity were significantly curtailed in the immediate aftermath of September 11th. Among intrastate services, weekly origin-destination (O-D) flights were consistently below 2000 levels through late September and October. Frequencies in most intrastate O-D markets were down 20 to 50 percent compared to levels for the previous year. The variation in percentage cuts mainly reflected differences in pre-September 11th service trends. For example, city pairs such as LAX-ONT and SAN-SFO that had substantial reductions in service prior to September 11th were the ones with the largest fall-offs in the post-attack period when compared to 2000.

When comparing California to the entire United States, California experienced much smaller decreases in operations for October of 2001 when compared to the previous year than the rest of the country but considerably larger reductions in December. Similar trends were found when looking at air carrier operations at the six largest airports in California, the exception being ONT which saw a seven percent increase in total operations for October when compared with the previous year.

In terms of delay, California's aviation system generally improved after September 11, 2001, as a result of the drop in traffic and reduced congestion. Airports in California saw a drop of almost 21.5 minutes in October and just over seven minutes in December when compared to the previous year. The United States as a whole saw drops of four and eleven minutes, respectively, for October and December, though the average delay in California was still generally higher than the average delay for the rest of the country.

Part of the reductions seen in traffic and operations were due to cuts made by airlines in their schedules after September 11, 2001. Total arrivals at SFO declined about 20 percent for both October and December of 2001 when compared to the previous year while LAX also showed significant reductions. Compared with SFO and LAX, other California airports registered

more modest cuts in service, like SAN with a decline of 13 percent and SJC and ONT, both with declines below 10 percent.

Overall, there was a 15 percent reduction in flights in October and a 20 percent reduction in flights in December when compared with the previous year. United and its affiliate Sky West have cut the most flights, together accounting for over half of the approximately 400 flights that were eliminated. This has made Southwest Airlines, which cut service only six percent, the leading carrier in the California market. With this and Federal Express (FDX) and United Parcel Service (UPS) as exceptions, every airline cut service 15 percent or more in December of 2001 when compared to the previous year. Cuts made in schedules involve mostly older aircraft types such as the B737-200, Embraer 120, noise retrofitted B737 and B727, and MD90. Flights using B737-800's and A319's have increased and the use of Canadair Regional Jets has dramatically increased since September 11th.

Models estimated to determine how airlines have responded in cutting schedules reveal that airlines have cut their schedules based on competitors' flight frequency as well as their own. Overall, carrier and destination effects are the most important ones and account for between a half and a third of the total flights eliminated. About 20 percent of the cuts are associated with the total frequency effect. Finally, the destination effect has resulted in cuts at some airports like LAX and additional flights at others like SFO and SJC. Temporal patterns have shown changes relating to peaking in the schedules. In general, the level of peaking has decreased while the times of the largest peaks have shifted to different times of the day.

Airports in California have obviously been greatly affected financially by changes in the aviation system since September 11, 2001. While all airports in the study showed drops in revenue immediately after the terrorist attacks, they have varied in how they have recovered their revenue, with SFO and SAN being the hardest hit and OAK and John Wayne in Orange County (SNA) being the quickest to recover. Expenses, on the other hand, are consistently higher for all airports in the months following September 11th due to the cost involved with purchasing new equipment and hiring new personnel to meet new security regulations. In general and financially speaking, larger airports have been more negatively impacted by the terrorist attacks than smaller and primarily general aviation facilities.

1. Introduction

This report is intended to provide an overview of the current state of the California aviation system and recent trends in the evolution of the system. This edition updates the first report published in 1998 (Hansen, Gosling & Rice, 1998). The structure of this report is generally similar to the previous one except that a new chapter addressing airport delays has been added and the sequence of topics has been revised to present the material in a more logical order, starting with an overview of the California airport system. This is then followed by a discussion of passenger and cargo traffic levels and composition, before considering aircraft operations and delays.

The aviation system is critical to the economy of the state, and forms an essential element of the transportation system, particularly for longer distance travel and freight movement. At the same time, rising traffic levels at the major airports in the state are threatening to overwhelm their capacity, while changes in the pattern of general aviation activity pose significant problems for the viability of the large number of smaller airports.

However, the scale and complexity of the aviation system in California make it difficult to comprehend, while the volume of detailed data on the system can be daunting. The challenge is to synthesize these data to identify key trends and forces shaping the evolution of the system. The objective of this report is to provide both a high level picture of the current state of the system and the nature of the underlying trends, as well as information on sources of more detailed data on specific aspects of the system.

The presentation of the data is organized by region within the state, as well as by individual airport. The number of airports in California requires some level of aggregation to comprehend the overall pattern of activity. The regional approach also reflects the role of regional transportation planning agencies in establishing policies and allocating funding for other elements of the transportation system. If the aviation system is to be properly integrated into a comprehensive, multi-modal transportation planning process, then effective aviation system planning must occur at the regional as well as the state level.

The remainder of this report is divided into seven chapters. Chapter 2 describes the California airport system and discusses the functional classification of airports that is used in both

the California Aviation System Plan and to present airport traffic statistics in this report. Chapter 3 examines trends in passenger traffic at California airports. Chapter 4 expands on this by addressing the pattern of the underlying travel and how the level of traffic in each market is changing over time. Chapter 5 addresses trends in air cargo traffic at the top ten cargo airports in California. Chapter 6 then explores the recent trends in aircraft operations at both regional and airport levels, and discusses how average aircraft size has evolved at the larger commercial airports. Chapter 7 examines recent trends in airport delays, on-time performance and cancellations. Finally, Chapter 8 discusses the changes in traffic levels and composition of activity in the California aviation system following the events of September 11, 2001, as well as the implications of these changes for airport finances and airport ground transportation activity. References for the data sources used in generating these statistics are listed at the end of the report.

It is recognized that the information presented in this report addresses only some of the many aspects of the aviation system that are likely to be of interest to planners, policy makers, and others. It is also recognized that to remain relevant to the needs of the state, the information contained in this report will need to be updated on a regular basis. The intent is that updates of this document will be published periodically, with future editions incorporating more recent data and addressing other aspects of the state aviation system, as time and resources permit.

2. The California Airport System

As of September 1998, there were 260 public-use airports in California, of which 230 were publicly owned. Information on each of these airports is provided in the Inventory Element of the California Aviation System Plan (Caltrans, 1998). For the purposes of the California Aviation System Plan (CASP), the California Department of Transportation divides the state into nine regions. CASP Regions 3, 8 and 9 (Bay Area, Los Angeles/Desert, and San Diego) correspond to the Bay Area, Southern California and San Diego regions discussed elsewhere in this report. The Sacramento region discussed elsewhere in this report forms the northern part of CASP Region 6 (Central California).

The CASP Inventory Element classifies airports into a number of *Functional Categories*, based on the services provided by each airport and the role that it plays in the aviation system. This system follows FAA practice of classifying air carrier airports as either Primary or Commercial, based on the level of enplanements, and general aviation airports as either Reliever or General Aviation, depending on whether the airport is eligible to receive funding as a reliever airport under the FAA Airport Improvement Program. General aviation airports are further classified by the California functional classification system as Metropolitan, Regional, Community or Limited Use airports, depending on the type of activity they serve and their location in the state. Details of the functional classification system are provided in the CASP Inventory Element (Caltrans, 1998). In addition to the foregoing categories, there are also two joint-use military/commercial airports in the Los Angeles/Desert region (March Air Force Base and Palmdale Air Force Base).

The number of airports in each category in each of the CASP regions is shown in Table 2-1.

Table 2-1
Number of Airports in each California Region

	Commercial/ Primary	General Aviation: Metro-politan	General Aviation: Regional	General Aviation: Community	General Aviation: Limited Use	Joint Use	Total
North Coast	2	-	4	16	3	-	25
North State	2	-	6	20	10	-	38
Bay Area	4	6	7	6	-	-	23
Sierra	-	-	7	2	-	-	9
Central Coast	4	-	4	4	4	-	16
Central California	6	2	16	37	8	-	69
East Sierra	-	-	2	5	4	-	11
Los Angeles/Desert	8	9	20	10	8	2	57
San Diego	2	1	4	3	2	-	12
Total	28	18	70	103	39	2	260

Source: California Department of Transportation, *The California Aviation System Plan – 1998 Inventory Element*, September 1998.

3. Passenger Traffic

This chapter examines recent trends in passenger traffic activity, measured as enplanements. An enplanement occurs when a passenger boards a commercial flight, whether at the beginning of the journey or in making a connection from an earlier flight. (A passenger who reboards the same flight after deplaning at a stop is not counted, however.) The volume of enplanements is a common indicator of the level of commercial passenger activity and is used to track growth over time as well as in making comparisons across airports.

The data presented in this chapter were compiled from the Terminal Area Forecast (TAF) data system, maintained by the Federal Aviation Administration and accessible to the general public in the Internet (www.apo.faa.gov). This database contains historical and forecast data for enplanements and operations on an individual airport level beginning in 1976. For 2000, the TAF data system contains information on 206 California airports, of which 34 had some enplanement activity.

Table 3-1 lists those airports in California that had more than 100,000 enplanements in 2000. Only 17 airports met this criterion. Since 1996, one additional airport, Arcata/Eureka airport, reached 100,000 enplanements. It is the only airport in this group serving the area of the state to the north of the San Francisco Bay Area and Sacramento metropolitan areas. All of the other airports are situated in California's major urban regions. The regions mentioned in the table are those defined in the California Aviation System Plan.

Metropolitan areas served by multiple commercial airports are a significant feature of the state's aviation system. As shown in Table 3-2, the two largest urban areas in the state are both served by multiple airports with over 100,000 enplanements - six in the case of Southern California and three in the case of the San Francisco Bay Area. In these regions, which accounted for 84 percent of California enplanements in 2000, travelers have significant choice of which airport to use and airlines of which airports to serve. While desirable from a consumer's standpoint, the availability of air service at several airports in a region can increase the complexity and uncertainty of airport planning.

California accounts for about 12 percent of both the U.S. population and enplanements. As shown in Table 3-3, between 1980 and 2000 California's population growth was slightly faster

than the national average. However, California is slightly behind in the growth of enplanements. Southern California (strictly the Los Angeles Consolidated Metropolitan Statistical Area (CMSA)) contains about half of California's population and almost exactly the same share of passenger enplanements whereas the Bay Area (defined as the San Francisco CMSA) has a significantly larger share of enplanements compared to its population share. Furthermore, the Bay Area's enplanement share has increased even though its population share has declined. Airports outside of the four largest metropolitan regions have only a two percent share of the state's enplanements as shown in Figure 3-1. The historical enplanement trends for all regions are shown in Figure 3-2.

Table 3-4 presents the enplanements in more detail for all commercial airports in California, as defined in the California Aviation System Plan's Inventory Element. Almost all enplanements at the biggest airports are handled by air carriers (airlines operating large jet equipment), whereas the smaller airports are mostly (or only) served by commuter airlines.

Tables 3-5 to 3-8 present the historical enplanement data for regions and individual airports. Figures 3-3 and 3-4 illustrate the extent to which both Los Angeles International (LAX) and San Francisco International (SFO) dominate air passenger travel in their regions. Together these two airports account for almost 60 percent of the state's enplanements. The enplanements at these airports have roughly doubled since 1980, increasing at an average annual rate of about 3.6 percent at LAX and 3.1 percent at SFO. In 2000 LAX had about 32 million enplanements and SFO about 20 million.

The other Bay Area and Southern California airports, as well as San Diego and Sacramento, have generally experienced significantly higher growth between 1980 and 2000, with average annual growth rates in excess of 5 percent at both Sacramento and San Diego, as well as the larger secondary airports such as Oakland (8.2 percent), San Jose (7.0 percent), Ontario (5.5 percent), and Orange County (6.2 percent). Average growth rates at most other California airports (Table 3-8 and Figure 3-6) have been fairly small, with enplanements at these airports showing strong cyclical fluctuations over time.

Table 3-1

California Airports Handling Greater than 100,000 Total Passengers in 2000

Airport	Code	Region
Arcata/Eureka	ACV	North Coast
Oakland International	OAK	Bay Area
San Francisco International	SFO	Bay Area
San Jose International	SJC	Bay Area
Monterey Peninsula	MRY	Central Coast
San Luis Obispo	SBP	Central Coast
Santa Barbara Municipal	SBA	Central Coast
Bakersfield Meadows Field	BFL	Central California
Fresno Yosemite International	FAT	Central California
Sacramento International	SMF	Central California
Burbank/Glendale/Pasadena	BUR	Los Angeles/Desert
Long Beach Municipal	LGB	Los Angeles/Desert
Los Angeles International	LAX	Los Angeles/Desert
Ontario International	ONT	Los Angeles/Desert
Orange County/John Wayne	SNA	Los Angeles/Desert
Palm Springs Regional	PSP	Los Angeles/Desert
San Diego International	SAN	San Diego

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 3-2

California Airports with over 100,000 Enplanements in 2000, by Region

Southern California	Bay Area	San Diego	Sacramento	Rest of State
BUR	OAK	SAN	SMF	ACV
LAX	SFO			BFL
LGB	SJC			FAT
ONT				MRY
SNA				SBA
PSP				SBP

Table 3-3

Comparison of Enplanement Shares of Southern California and San Francisco Bay Area

	1980	1990	2000	Average Growth 1980-2000
United States				
Population (000)	226,546	248,791	281,422	1.1%
Enplanements (000)	309,908	495,400	703,901	4.2%
California				
Population (000)	23,668	29,811	33,872	1.9%
Enplanements (000)	38,556	60,023	83,289	4.1%
Percent of U.S. population	10.4%	12.0%	12.0%	
Percent of U.S. enplanements	12.4%	12.1%	11.8%	
Los Angeles CMSA*				
Population (000)	11,498	14,532	16,374	1.9%
Enplanements (000)	19,695	30,140	42,649	4.2%
Percent of state population	48.6%	48.7%	48.3%	
Percent of state enplanements	51.1%	50.2%	51.2%	
San Francisco CMSA				
Population (000)	5,368	6,278	7,039	1.4%
Enplanements (000)	13,199	20,821	30,721	4.5%
Percent of state population	22.7%	21.1%	20.8%	
Percent of state enplanements	34.2%	34.7%	36.9%	

Source: U.S. Department of Commerce, *Statistical Abstract of the United States*; Federal Aviation Administration, *Terminal Area Forecast Data System*

* Consolidated Metropolitan Statistical Area

Table 3-4
Enplanements at California Commercial Airports in 2000

Airport	Code	Region	Enplanements		
			Air Carrier	Commuter	Total
Arcata/Eureka	ACV	North Coast	10	110,584	110,594
Crescent City	CEC	North Coast	0	15,151	15,151
Chico Municipal	CIC	North State	216	32,466	32,682
Redding Municipal	RDD	North State	1,264	73,428	74,692
Oakland International	OAK	Bay Area	5,087,091	0	5,087,091
San Francisco International	SFO	Bay Area	18,948,760	623,527	19,572,287
San Jose International	SJC	Bay Area	5,964,533	60,302	6,024,835
Sonoma County	STS	Bay Area	0	37,086	37,086
Lake Tahoe	TVL	Sierra	3,900	0	3,900
Monterey Peninsula	MRY	Central Coast	24,001	214,088	238,089
Santa Barbara Municipal	SBA	Central Coast	193,715	201,740	395,455
San Luis Obispo	SBP	Central Coast	0	149,084	149,084
Santa Maria	SMX	Central Coast	1,332	44,371	45,703
Bakersfield Meadows Field	BFL	Central California	7,539	143,260	150,799
Fresno Yosemite International	FAT	Central California	75,754	428,327	504,081
Inyokern	IYK	Central California	0	12,722	12,722
Merced Municipal	MCE	Central California	0	4,670	4,670
Modesto City-County	MOD	Central California	128	26,564	26,692
Sacramento International	SMF	Central California	3,724,140	230,718	3,954,858
Visalia Municipal	VIS	Central California	0	10,729	10,729
Burbank/Glendale/Pasadena	BUR	Los Angeles/Desert	2,371,364	1	2,371,365
Imperial County	IPL	Los Angeles/Desert	0	24,127	24,127
Long Beach Municipal	LGB	Los Angeles/Desert	349,266	0	349,266
Los Angeles International	LAX	Los Angeles/Desert	30,651,884	1,415,412	32,067,296
Ontario International	ONT	Los Angeles/Desert	3,119,309	60,993	3,180,302
Orange County/John Wayne	SNA	Los Angeles/Desert	3,834,105	83,064	3,917,169
Oxnard	OXR	Los Angeles/Desert	0	39,894	39,894
Palm Springs Regional	PSP	Los Angeles/Desert	420,424	235,817	656,241

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 3-5
California Enplanements by Region

Year	Southern California	Bay Area	San Diego	Sacramento	Rest of State	Total
1980	19,695	13,199	2,757	1,228	1,678	38,556
1981	18,953	11,570	2,450	1,054	1,092	35,119
1982	19,238	12,461	2,565	1,097	1,208	36,568
1983	20,598	14,447	3,113	1,269	1,336	40,762
1984	21,382	14,964	3,573	1,275	1,466	42,661
1985	24,302	16,476	3,953	1,411	1,431	47,573
1986	26,774	18,195	4,479	1,630	1,510	52,589
1987	29,425	19,487	4,988	1,896	1,785	57,582
1988	29,420	19,655	5,328	1,839	1,508	57,749
1989	30,037	20,148	5,467	1,853	1,595	59,098
1990	30,140	20,821	5,488	1,807	1,767	60,023
1991	31,243	22,306	5,649	2,111	2,037	63,345
1992	32,098	22,659	5,968	2,629	1,925	65,280
1993	32,377	22,587	5,883	2,639	1,742	65,229
1994	34,575	24,293	6,296	2,829	1,531	69,524
1995	36,070	25,973	6,626	3,308	1,532	73,509
1996	38,456	27,954	6,842	3,461	1,668	78,381
1997	39,527	28,610	7,087	3,492	1,829	80,545
1998	39,181	28,721	7,318	3,573	1,756	80,549
1999	40,703	29,484	7,618	3,740	1,726	83,271
2000	42,649	30,721	7,924	3,955	1,776	87,026
Average Growth	3.9%	4.3%	5.4%	6.0%	0.3%	4.2%

(Thousands)

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 3-6
Enplanements for Southern California Airports
(Thousands)

Year	LAX	ONT	SNA	BUR	LGB	PSP	VCV	OXR	IPL	Total
1980	15,957	1,084	1,176	1,053	101	267	0	42	15	19,695
1981	15,717	863	1,151	869	52	243	0	34	24	18,953
1982	15,690	967	1,219	974	159	208	0	17	5	19,238
1983	15,979	1,206	1,310	1,422	407	244	0	15	15	20,598
1984	16,349	1,448	1,389	1,363	529	271	0	18	16	21,382
1985	18,694	1,717	1,537	1,480	540	304	0	15	16	24,302
1986	20,428	2,020	1,906	1,485	563	345	0	12	14	26,774
1987	22,399	2,238	2,185	1,564	608	400	0	16	14	29,425
1988	22,342	2,374	2,194	1,511	579	391	0	18	12	29,420
1989	22,749	2,622	2,230	1,342	665	401	0	28	0	30,037
1990	22,276	2,670	2,282	1,726	693	450	0	43	0	30,140
1991	22,575	2,812	2,759	1,854	702	465	0	64	12	31,243
1992	23,335	3,044	2,861	1,901	446	473	0	29	10	32,098
1993	23,466	3,043	2,993	2,063	313	457	0	31	12	32,377
1994	24,932	3,225	3,253	2,372	261	480	0	40	14	34,575
1995	26,147	3,234	3,521	2,471	185	457	0	38	16	36,070
1996	28,397	3,188	3,577	2,465	221	549	23	34	24	38,479
1997	29,336	3,085	3,838	2,362	301	559	41	23	23	39,569
1998	29,124	3,009	3,711	2,352	314	611	30	35	26	39,212
1999	30,454	3,081	3,708	2,386	339	631	43	38	23	40,703
2000	32,067	3,180	3,917	2,371	349	656	44	40	24	42,649
Average growth	3.6%	5.5%	6.2%	4.1%	6.4%	4.6%	17.0%	-0.3%	2.3%	3.9%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 3-7
Enplanements for Bay Area Airports
(Thousands)

Year	SFO	SJC	OAK	STS	Total
1980	10,594	1,544	1,055	5	13,199
1981	9,161	1,314	1,090	5	11,570
1982	9,684	1,351	1,425	2	12,461
1983	11,271	1,709	1,465	2	14,447
1984	11,464	1,863	1,635	2	14,964
1985	12,165	2,176	2,132	4	16,476
1986	13,484	2,780	1,921	10	18,195
1987	14,646	2,836	1,978	27	19,487
1988	14,892	2,817	1,928	18	19,655
1989	14,781	3,216	2,094	57	20,148
1990	14,692	3,345	2,721	64	20,821
1991	15,749	3,456	3,000	101	22,306
1992	15,936	3,512	3,136	76	22,659
1993	15,639	3,304	3,585	59	22,587
1994	16,396	3,986	3,884	26	24,293
1995	16,887	4,336	4,721	29	25,973
1996	18,347	4,777	4,802	28	27,954
1997	19,005	5,067	4,516	23	28,610
1998	19,205	5,039	4,458	19	28,721
1999	19,225	5,502	4,734	23	29,484
2000	19,572	6,025	5,087	37	30,721
Average growth	3.1%	7.0%	8.2%	10.1%	4.3%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 3-8
Enplanements for Other California Airports
(Thousands)

Year	Fresno	Santa Barbara	Monterey	Bakersfield	San Luis Obispo	Arcata/ Eureka	Other
1980	499	226	241	127	100	56	485
1981	335	166	193	52	34	54	313
1982	350	169	202	58	32	51	396
1983	418	210	185	77	45	68	402
1984	450	241	209	72	59	74	436
1985	401	254	192	112	53	71	419
1986	421	274	227	122	53	79	413
1987	482	327	274	133	66	80	504
1988	405	295	232	115	65	56	395
1989	424	310	249	123	60	70	428
1990	461	308	240	138	82	68	539
1991	576	330	280	176	93	127	583
1992	558	314	290	144	109	133	511
1993	515	277	243	134	114	116	459
1994	500	269	209	111	106	71	336
1995	458	262	213	111	120	85	368
1996	537	302	224	107	124	90	373
1997	521	404	264	118	139	90	383
1998	487	403	235	122	136	93	373
1999	501	405	250	142	137	104	291
2000	504	395	238	151	149	111	338
Average growth	0.1%	2.8%	-0.1%	0.9%	2.0%	3.4%	-1.8%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Figure 3-1 **California Enplaned Passengers by Region, 2000**

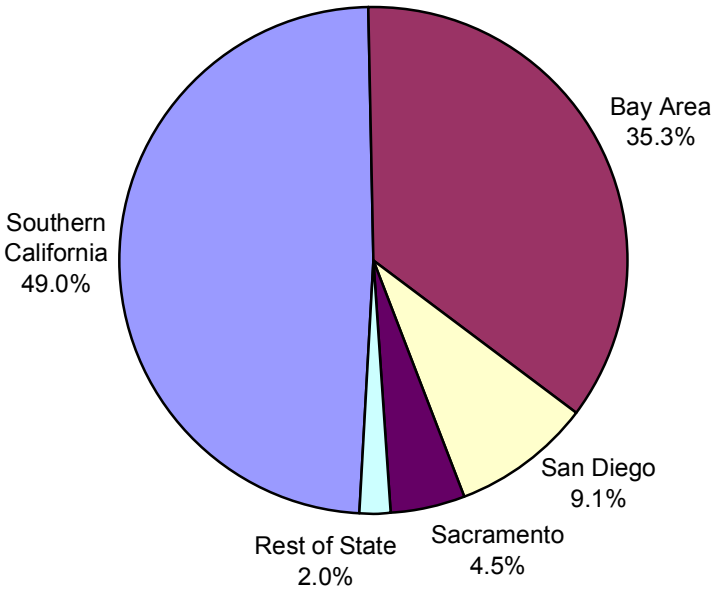


Figure 3-2 **Trends in California Enplanements, by Region**

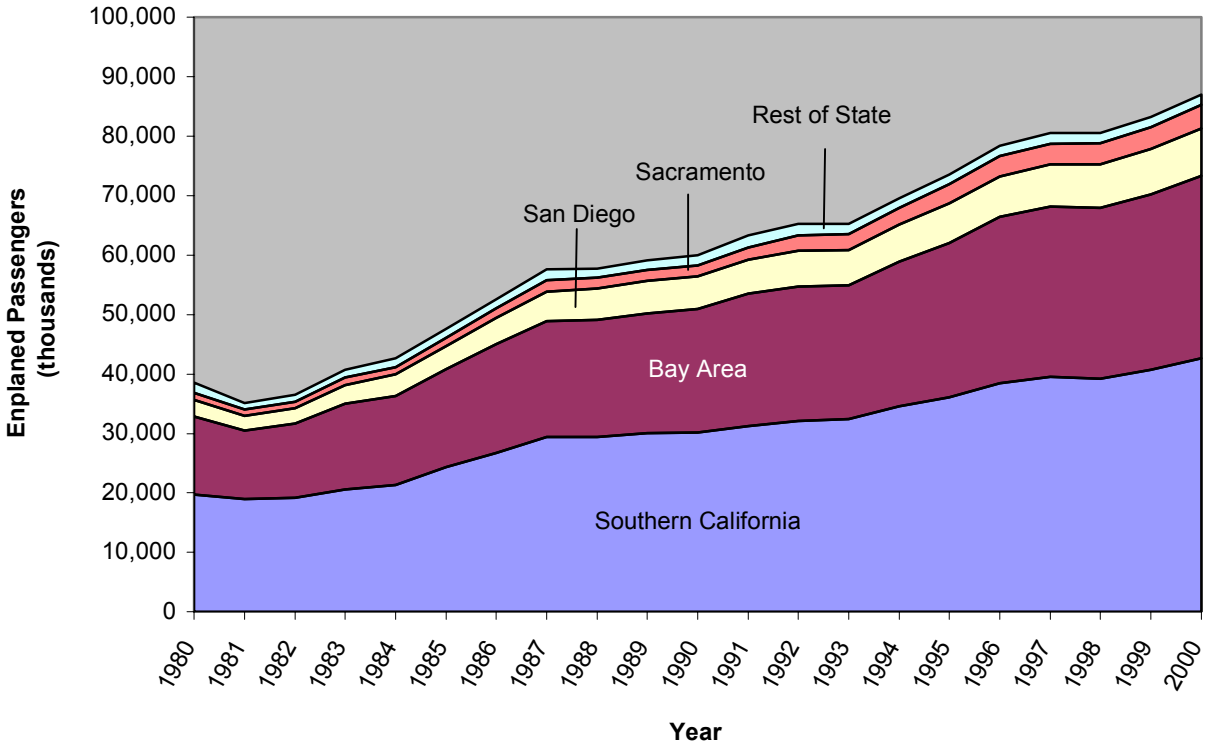


Figure 3-3 **Trends in Southern California Enplanements, by Airport**

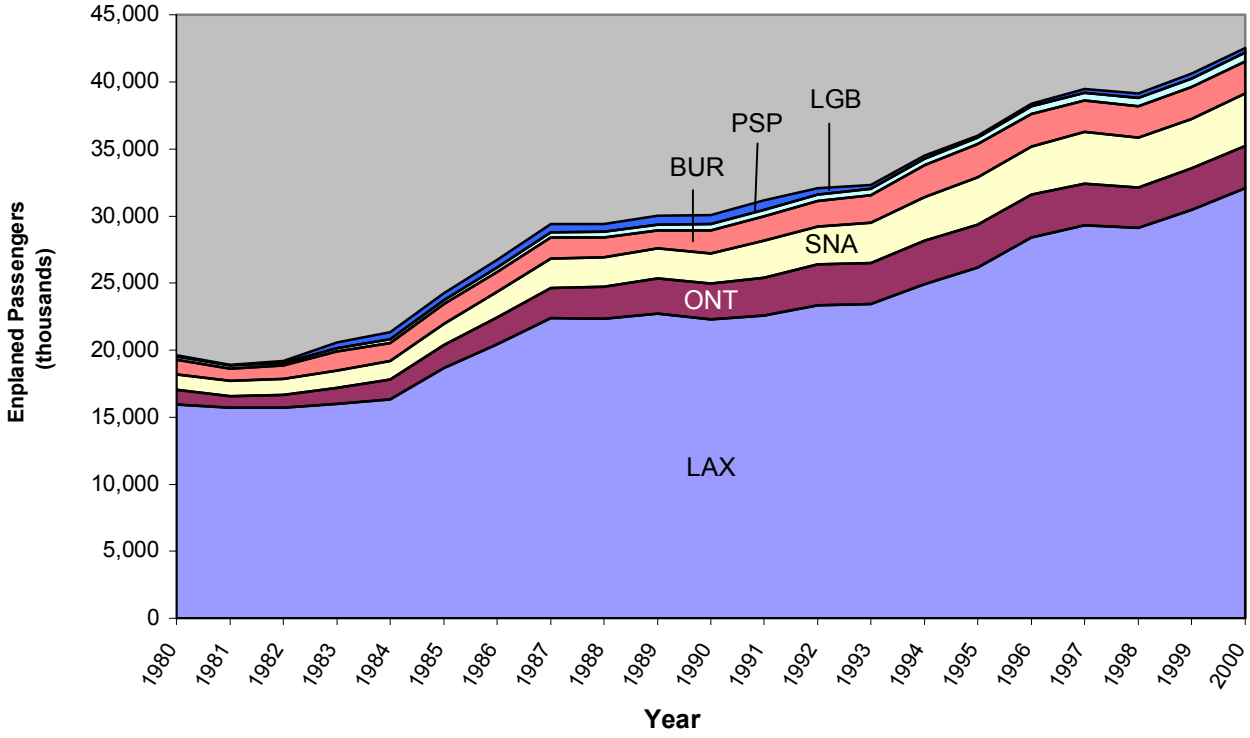


Figure 3-4 **Trends in Bay Area Enplanements, by Airport**

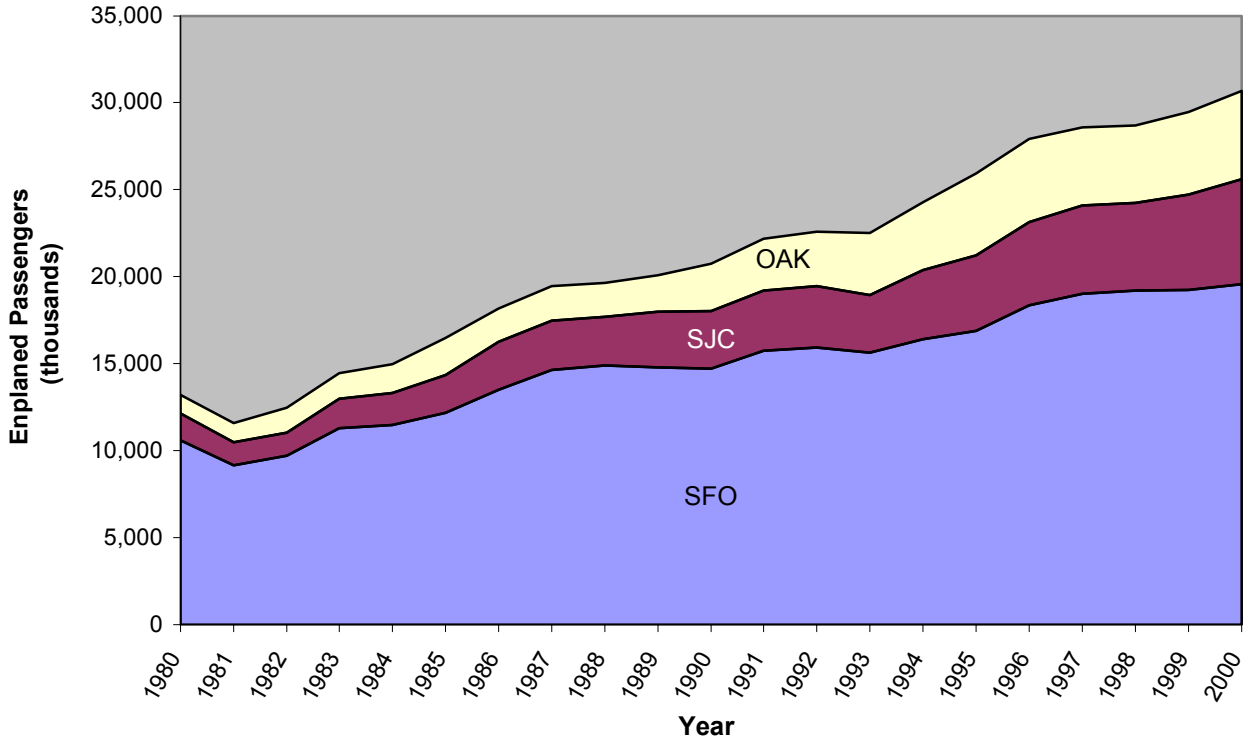
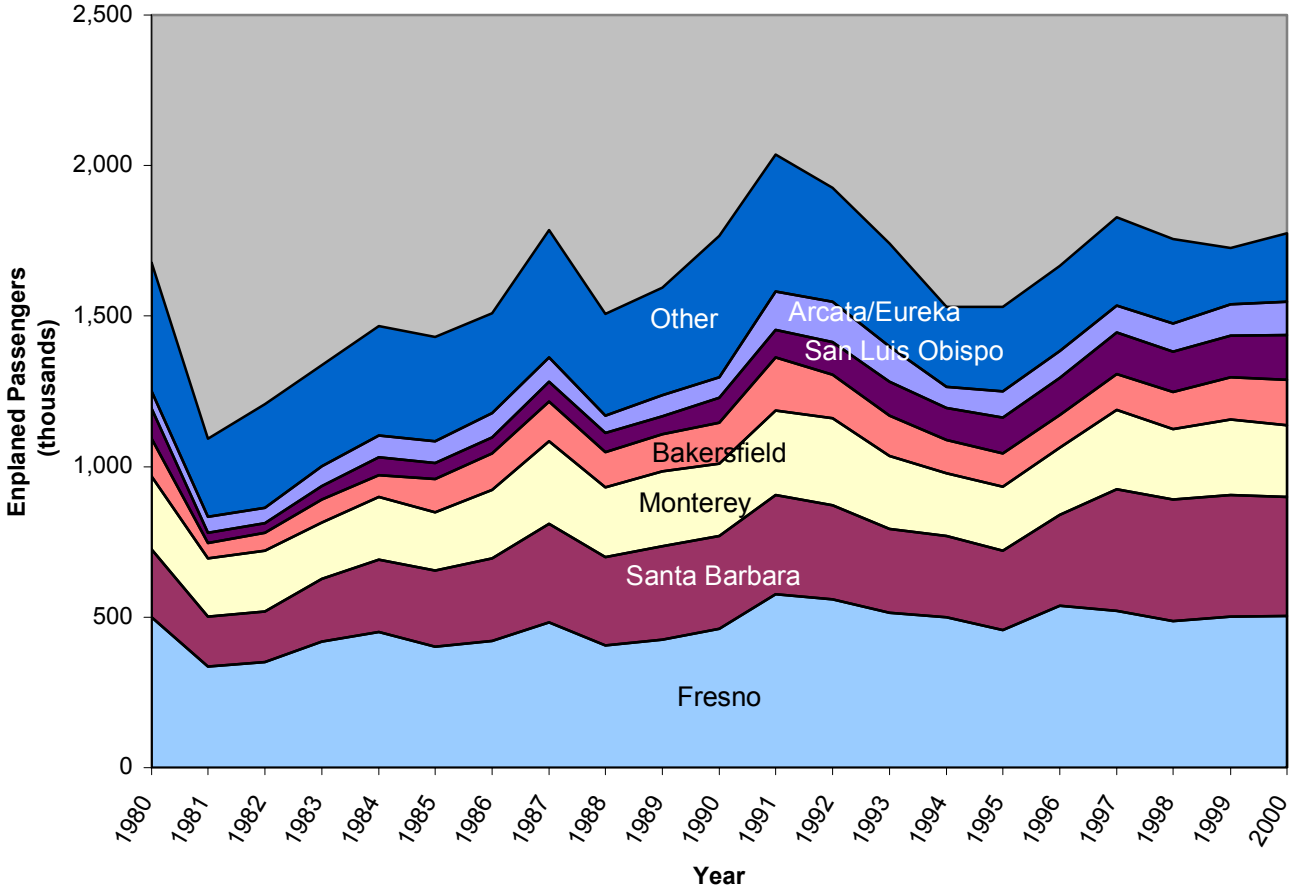


Figure 3-5 **Enplanement Trends at Other California Airports**



4. Air Travel Patterns

This chapter examines the geographic pattern of air travel by passengers flying to and from California airports. While the number of enplaned passengers at an airport is a useful measure of overall air travel activity, it provides no information on where those passengers are coming from or going. This chapter will present such data, first for California as a whole, and then for the state's two largest airports: Los Angeles International and San Francisco International.

The data provided in this chapter were obtained from the ODPlus database, a product of Data Base Products, Incorporated (www.databaseproducts.com). The ODPlus database contains data from a 10 percent sample of domestic ticket coupons provided by air carriers and compiled by the U.S. Department of Transportation. The data analyzed here are based on the sampled coupons of air travelers who originate or terminate their travel within California.

The analysis presented in this chapter only considers air travel within the United States. Analysis of international travel patterns requires the integration of several data sources, due to the role of foreign flag airlines in these markets, and has been deferred for a subsequent study.

California Air Travel Patterns

California air travel in domestic markets involves several thousand destinations within and outside the state. To obtain an overall view of these travel patterns, it is useful to aggregate the origins and destinations regionally within the U.S. Eleven regions were defined: California, Midwest, Mountain, Nevada, North Central, Northeast, Northwest, Pacific, South Central, Southeast, and Southwest. The states and territories included in each region as well as each region's most recent population are shown in Table 4-1.

Table 4-2 and Figures 4-3 and 4-4 present California's origin-destination air traffic divided by region from 1993 to 1999. The most notable fact obtained from the data is the difference in growth between the periods 1993-1996 and 1996-1999. During the earlier period the growth was much stronger than that in the latter period. Most notably, the traffic between California and the Northwest region grew considerably between 1993-1996 (59 percent), after which time the growth almost stopped. Until 1997 California intrastate travel (air travel within the state) used to be a larger market than any of the other regions, but from 1998 the Northeast region has become

the biggest market, with a share of 17.2 percent in 1999 (Figure 4-1). All the other regions have significantly smaller market shares than the California intrastate market, the third biggest being the Northwest (11.3 percent).

Pacific and Southwest markets have shown the least growth. Travel between California and the Pacific region has been stable, whereas the Southwest market first faced some growth and then decline. The Mountain region market also experienced growth followed by decline.

When comparing the market sizes of different regions to their resident population, an interesting perspective is obtained. The resulting figures can be seen as traffic density, presented in Figure 4-2. The market between California and Nevada has the biggest traffic density, about 4.5 passengers per resident. This fact reflects the role Nevada has as a holiday destination. A similar pattern is noticeable in the Pacific region where Hawaii serves as a primary tourist destination. Following these regions are the Southwest, Northwest and Mountain regions, which are all fairly close to California. California's intrastate travel has only about 0.5 passengers per resident air traffic density, due to the role highway traffic has in California. The rest of the regions are further away from California and thus have a fairly low traffic density.

Airport Variation in Air Travel Patterns

Different California airports serve different markets. Table 4-3 and Figure 4-5 demonstrate this fact, separating LAX, SFO and all other airports. Of 102 million domestic one-way air trips either to or from California in 1999, a third used LAX, a fifth used SFO and the rest some other airport. However, compared to the 1996 data presented in the previous report, the other airports have gained some ground, increasing their share by a couple of percentage units.

When comparing SFO and LAX to the rest of the airports it is clear that these big airports have a large share of long-haul markets like those in the Pacific and Northeast regions (92 and 68 percent shares, respectively). Other airports serve shorter haul markets such as those in the Northwest (64 percent share), Southwest (62 percent share) and Nevada (61 percent share) regions. LAX has a bigger share of all markets than SFO. SFO is especially weak in the Southwest and Nevada regions where it has only about a 10 percent share compared to LAX's 28 percent.

The Top 50 California O-D Markets

Table 4-4 presents the 50 busiest O-D markets for California air travel in 1999. Altogether, the top 50 markets account for 41 percent of all air traffic originating or ending in California. For 1996 that figure was 43 percent, suggesting that California air travel is experiencing greater growth in the smaller markets than the larger ones. There are 11 markets with over one million passengers, nine of which involve LAX and two of which involve SFO. Six of the top 10 O-D pairs are in California or the western U.S., the exceptions being the New York/Newark and Honolulu markets. No airport from outside California's two largest urban areas is in the top 10 O-D pairs. Sixteen of the top 50 markets are intrastate. The out-of-state airports that appear most frequently in the top 50 markets are Las Vegas (six times), Seattle (five times) and Phoenix (four times). Portland appears in only two airport pairs in the top 50 in 1999 compared to four in 1996.

As in 1996, LAX-Las Vegas (LAS) is the largest market with 1.9 million passengers. However, in recent years traffic in this market has declined slightly, while LAX-New York (JFK) has almost reached the same traffic levels, with 1.8 million passengers. The traffic increase in this market has lifted it from fourth largest to second, becoming larger than LAX-SFO and LAX-Oakland (OAK), both of which have dropped one place in rank since 1996. Traffic in all the New York/Newark markets in the top 50 California markets has grown substantially between 1996 and 1999. SFO-JFK has seen the largest increase, moving from 11th place to sixth with about 300,000 more passengers. LAX-Newark (EWR) and SFO-EWR have also moved up in rank.

Table 4-1
States and Territories Grouped by Region

Region	States and Territories	Resident Population 1999
		(000)
California	California	33,145
Midwest	Illinois, Indiana, Michigan, Ohio, Wisconsin	44,442
Mountain	Colorado, Utah	6,186
Nevada	Nevada	1,809
North Central	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota	18,800
Northeast	Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia	66,955
Northwest	Alaska, Idaho, Montana, Oregon, Washington, Wyoming	12,307
Pacific	Hawaii, Guam, Pacific Territories	1,470
South Central	Arkansas, Louisiana, Oklahoma, Texas	30,325
Southeast	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, Virgin Islands	55,030
Southwest	Arizona, New Mexico	6,518

Source: U.S. Department of Commerce, *Statistical Abstract of the United States*

Table 4-2
California O-D Traffic by Regional Market, 1993-1999
(Thousands)

Region	1993	1994	1995	1996	1997	1998	1999	Percent growth 1993-1996	Percent growth 1996-1999
California	13919	15539	16763	16457	16586	16250	16750	18.23%	1.78%
Midwest	7261	7521	7798	8271	8764	9056	9402	13.91%	13.68%
Mountain	4137	5128	5371	5922	5848	5728	5570	43.15%	-5.95%
Nevada	5897	7258	7329	7932	7739	7595	8111	34.51%	2.25%
North Central	3588	3691	3884	4357	4504	4449	4689	21.44%	7.63%
Northeast	13123	13122	13991	14913	16070	16730	17582	13.64%	17.89%
Northwest	7156	8823	10346	11399	11211	11159	11570	59.29%	1.50%
Pacific	3185	3303	3323	3308	3357	3408	3575	3.86%	8.08%
South Central	6490	6811	6840	7291	7508	7823	8128	12.33%	11.48%
Southeast	7236	7260	7643	7987	8586	8909	9505	10.37%	19.01%
Southwest	6632	7234	7375	7792	7470	7227	7368	17.50%	-5.45%

Source: Data Base Products, *ODPlus*

Table 4-3
California Origin and Destination Traffic by Regional Market and Airport, 1999
(Thousands)

Region	California	LAX	SFO	Other	LAX Share	SFO Share	Other Share
California	16,750	6,108	4,446	6,197	36.5%	26.5%	37.0%
Midwest	9,402	3,243	2,228	3,931	34.5%	23.7%	41.8%
Mountain	5,570	1,638	1,113	2,819	29.4%	20.0%	50.6%
Nevada	8,111	2,306	884	4,920	28.4%	10.9%	60.7%
North Central	4,689	1,303	1,000	2,386	27.8%	21.3%	50.9%
Northeast	17,582	6,640	5,311	5,630	37.8%	30.2%	32.0%
Northwest	11,570	2,348	1,874	7,348	20.3%	16.2%	63.5%
Pacific	3,575	1,967	1,320	288	55.0%	36.9%	8.1%
South Central	8,128	2,233	1,312	4,583	27.5%	16.1%	56.4%
Southeast	9,505	3,399	2,120	3,986	35.8%	22.3%	41.9%
Southwest	7,368	2,089	746	4,533	28.3%	10.1%	61.5%
Total	102,249	33,273	22,353	46,622	32.5%	21.9%	45.6%

Source: Data Base Products, *ODPlus*

Table 4-4
Top 50 California O-D Markets, 1999

Rank 1999	Rank 1996	California Airport	Other Airport		1996 Pax (000)	1999 Pax (000)	Cumulative Percent
1	1	LAX	LAS	Las Vegas, NV	2023	1,944	1.90%
2	4	LAX	JFK	New York, NY	1671	1,837	3.70%
3	2	LAX	SFO	San Francisco, CA	1688	1,658	5.32%
4	3	LAX	OAK	Oakland, CA	1675	1,441	6.73%
5	5	LAX	PHX	Phoenix, AZ	1412	1,279	7.98%
6	11	SFO	JFK	New York, NY	968	1,243	9.20%
7	6	LAX	HNL	Honolulu, Oahu, HI	1390	1,226	10.39%
8	8	LAX	SJC	San Jose, CA	1091	1,155	11.52%
9	7	LAX	SEA	Seattle, WA	1225	1,126	12.63%
10	12	LAX	EWR	Newark, NY	927	1,122	13.72%
11	9	SAN	SFO	San Francisco, CA	1077	1,010	14.71%
12	10	LAX	ORD	Chicago, IL	1036	986	15.67%
13	21	SFO	EWR	Newark, NY	740	889	16.54%
14	17	SNA	SJC	San Jose, CA	830	880	17.40%
15	13	SFO	SEA	Seattle, WA	907	867	18.25%
16	22	LAX	SMF	Sacramento, CA	736	837	19.07%
17	16	BUR	OAK	Oakland, CA	840	831	19.88%
18	23	SAN	SJC	San Jose, CA	731	817	20.68%
19	18	SAN	PHX	Phoenix, AZ	828	807	21.47%
20	19	SFO	ORD	Chicago, IL	801	802	22.26%
21	15	SFO	HNL	Honolulu, Oahu, HI	849	766	23.00%
22	14	LAX	DEN	Denver, CO	896	763	23.75%
23	29	SFO	LAS	Las Vegas, NV	689	760	24.49%
24	24	SFO	BOS	Boston, MA	728	735	25.21%
25	25	SAN	LAS	Las Vegas, NV	723	721	25.92%
26	30	SFO	DEN	Denver, CO	668	717	26.62%
27	26	SNA	OAK	Oakland, CA	720	707	27.31%
28	36	SAN	SMF	Sacramento, CA	587	683	27.98%
29	32	BUR	LAS	Las Vegas, NV	655	680	28.64%
30	20	LAX	SLC	Salt Lake City, UT	745	675	29.30%

Table 4-4 (cont.)

Rank 1999	Rank 1996	California Airport	Other Airport		1996 Pax (000)	1999 Pax (000)	Cumulative Percent
31	34	SAN	OAK	Oakland, CA	629	674	29.96%
32	43	SJC	LAS	Las Vegas, NV	552	665	30.61%
33	27	OAK	SEA	Seattle, WA	711	662	31.26%
34	28	LAX	PDX	Portland, OR	704	652	31.90%
35	37	LAX	IAD	Washington, DC	586	652	32.54%
36	33	SJC	SEA	Seattle, WA	654	638	33.16%
37	41	ONT	SMF	Sacramento, CA	568	636	33.78%
38	42	OAK	ONT	Ontario, CA	567	607	34.38%
39	31	LAX	BOS	Boston, MA	657	606	34.97%
40	35	SFO	PHX	Phoenix, AZ	627	592	35.55%
41	40	BUR	SMF	Sacramento, CA	575	582	36.12%
42	44	LAX	ATL	Atlanta, GA	551	582	36.69%
43	>50	SNA	SFO	San Francisco, CA	469	556	37.23%
44	45	ONT	PHX	Phoenix, AZ	549	551	37.77%
45	49	OAK	LAS	Las Vegas, NV	502	549	38.31%
46	47	SJC	PDX	Portland, OR	515	530	38.82%
47	48	SAN	SEA	Seattle, WA	506	526	39.34%
48	>50	LAX	BWI	Baltimore, MD	311	519	39.85%
49	>50	LAX	DTW	Detroit, MI	318	510	40.35%
50	39	BUR	SFO	San Francisco, CA	580	502	40.84%

Source: Data Base Products, *ODPlus*

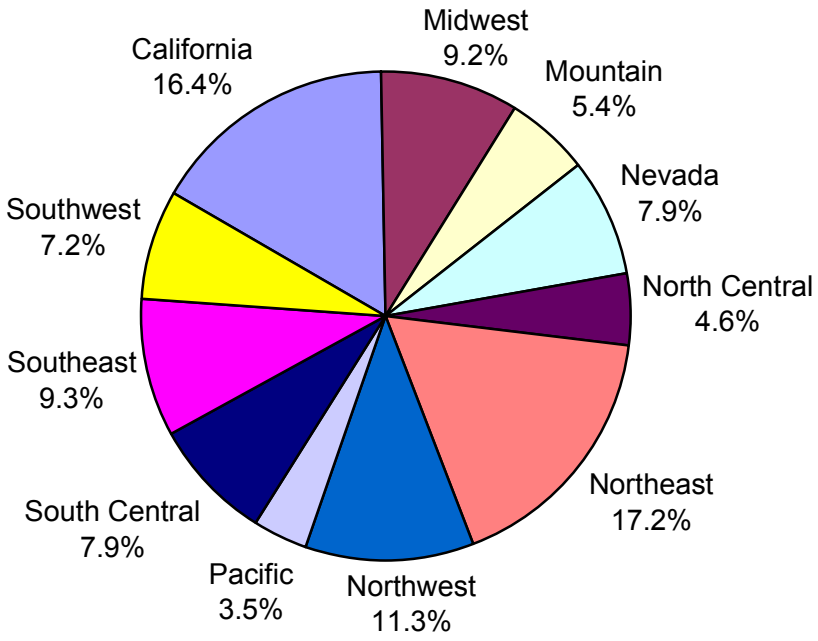


Figure 4-1 **Origins and Destinations of California Air Travelers, 1999**

Figure 4-2 **Traffic Density in California Regional Markets, 1999**

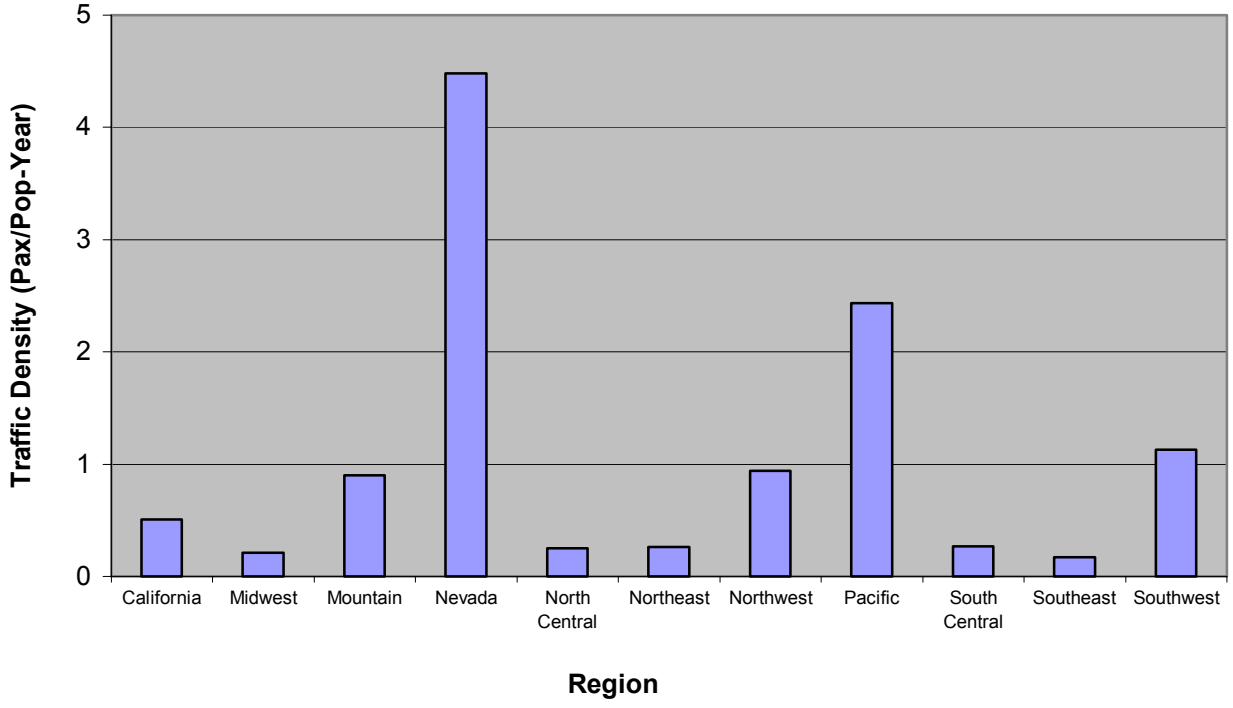


Figure 4-3 **Traffic Growth in California Regional Markets, 1993-1999**

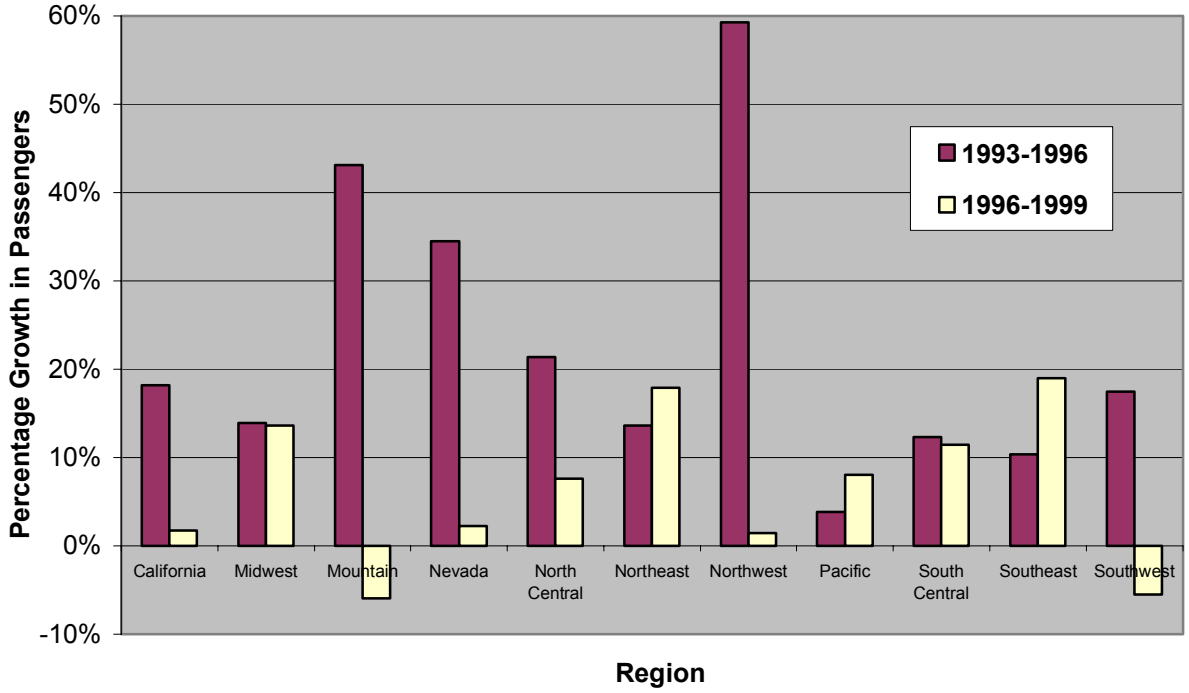


Figure 4-4 **Absolute Traffic in California Regional Markets, 1993 and 1999**

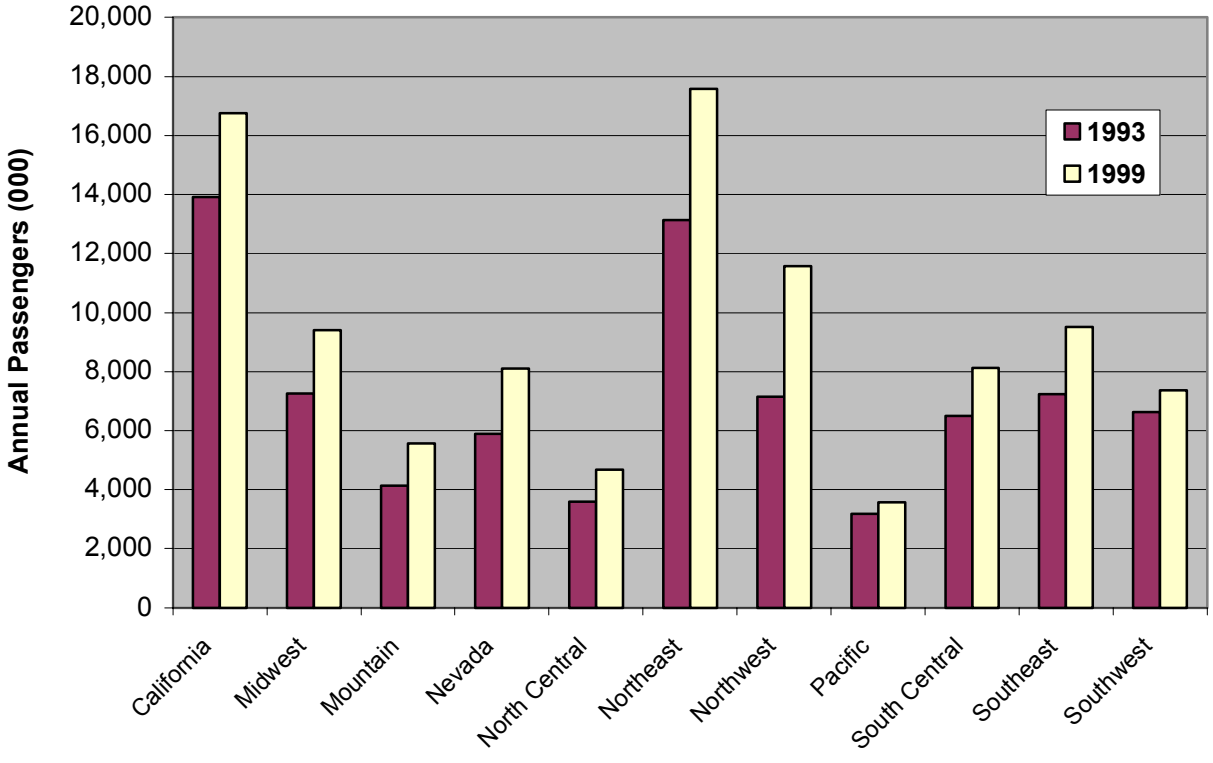
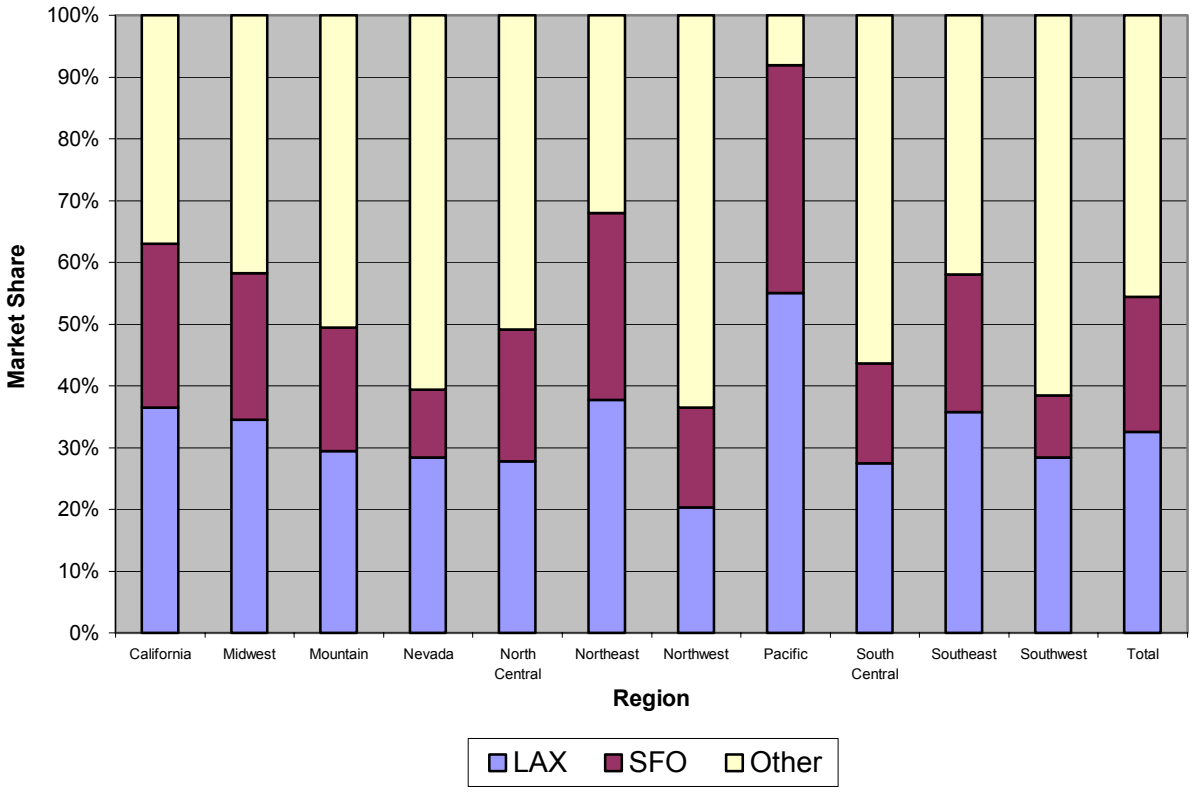


Figure 4-5 **Airport Shares of California Traffic by Regional Market, 1999**



5. Air Cargo

California would be the seventh largest economy in the world if it were a nation. Efficient goods movement is crucial to California's economy. Air cargo consists predominantly of high-value, time-sensitive or time-definite goods, such as electronic equipment, emergency shipments, overnight packages, *etc*. Timely delivery of these goods has become an important element of many manufacturing and service operations in California. Therefore, the air cargo industry is a vital part of the state's economy. The continued ability of the state's air cargo industry to serve the other industries in the state as well as the state's ability to capitalize on the forecast growth of air cargo between the Pacific Rim countries in Asia and North America are essential to the prosperity of California.

Given the importance of air cargo to California's economy, it is imperative to better understand the role of air cargo in the California aviation system. There are many important aspects of California's air cargo market that deserve further study. A more detailed discussion of air cargo activities in California can be found in *The Role of Air Cargo in California's Goods Movement* (Tsao, 1998). This chapter focuses on the total weights of air cargo enplaned or deplaned at the top twelve California cargo airports shown in Table 5-1. Eleven of the twelve airports listed are among the 17 largest passenger airports in the state shown in Table 3-1. One, Mather Airport in Sacramento, is primarily a cargo airport at the former Mather Air Force Base.

The *Worldwide Airport Traffic Report* published by the Airports Council International includes air cargo data for the ten California airports. Table 5-1 presents the total weight of air cargo enplaned or deplaned at these airports in 1990, 1996 and 2000 as well as the percentage changes seen during the two periods.

It is clear from Table 5-1 that the growth of air cargo at the eleven airports in operation in 1996 has been very fast. Eight of these airports experienced growth higher than 50 percent over the six-year period from 1990 to 1996. Four of these eight experienced more than a doubling of their total air cargo tonnage, with growth at Orange County, Oakland, Sacramento and Fresno airports of 952 percent, 189 percent, 122 and 116 percent, respectively. The average annual growth rate for Orange County Airport during the six years was almost 50 percent, albeit from a very low initial level.

During the four-year period from 1996 to 2000, the growth rate in air cargo slowed. Those airports that had seen the strongest growth during the early 1990s generally saw their growth slacken or their air cargo activity even decline towards the end of the decade, while growth rates at Los Angeles International, San Francisco International, and San Diego remained fairly stable.

Table 5-2 shows the same data aggregated at the regional level, using the regional definitions discussed in Chapter 2. Air cargo growth in all four regions exceeded 50 percent during the first six years, while air cargo in the two smaller regions grew faster than in the two larger regions. During the period from 1996 to 2000, the average annual growth rates in Southern California and the Bay Area dropped significantly compared to their previous levels. The San Diego area continued its fairly strong growth while cargo activity in the Sacramento area grew at an average annual rate of 37 percent.

Table 5-1
Total Weights of Cargo Enplaned or Deplaned at Top Twelve California Cargo Airports
(Metric Tonnes)

Airport	Total Tonnes 1990	Total Tonnes 1996	Change from 1990	Annual Change from 1996	Total Tonnes 2000	Change from 1996	Annual Change from 1996
Los Angeles	1,164,926	1,719,449	47.6%	6.7%	2,038,784	18.6%	4.4%
San Francisco	567,177	711,877	25.5%	3.9%	869,839	22.2%	5.1%
Oakland	212,740	615,298	189.2%	19.4%	685,425	11.4%	2.7%
Ontario	247,283	396,485	60.3%	8.2%	464,164	17.1%	4.0%
Mather					167,491		
San Jose	83,164	91,798	10.4%	1.7%	147,929	61.1%	12.7%
San Diego	52,821	92,980	76.0%	9.9%	139,260	49.8%	10.6%
Sacramento	29,539	65,426	121.5%	14.2%	61,472	-6.0%	-1.5%
Long Beach	18,151	27,392	50.9%	7.1%	49,415	80.4%	15.9%
Burbank	20,010	37,751	88.7%	11.2%	37,398	-0.9%	-0.2%
Fresno	7,117	15,347	115.6%	13.7%	19,327	25.9%	5.9%
Orange County	1,883	19,822	952.7%	48.0%	15,589	-21.4%	-5.8%
Total	2,404,811	3,793,625	57.8%	7.9%	4,696,093	23.8%	5.5%

Source: Airports Council International, *Worldwide Airport Traffic Report*
Airports Council International, *U.S. Airport Traffic Statistics* (www.aci-na.org)

Table 5-2
Total Weights of Cargo Enplaned or Deplaned at Airports in California Regions
(Metric Tonnes)

California Region	Total Tonnes 1990	Total Tonnes 1996	Change from 1990	Annual Change from 1990	Total Tonnes 2000	Change from 1996	Annual Change from 1996
Southern California	1,452,253	2,200,899	51.6%	7.2%	2,624,677	19.3%	4.5%
Bay Area	863,081	1,418,973	64.4%	8.6%	1,703,193	20.0%	4.7%
San Diego	52,821	92,980	76.0%	9.9%	139,260	49.8%	10.6%
Sacramento	29,539	65,426	121.5%	14.2%	228,963	250.0%	36.8%
Total	2,397,694	3,778,278	57.6%	9.6%	4,696,093	24.3%	8.1%

Source: Airports Council International, *Worldwide Airport Traffic Report*
Airports Council International, *U.S. Airport Traffic Statistics* (www.aci-na.org)

6. Aircraft Operations

This chapter considers recent trends in aircraft operations at California airports. An operation is a take-off or landing (or in the case of a touch-and-go operation, a combined landing and take-off). Operations are a good indicator of the amount of air traffic activity experienced by the airfield and air traffic control infrastructure. In contrast to the passenger traffic statistics considered in Chapters 3 and 4 of this report, general aviation activity accounts for a large proportion of the aircraft operations statistics.

This analysis differs slightly from the one presented in the 1998 report, which included only 48 airports in the calculations for the four metropolitan regions. In the current report, all the airports in each region that are listed in the 1998 California Aviation System Plan's Inventory Element and are found in the FAA TAF database have been considered for a specific region. This method increases the operations count for the four regions and consequently reduces the operations for the *Rest of State.* The new method was applied for the period from 1980 to 2000. However, the California total is still calculated the same way as before and includes all of the California airports found in the TAF data.

Figure 6-1 shows the distribution of aircraft operations by region. In contrast to the passenger enplanements, only about 75 percent of operations occur in the four large urban areas (compared to 98 percent of enplanements, as shown in Figure 3-1). This reflects the fact that most general aviation activity occurs at airports other than those with commercial air service.

Table 6-1 presents aircraft operations data for California regions between 1980 and 2000. During this period, the number of operations in each region has fluctuated. Overall, the trend has been generally downward in most California regions. As shown in Figure 6-2, there was a sharp decline in the early 1980s, followed by a slow resurgence that lasted into the early 1990s, after which the decline resumed. However, it appears that the growth may have resumed in 1999, since total operations grew by 500,000, remaining virtually unchanged in 2000, although this was the result of a resumed decline in Southern California being offset by an increase in the Bay Area and to a lesser extent the rest of the state outside of the four largest metropolitan regions.

Tables 6-2 to 6-5 (and Figures 6-3 to 6-6) present the data for individual airports in each region. In Southern California, the only airport showing a significant increase in operations since

1980 is Los Angeles International (LAX). Its growth has been the largest of all the major airports in the state. The strongest decline has been at Oxnard Airport (OXR), although operations declined at all the larger secondary airports in the region. These results suggest that a reduction in general aviation activity is a major reason for the overall decline in operations. There is also evidence that the average size of commercial aircraft serving LAX has increased, since its rate of growth of passenger enplanements (as shown in Chapter 3) has been nearly twice that for aircraft operations.

In the Bay Area, the general pattern is similar. Both SFO and OAK have experienced some growth. As in Southern California, the general aviation airports, along with San Jose International Airport and Sonoma County Airport, have been experiencing sharp declines. SFO's enplanement growth rate was over twice its operations growth rate over the period from 1980 to 2000. In addition, SFO's operations have been quite stable during recent years, around 440,000 annually. These facts may reflect severe capacity constraints at SFO, forcing airlines to absorb growth in passenger traffic through fleet upsizing.

San Diego International Airport's operations have grown 1.5 percent annually, although that growth is not as high as its enplanements growth (5.4 percent). General aviation activity in the San Diego region is rising in the last few years after a period of decline. Lastly, in the Sacramento region both Sacramento Metropolitan Airport (SMF) and the GA airports have experienced a decrease in operations until 1998, although the enplanement growth at SMF, with an annual rate of 6.0 percent, was higher than any other region in the state.

The foregoing discussion has considered total aircraft operations of all types, including air carrier and general aviation operations at each airport. Although there are relatively few general aviation operations at the two largest airports, Los Angeles International and San Francisco International, the other commercial service airports show a significant amount of general aviation activity, particularly Oakland International and San Jose International in the Bay Area and Orange County Airport in Southern California. Table 6-6 shows the change in the number of air carrier enplanements and aircraft operations between 1980 and 2000 at the air carrier airports in the four largest metropolitan regions.

The average number of passengers per operation can be calculated from the data presented in Table 6-6 and are shown in Table 6-7. The growth between 1980 and 2000 was

smallest at Oakland airport, where the average passenger load only increased from 41 passengers per operation in 1980 to 49 passengers per operation in 2000. The biggest percentage growth was experienced at Long Beach Airport, where the average load increased from 21 to 37 passengers per operation. At SFO the average passenger load went from 69 to 95, the highest at any of the airports, and at LAX from 70 to 84 passengers per operation.

Table 6-8 presents enplanement and operations data for 2000 separately for air carrier and commuter airlines, with the resulting passengers per operation shown in Table 6-9. Unfortunately, the FAA TAF database combines commuter airline and air taxi operations, but does not include air taxi passengers. Thus the use of the TAF data leads to an underestimate of the average number of passengers per operation for commuter airlines. This problem notwithstanding, it can be seen that air taxi/commuter operations, albeit fairly numerous, carry far less passengers than air carrier operations. For example in the case of SFO, the air taxi/commuter operations account for 19 percent of total operations but carry only three percent of total enplaned passengers.

Table 6-1
Aircraft Operations at California Airports, 1980-2000, by Region
(Thousands)

Year	Southern California	Bay Area	San Diego	Sacramento	Rest of State	Total
1980	6,807	3,668	1,148	937	4,495	17,055
1981	6,310	3,369	1,017	875	4,428	16,000
1982	5,322	2,652	808	788	4,468	14,039
1983	5,596	2,666	946	772	4,269	14,248
1984	6,108	2,932	990	825	4,433	15,287
1985	6,013	2,914	1,011	845	4,359	15,142
1986	5,871	2,919	993	868	4,316	14,967
1987	5,986	3,114	1,048	900	4,410	15,457
1988	5,955	3,107	1,054	922	4,498	15,536
1989	6,097	3,096	1,089	929	4,334	15,545
1990	6,298	3,239	1,172	940	4,365	16,014
1991	6,518	3,128	1,119	926	4,270	15,961
1992	6,478	3,108	1,129	923	4,279	15,918
1993	6,210	2,999	1,074	925	4,247	15,455
1994	5,962	2,961	1,037	897	4,202	15,060
1995	5,710	2,872	1,014	868	4,008	14,472
1996	5,651	2,956	1,007	823	3,974	14,410
1997	5,484	2,968	980	809	3,854	14,095
1998	5,514	2,957	1,036	837	3,745	14,088
1999	5,786	3,070	1,254	844	3,618	14,573
2000	5,521	3,240	1,256	844	3,691	14,552
Average Growth	-1.04%	-0.62%	0.45%	-0.52%	-0.98%	-0.79%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*
Numbers include GA and military operations

Table 6-2
Aircraft Operations at Southern California Airports, 1980-2000
(Thousands)

Year	GA Airports	LAX	SNA	LGB	BUR	ONT	PSP	VCV	OXR	IPL	Total
1980	4,319	534	570	645	216	167	98	0	197	61	6,807
1981	4,127	511	482	593	194	155	83	0	124	41	6,310
1982	3,420	473	431	507	179	105	81	0	91	36	5,322
1983	3,682	498	453	417	195	116	76	0	122	37	5,596
1984	4,004	543	484	451	241	128	87	0	134	37	6,108
1985	3,909	546	522	399	245	128	92	0	131	41	6,013
1986	3,728	565	540	397	236	132	100	0	134	38	5,871
1987	3,702	655	527	438	243	137	104	0	135	44	5,986
1988	3,711	632	528	435	222	141	102	0	139	44	5,955
1989	3,800	632	534	462	246	143	100	0	136	44	6,097
1990	3,946	669	523	483	235	151	107	0	140	45	6,298
1991	4,157	661	551	461	229	156	101	0	140	61	6,518
1992	4,158	678	557	432	214	153	94	0	130	61	6,478
1993	3,949	682	494	426	207	153	91	0	146	61	6,210
1994	3,668	688	509	475	194	159	92	0	103	74	5,962
1995	3,399	716	493	491	184	158	102	0	91	74	5,710
1996	3,317	764	475	482	185	154	94	1	107	73	5,651
1997	3,181	767	459	449	184	161	90	1	118	74	5,484
1998	3,245	786	431	451	179	142	88	18	99	74	5,514
1999	3,427	771	448	505	179	157	102	25	98	73	5,786
2000	3,294	781	412	413	163	153	101	42	89	73	5,521
Average Growth	-1.34%	1.92%	-1.61%	-2.20%	-1.39%	-0.43%	0.17%	52.01%	-3.93%	0.91%	-1.04%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*
Numbers include GA and military operations
GA Airports include Joint Use military facilities

Note: Average growth rate for Southern California Logistics Airport (VCV) for 1998-2000

Table 6-3
Aircraft Operations at Bay Area Airports, 1980-2000
(Thousands)

Year	GA Airports	SFO	OAK	SJC	STS	Total
1980	2211	371	488	416	182	3,668
1981	2047	329	460	376	158	3,369
1982	1532	315	386	300	119	2,652
1983	1533	349	361	317	106	2,666
1984	1682	401	374	361	114	2,932
1985	1660	396	371	365	122	2,914
1986	1651	423	371	349	126	2,919
1987	1765	451	398	358	143	3,114
1988	1754	461	402	356	135	3,107
1989	1792	434	403	318	149	3,096
1990	1929	437	389	320	165	3,239
1991	1786	435	414	337	156	3,128
1992	1758	425	419	343	163	3,108
1993	1666	423	439	312	158	2,999
1994	1606	430	471	298	156	2,961
1995	1509	437	503	271	152	2,872
1996	1572	442	516	279	146	2,956
1997	1594	447	488	304	135	2,968
1998	1587	435	516	288	131	2,957
1999	1685	437	508	304	136	3,070
2000	1887	438	479	299	137	3,240
Average Growth	-0.79%	0.83%	-0.09%	-1.63%	-1.40%	-0.62%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*
Numbers include GA and military operations.

Table 6-4
Aircraft Operations at San Diego Airports, 1980-2000
(Thousands)

Year	GA Airports	SAN	CRQ	Total
1980	755	156	237	1,148
1981	666	139	212	1,017
1982	500	132	176	808
1983	611	140	195	946
1984	645	150	195	990
1985	667	161	184	1,011
1986	638	164	190	993
1987	656	193	198	1,048
1988	647	206	202	1,054
1989	659	207	223	1,089
1990	708	212	252	1,172
1991	686	206	227	1,119
1992	689	215	225	1,129
1993	642	209	223	1,074
1994	605	215	216	1,037
1995	571	229	215	1,014
1996	540	244	223	1,007
1997	530	221	229	980
1998	566	224	245	1,036
1999	745	224	285	1,254
2000	780	209	266	1,256
Average Growth	0.17%	1.47%	0.58%	0.45%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*
Numbers include GA and military operations

Table 6-5
Aircraft Operations at Sacramento Airports, 1980-2000
(Thousands)

Year	GA Airports	SMF	MHR	Total
1980	767	171	0	937
1981	727	149	0	875
1982	679	109	0	788
1983	655	116	0	772
1984	696	129	0	825
1985	710	135	0	845
1986	713	155	0	868
1987	737	163	0	900
1988	740	182	0	922
1989	752	177	0	929
1990	778	162	0	940
1991	774	152	0	926
1992	760	163	0	923
1993	756	169	0	925
1994	748	149	0	897
1995	691	177	0	868
1996	649	174	0	823
1997	640	169	0	809
1998	642	153	42	837
1999	648	154	42	844
2000	650	152	42	844
Average Growth	-0.82%	-0.57%	0.29%	-0.52%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*
Numbers include GA and military operations

Note: Average growth rate for Mather Airport (MHR) for 1998-2000

Table 6-6
Growth in Air Carrier Aircraft Operations 1980 to 2000
Airports in the Four Largest Metropolitan Regions

	Enplaned Passengers (000)			Aircraft Operations		
Airport	1980	2000	Average Annual Growth	1980	2000	Average Annual Growth
Burbank/Glendale/Pasadena	1,053	2,371	4.1%	52,170	88,310	2.7%
Long Beach Municipal	101	349	6.4%	9,617	19,058	3.5%
Los Angeles International	15,957	32,067	3.6%	455,728	760,488	2.6%
Ontario International	1,084	3,180	5.5%	51,630	122,301	4.4%
Orange County/John Wayne	1,176	3,917	6.2%	48,325	99,266	3.7%
Oakland International	1,055	5,087	8.2%	52,032	194,640	6.8%
San Francisco International	10,594	19,572	3.1%	306,866	407,465	1.4%
San Jose International	1,544	6,025	7.0%	60,114	156,620	4.9%
Sacramento Metropolitan	1,228	3,955	6.0%	57,872	107,776	3.2%
San Diego International	2,757	7,846	5.4%	98,803	191,372	3.4%

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 6-7
Air Carrier and Commuter Enplanements and Operations, 2000

	Enplanements		Operations	
Airport	Air Carrier	Commuter	Air Carrier	Air Taxi/ Commuter
Burbank/Glendale/Pasadena	2,371,364	1	58,366	29,944
Long Beach Municipal	349,266	0	12,636	6,422
Los Angeles International	30,651,884	1,415,412	561,688	198,800
Ontario International	3,119,309	60,993	94,287	28,014
Orange County/John Wayne	3,834,105	83,064	86,374	12,892
Oakland International	5,087,091	0	149,007	45,633
San Francisco International	18,948,760	623,527	330,225	77,240
San Jose International	5,964,533	60,302	144,070	12,550
Sacramento Metropolitan	3,724,140	230,718	86,217	21,559
San Diego International	7,468,379	377,450	153,432	37,940

Source: Federal Aviation Administration, *Terminal Area Forecast Data System*

Table 6-8
Average Passengers per Operation, 2000

Airport	Air Carrier	Air Taxi/ Commuter	Total
Burbank/Glendale/Pasadena	81.3	0	53.7
Long Beach Municipal	55.3	0	36.7
Los Angeles International	109.1	14.2	84.3
Ontario International	66.2	4.4	52.0
Orange County/John Wayne	88.8	12.9	78.9
Oakland International	68.3	0	52.3
San Francisco International	114.8	16.1	96.1
San Jose International	82.8	9.6	76.9
Sacramento Metropolitan	86.4	21.4	73.4
San Diego International	97.4	19.9	82.0

Figure 6-1 **California Operations by Region, 2000**

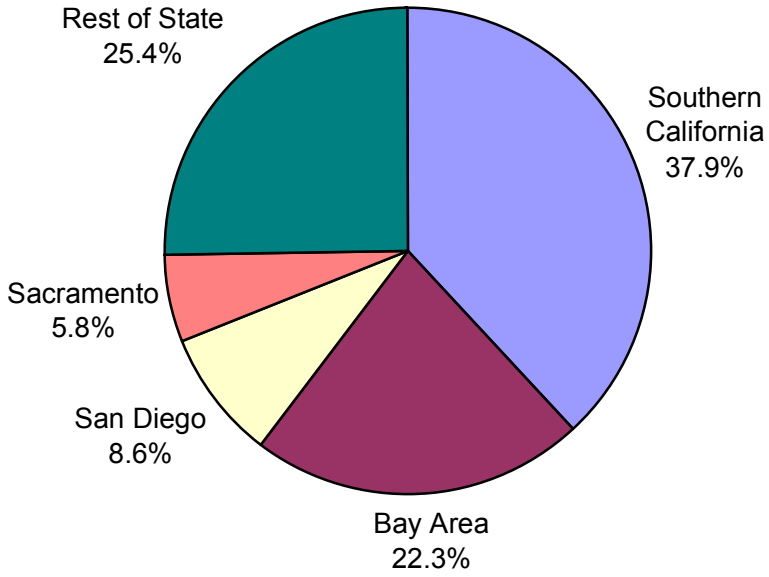


Figure 6-2 **California Operations by Region, 1980-2000**

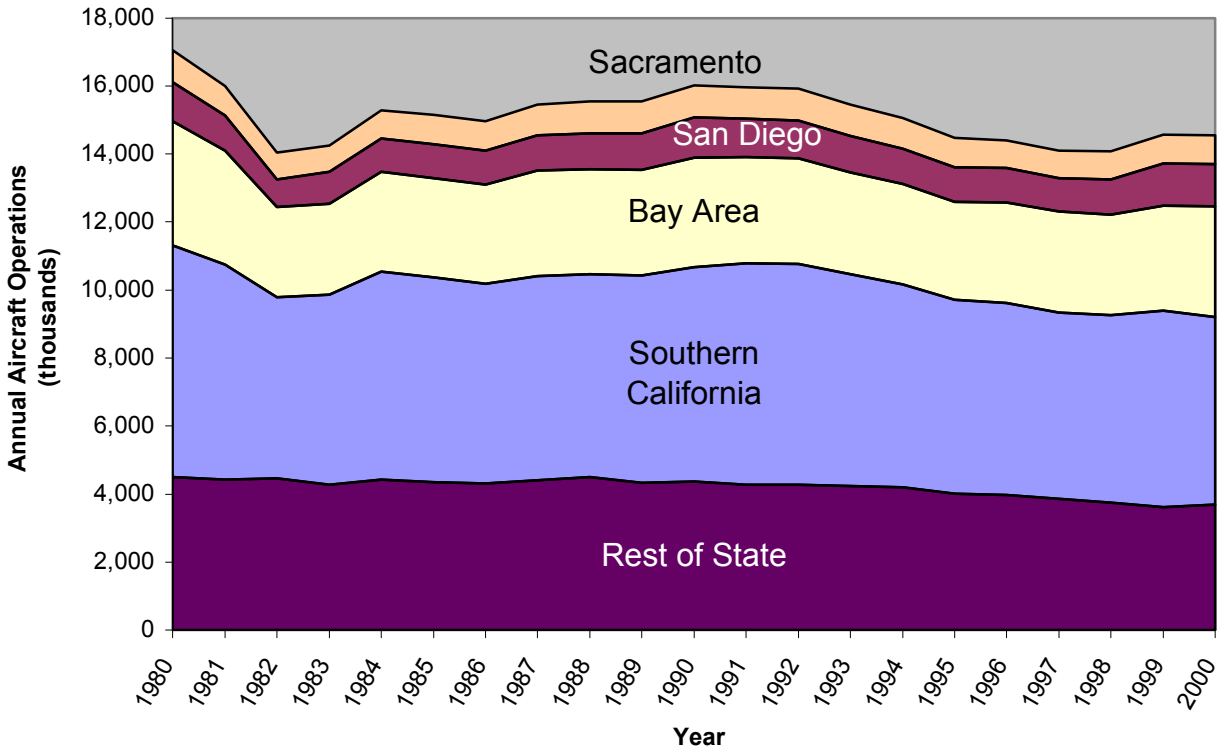


Figure 6-3 **Southern California Operations, 1980-2000**

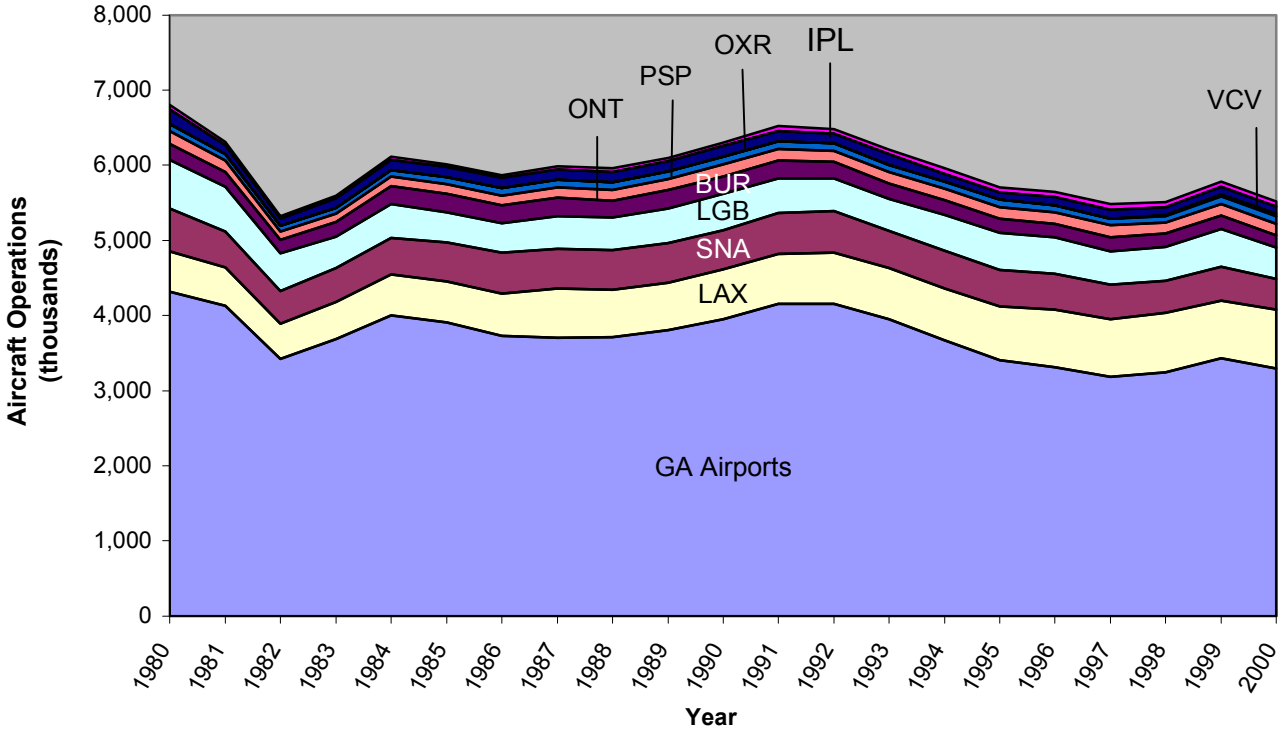


Figure 6-4 **Bay Area Operations, 1980-2000**

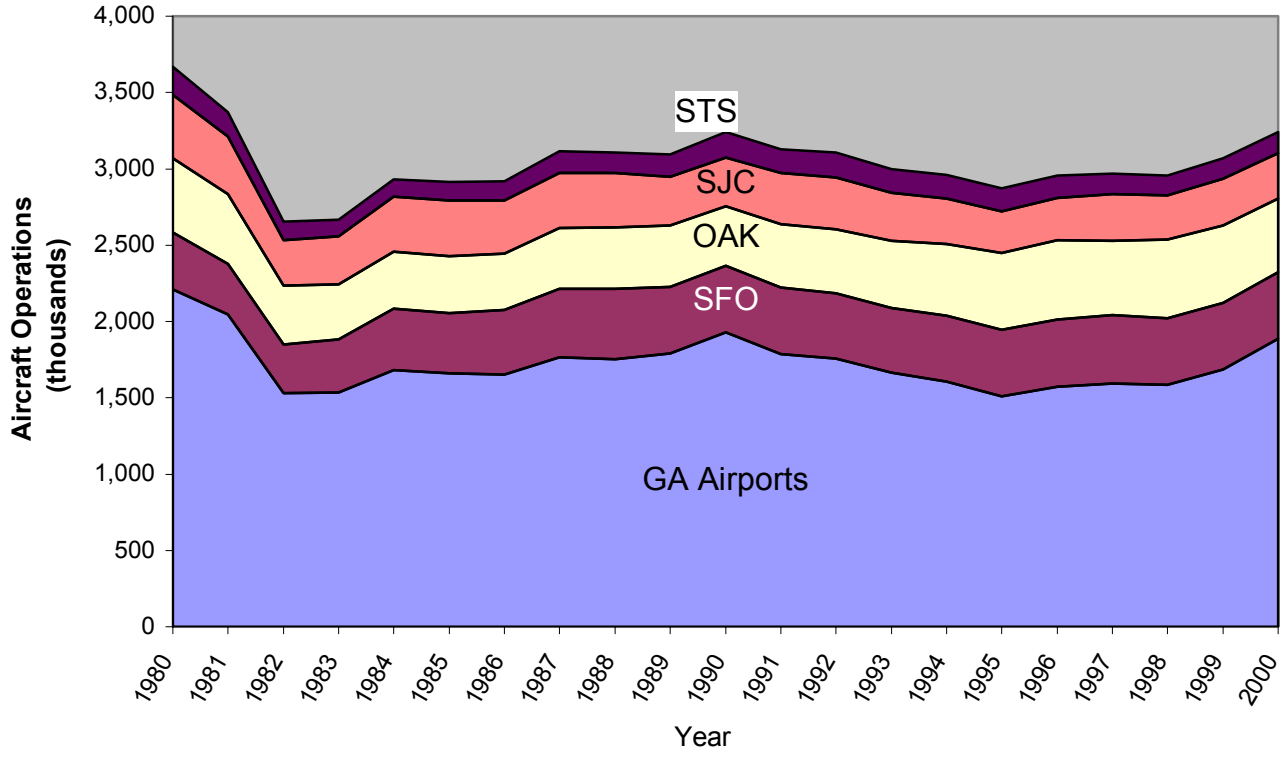


Figure 6-5 **San Diego Operations, 1980-2000**

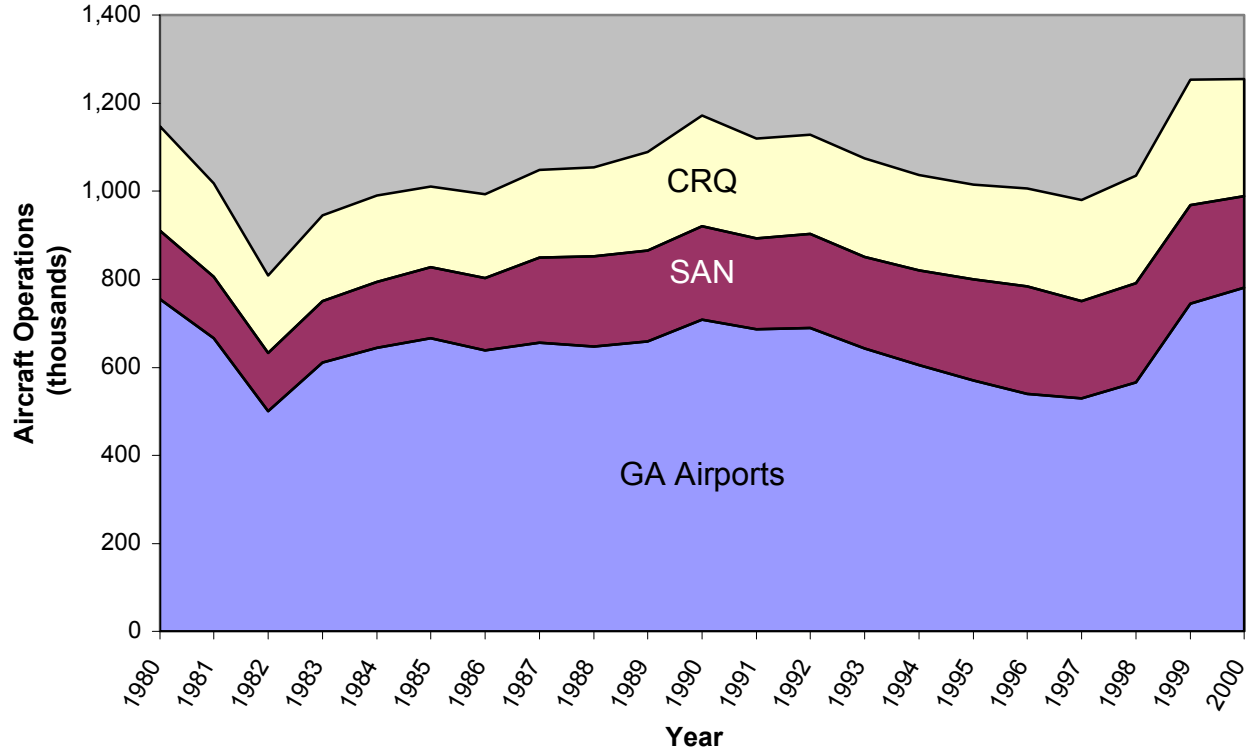
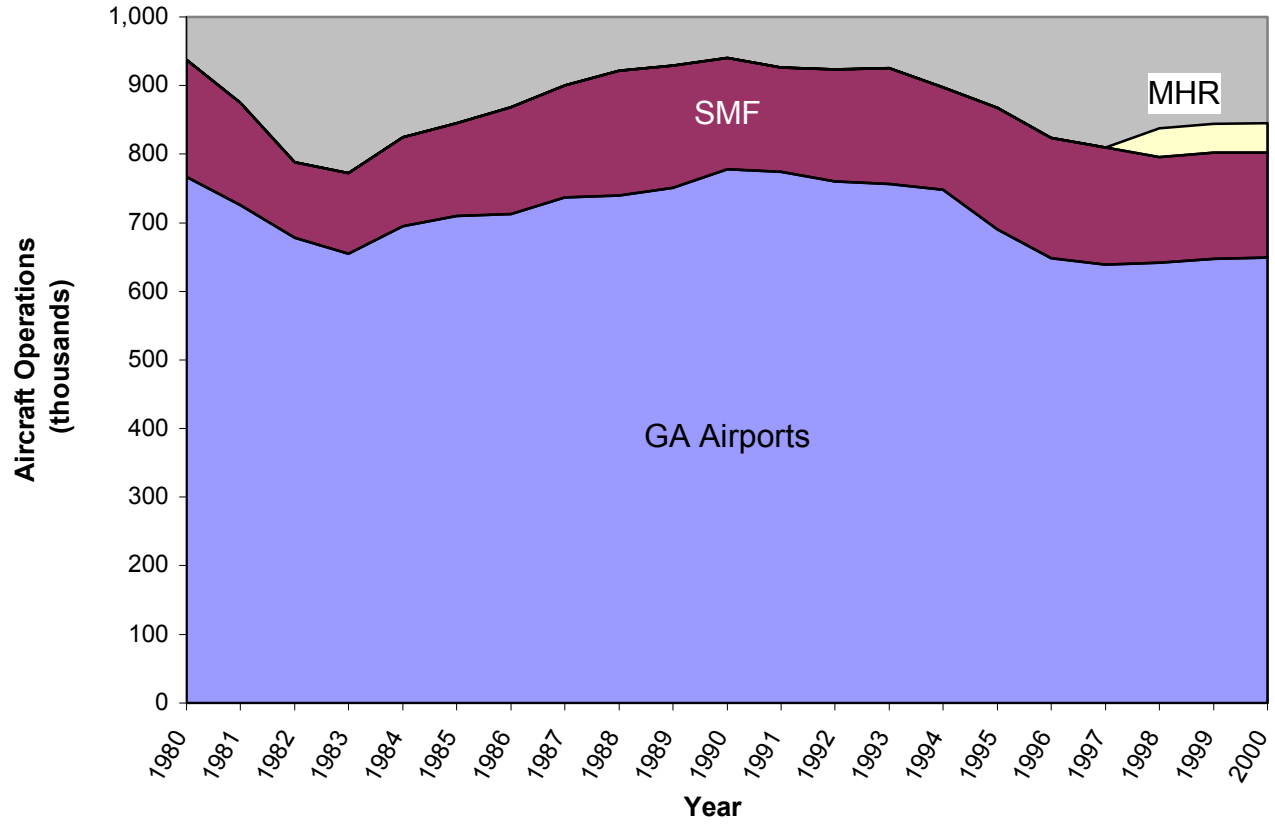


Figure 6-6 **Sacramento Operations, 1980-2000**



7. Flight Delays

Prior to the recent drop in traffic following the events of September 11, 2001, the growing level of flight delays in the National Airspace System was recognized as one of the most important issues facing the future development of the aviation system in both the U.S. and elsewhere. This was a particular concern in California, with traffic levels at the two largest commercial service airports, Los Angeles International and San Francisco International, rapidly approaching, if not exceeding, the ability of those airports to accommodate them without excessive delays and cancellation. Because of the constraints imposed in poor weather by its runway configuration, in recent years San Francisco International has experienced some of the highest delay levels of any airport in the U.S. This chapter examines the recent trends in flight delays at California airports.

Several factors can affect the occurrence of flight delays. Some of the most common ones include weather, equipment problems and maintenance, runway closures and inadequate airport capacity compared to demand. This chapter presents data on on-time performance, delays and cancellations for the 10 air carrier airports in the four largest urban areas in California.

The data presented in this chapter is compiled from the U.S. Department of Transportation's Bureau of Transportation Statistics (BTS) website. The airline on-time performance database covers the 10 biggest airlines, each of which earn one percent or more of total domestic scheduled passenger revenue and are therefore obliged by Federal regulations to report their on-time performance data. BTS uses the airlines' Computerized Reservation Systems (CRS) to get the scheduled departure and arrival times. There are several more delay data sources available, all having their own special features, because each of them was designed for a specific and different purpose. As a consequence, measures of delay are difficult to compare with each other. Some of the databases are discussed here in more detail.

CODAS (Consolidated Operations and Delay Analysis System) was created by the Office of Aviation Policy and Plans to provide estimates of aircraft delay by individual flight. The objective was to develop a comprehensive delay measurement system that will be accepted by both government and industry. CODAS combines data from two primary sources: the Enhanced Traffic Management System (ETMS) and the Airline Service Quality Performance (ASQP)

System. It calculates delays by phase of flight, the data for which are available approximately 30 days after the end of a month.

ASQP (Airline Service Quality Performance) data are collected by the U.S. Department of Transportation (DOT) to calculate on-time performance for the monthly Air Travel Consumer Report. A flight is considered to be on time if it arrives or departs no more than 15 minutes past its scheduled arrival or departure time. Ten major air carriers are required by regulation to report this information. ASQP does not contain any information on the operations of smaller air carriers, commuters, air taxis, or on general aviation, cargo, military and international flights.

OPSNET (Operations Network) is the official Federal Aviation Administration (FAA) delay reporting system. Its data is based on FAA personnel's observations of aircraft that are delayed by 15 minutes or more. This monthly summary reports delays for specific airports but not by specific flights or airlines. It also provides information on the cause of the delay. Cancelled flights are not reported in OPSNET.

ASPM (Aviation System Performance Metrics) is another FAA database that provides information on individual flight performance and for separate phases of flight as well as on airport efficiency for 21 major airports. It integrates data from two primary sources: the Enhanced Traffic Management System (ETMS) and Out, Off, On, and In (OOOI) times for a given flight obtained from ARINC (the service provider that handles air/ground communications for the airlines, including transmission of the OOOI data from the aircraft to airline flight operations departments). ASPM calculates many of the same metrics as CODAS. The main difference is that CODAS uses ASQP data for actual times whereas ASPM uses ARINC data. However, the OOOI times relayed by ARINC are the source of the data that the airlines subsequently report to the U.S. Department of Transportation to form the ASQP database. By obtaining the OOOI data directly from ARINC, the ASPM data are available on a next day basis.

On-time Performance

Table 7-1 presents the statistical on-time performance data for the years 1997 to 1999, using the U.S. DOT definition that a flight is considered to be on time if it arrives at the gate within 15 minutes of the scheduled arrival time or departs within 15 minutes of the scheduled departure time. The definition of delay is handled differently in different data sources, but having a

15-minute buffer is the most common approach. Cancelled and diverted operations are counted as late, but they are not included in the calculation of average minutes late.

Of the 10 airports studied, SFO has the worst record for both arrivals and departures. It also shows a large variation from year to year while LAX has a more uniform record. SFO's worst year during the three-year period was 1998 when only 69 percent of arrivals and 74 percent of departures were on time. At SFO it is generally the case that the departures are more often on time than the arrivals. This results from the airport's sensitivity to weather conditions, which affects the arrivals more than departures.

Following SFO is LAX, whose on-time percentage is consistently around 77 percent, except in 1998 when 81 percent of the departures were on time. The rest of the airports have better records, although a small decline from 1997 to 1999 can be observed at all airports. The on-time performance at Ontario, San Diego, Sacramento and San Jose has fallen to below 80 percent in recent years. Oakland Airport had a higher proportion of its arriving flights on time than the other airports, followed closely by Orange County Airport. Long Beach Airport had the best on-time performance for departures, followed by Burbank and Ontario in 1997 and 1999, and Orange County in 1998.

Arrival and Departure Delays

Table 7-2 shows the average arrival and departure delays for each airport. The table presents the average delay for all flights as well as just for the flights that were late (i.e. arrive more than 15 minutes after the scheduled arrival time). In almost all cases, the average arrival and departure delays are less than 10 minutes. SFO is an exception, particularly in 1998 and 1999. In 1998 the average arrival delay was almost 18 minutes and the departure delay over 15 minutes. For the arriving flights that were late the average delay exceeded 63 minutes.

LAX had the second worst record, but only in departures. Burbank and Ontario have quite large average arrival delays, exceeding those of LAX. Orange County and Long Beach airports generally have the least average delay.

Not surprisingly, the average arrival delay of late arriving flights is higher than the average departure delay of late departing flights, since some delay can usually be recovered during the aircraft layover time (turn time) at the airport. Also, during very disrupted operations, flights can

be cancelled and the aircraft used to replace late arriving aircraft, allowing the flights that would have been operated by the late arriving aircraft to depart with less delay.

Cancellations

Flight cancellations are the events that air travelers hate the most. California airport cancellation statistics are presented in Table 7-3. Not surprisingly considering the delay data, SFO has the worst record in terms of cancelled flights. In 1998 about 12,000 (4.3 percent) of its flights were cancelled. LAX had a cancellation rate of 2.9 percent for 1998 and 1999. Even though Orange County had some of the best on-time performance and experienced some of the lowest average delays, its cancellation rate increased to three percent in 1999. Sacramento was the only airport with fewer than one percent of flights cancelled. The second most reliable airport, Oakland, had a cancellation rate about double that of Sacramento.

Distribution of Delay

The average delay does not tell the whole story of delays at an airport since all the flights do not experience the same delay. Average delay provides no information about the extreme cases when the delay is very extensive or when the flight arrives early. To analyze the delays at SFO and LAX in more detail, cumulative distribution curves were constructed from the delays experienced by each flight. These are shown in Figures 7-1 to 7-4. The analysis has been done for the months of January and August of 1999. These months have been chosen to represent both typical winter and summer months when the delays are often very obvious, at least at SFO. Winter storms often occur during January and morning fog is very typical for August. The data were compiled from the BTS website.

LAX showed very little variation between January and August (Figures 7-1 and 7-2). This indicates stability in the weather conditions in Southern California. The departures did not experience as many delays as arrivals and the departure delays were less severe, as indicated by the average delay data. Fifty percent of arrivals and 55 percent of departures were either early or on time. Using the U.S. DOT definition of a delayed flight (more than 15 minutes late relative to the scheduled time), then 77 percent of the arrivals and a little over 80 percent of the departures were on time. Ninety percent of the arrivals were within 40 minutes of the scheduled time whereas

90 percent of the departures were within 30 minutes. Of the arriving flights, seven were more than six hours late in January while eight were more than six hours late in August. Both months showed four departing flights more than six hours late.

SFO had a wider range of delays than LAX. Also, there was a greater difference between January and August, with August experiencing a more severe delay problem. According to a delay study performed for SFO by Charles River Associates and John F. Brown Company (2000), August was the worst month of 1999 in terms of delays. Fifty-one percent of the arrivals were early or on time in January and 47 percent in August. The corresponding figures for departures were 58 percent in January and 55 percent in August. When comparing the flights that were within 15 minutes of the scheduled time with the annual averages (Table 7-1) it can be seen that both January and August were below average in terms of arrival on-time performance (less than 70 percent on time). Departures were on time more often in January (80 percent) than on average in 1999. August departures (77 percent on time) were close to the average. Ninety percent of the arrivals were within 72 minutes of the scheduled time in January and within 87 minutes in August. The corresponding figures for departures were 50 and 60 minutes, respectively. These distributions are much wider than that for LAX, with only 79 percent of the flights arriving within 40 minutes of the scheduled time in August, compared to 90 percent at LAX. There were a total of nine arriving and five departing flights in January and 11 arriving and nine departing flights in August that were delayed for more than six hours.

Table 7-1
Airport On-time Performance, 1997-1999

	Arrivals			Departures		
	Total Flights	Flights late >15min	on-time %	Total Flights	Flights late >15min	on-time %
SFO						
1997	138190	33153	76.0%	138191	34697	74.9%
1998	139884	43326	69.0%	139853	36634	73.8%
1999	136995	35773	73.9%	136952	29786	78.3%
LAX						
1997	188144	43090	77.1%	188093	42042	77.6%
1998	184129	42228	77.1%	184078	35526	80.7%
1999	191831	43448	77.4%	191762	43334	77.4%
OAK						
1997	58738	9021	84.6%	58734	8529	85.5%
1998	56007	10468	81.3%	56002	9519	83.0%
1999	55489	10300	81.4%	55489	10201	81.6%
ONT						
1997	36481	6588	81.9%	36479	5100	86.0%
1998	35422	7620	78.5%	35410	5641	84.1%
1999	34745	7422	78.6%	34751	5698	83.6%
BUR						
1997	29115	4731	83.8%	29115	3711	87.3%
1998	28094	6050	78.5%	28095	5106	81.8%
1999	27869	5446	80.5%	27872	4685	83.2%
SNA						
1997	35412	5559	84.3%	35468	5321	85.0%
1998	34624	6519	81.2%	34683	5170	85.1%
1999	38109	7132	81.3%	38154	6824	82.1%
SAN						
1997	67804	13199	80.5%	67801	11542	83.0%
1998	67143	15619	76.7%	67143	12961	80.7%
1999	68237	14663	78.5%	68244	12869	81.1%
SMF						
1997	37147	6673	82.0%	37146	5878	84.2%
1998	36434	7566	79.2%	36431	6338	82.6%
1999	36628	7568	79.3%	36625	6745	81.6%
SJC						
1997	48003	7910	83.5%	48009	7566	84.2%
1998	49189	10011	79.6%	49200	8713	82.3%
1999	56218	11421	79.7%	56219	11281	79.9%
LGB						
1997	2526	456	81.9%	2522	289	88.5%
1998	3118	768	75.4%	3118	410	86.9%
1999	3329	644	80.7%	3329	458	86.2%

Source: BTS website, *Airline On-Time Statistics*

Table 7-2
Airport Arrival and Departure Delays, 1997-1999

	Arrivals				Departures			
	Total flights	Average arrival delay	Flights late >15min	Average arrival delay for late flights	Total flights	Average departure delay	Flights late >15min	Average departure delay for late flights
SFO								
1997	138190	9.03	33153	49.63	138191	10.71	34697	36.48
1998	139884	17.90	43326	63.42	139853	15.49	36634	52.5
1999	136995	12.46	35773	61.92	136952	11.03	29786	48.09
LAX								
1997	188144	7.58	43090	43.62	188093	9.45	42042	34.41
1998	184129	8.15	42228	47.22	184078	9.76	35526	41.72
1999	191831	7.86	43448	46.80	191762	9.51	43334	36.22
OAK								
1997	58738	5.12	9021	39.95	58734	6.51	8529	33.77
1998	56007	7.69	10468	42.49	56002	8.21	9519	37.64
1999	55489	6.77	10300	41.15	55489	8.2	10201	35.01
ONT								
1997	36481	7.26	6588	42.81	36479	5.77	5100	34.72
1998	35422	9.88	7620	45.66	35410	7.92	5641	42.41
1999	34745	8.99	7422	44.24	34751	8.18	5698	41.82
BUR								
1997	29115	6.60	4731	40.95	29115	5.99	3711	38.68
1998	28094	10.68	6050	47.07	28095	9.61	5106	45.72
1999	27869	8.38	5446	43.86	27872	8.38	4685	43.62
SNA								
1997	35412	4.64	5559	38.30	35468	4.94	5321	27.99
1998	34624	6.58	6519	39.82	34683	6.02	5170	35.68
1999	38109	6.28	7132	41.83	38154	6.34	6824	32.98
SAN								
1997	67804	6.87	13199	43.14	67801	6.75	11542	32.93
1998	67143	9.92	15619	46.99	67143	9.37	12961	41.25
1999	68237	8.23	14663	46.66	68244	8.63	12869	40.12
SMF								
1997	37147	6.96	6673	42.44	37146	7.14	5878	37.15
1998	36434	8.74	7566	45.49	36431	8.65	6338	41.21
1999	36628	7.74	7568	43.37	36625	8.73	6745	37.93
SJC								
1997	48003	4.94	7910	40.91	48009	5.83	7566	30.59
1998	49189	7.57	10011	42.39	49200	7.17	8713	34.24
1999	56218	7.1	11421	42.81	56219	7.47	11281	33.18
LGB								
1997	2526	5.92	456	42.24	2522	3.43	289	36.72
1998	3118	9.6	768	42.67	3118	5.56	410	46.62
1999	3329	4.08	644	42.63	3329	3.76	458	37.15

Source: BTS website, *Airline On-Time Statistics*

Table 7-3
Flight Cancellations at Airports, 1997-1999

	Arrivals			Departures		
	Total Flights	Cancelled Flights	% Cancelled	Total Flights	Cancelled Flights	% Cancelled
SFO						
1997	138190	2785	2.0%	138191	2739	2.0%
1998	139884	5960	4.3%	139853	6022	4.3%
1999	136995	5275	3.9%	136952	5210	3.8%
LAX						
1997	188144	4295	2.3%	188093	4302	2.3%
1998	184129	5419	2.9%	184078	5326	2.9%
1999	191831	5631	2.9%	191762	5595	2.9%
OAK						
1997	58738	991	1.7%	58734	917	1.6%
1998	56007	830	1.5%	56002	843	1.5%
1999	55489	696	1.3%	55489	697	1.3%
ONT						
1997	36481	551	1.5%	36479	594	1.6%
1998	35422	673	1.9%	35410	739	2.1%
1999	34745	474	1.4%	34751	496	1.4%
BUR						
1997	29115	445	1.5%	29115	450	1.5%
1998	28094	676	2.4%	28095	674	2.4%
1999	27869	538	1.9%	27872	564	2.0%
SNA						
1997	35412	501	1.4%	35468	536	1.5%
1998	34624	719	2.1%	34683	758	2.2%
1999	38109	1102	2.9%	38154	1144	3.0%
SAN						
1997	67804	655	1.0%	67801	739	1.1%
1998	67143	1253	1.9%	67143	1352	2.0%
1999	68237	1030	1.5%	68244	1202	1.8%
SMF						
1997	37147	285	0.8%	37146	330	0.9%
1998	36434	269	0.7%	36431	314	0.9%
1999	36628	233	0.6%	36625	262	0.7%
SJC						
1997	48003	571	1.2%	48009	587	1.2%
1998	49189	748	1.5%	49200	758	1.5%
1999	56218	1037	1.8%	56219	1049	1.9%
LGB						
1997	2526	12	0.5%	2522	13	0.5%
1998	3118	45	1.4%	3118	48	1.5%
1999	3329	69	2.1%	3329	74	2.2%

Source: BTS website, *Airline On-Time Statistics*

Figure 7-1 **Distribution of Arrival Delays at LAX, 1999**

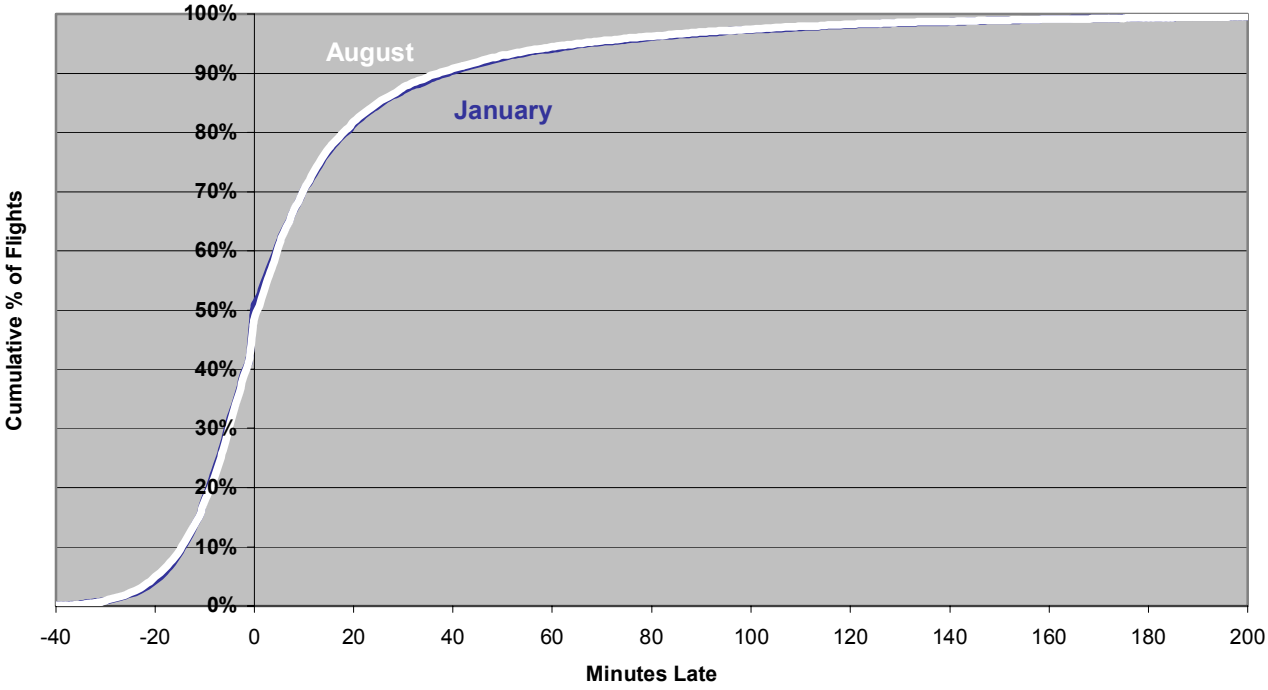


Figure 7-2 **Distribution of Departure Delays at LAX, 1999**

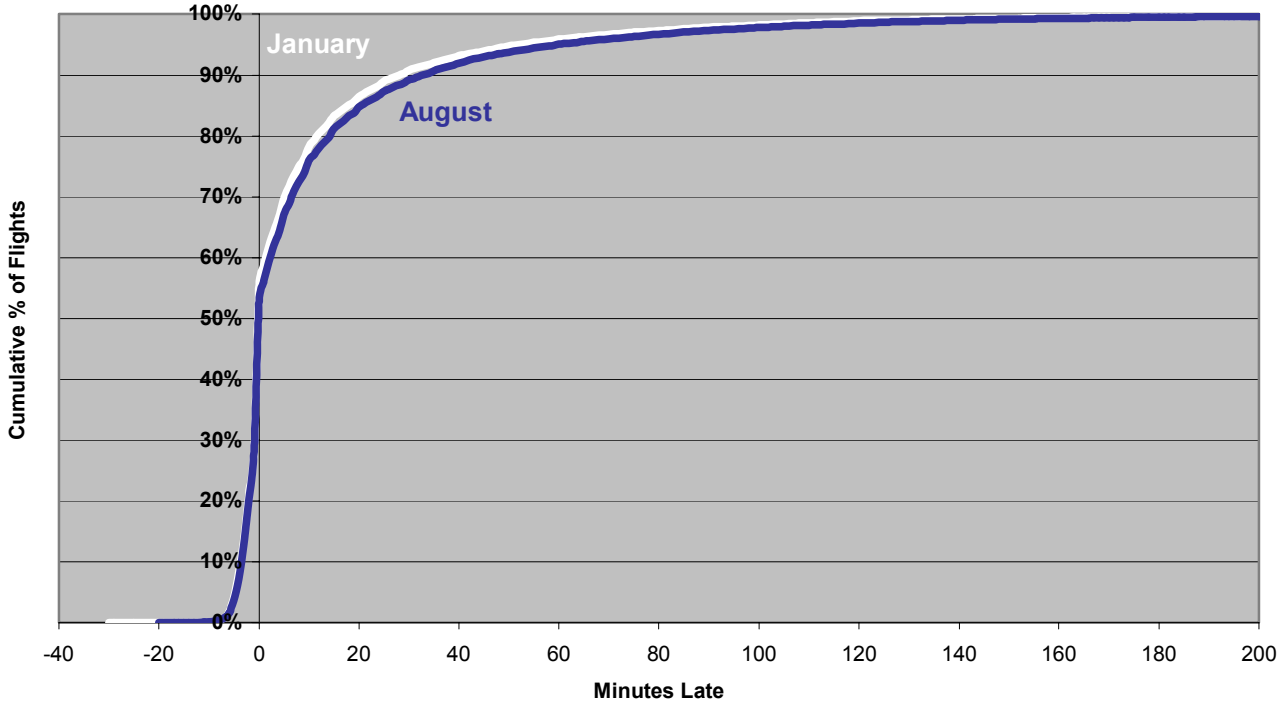


Figure 7-3 **Distribution of Arrival Delays at SFO, 1999**

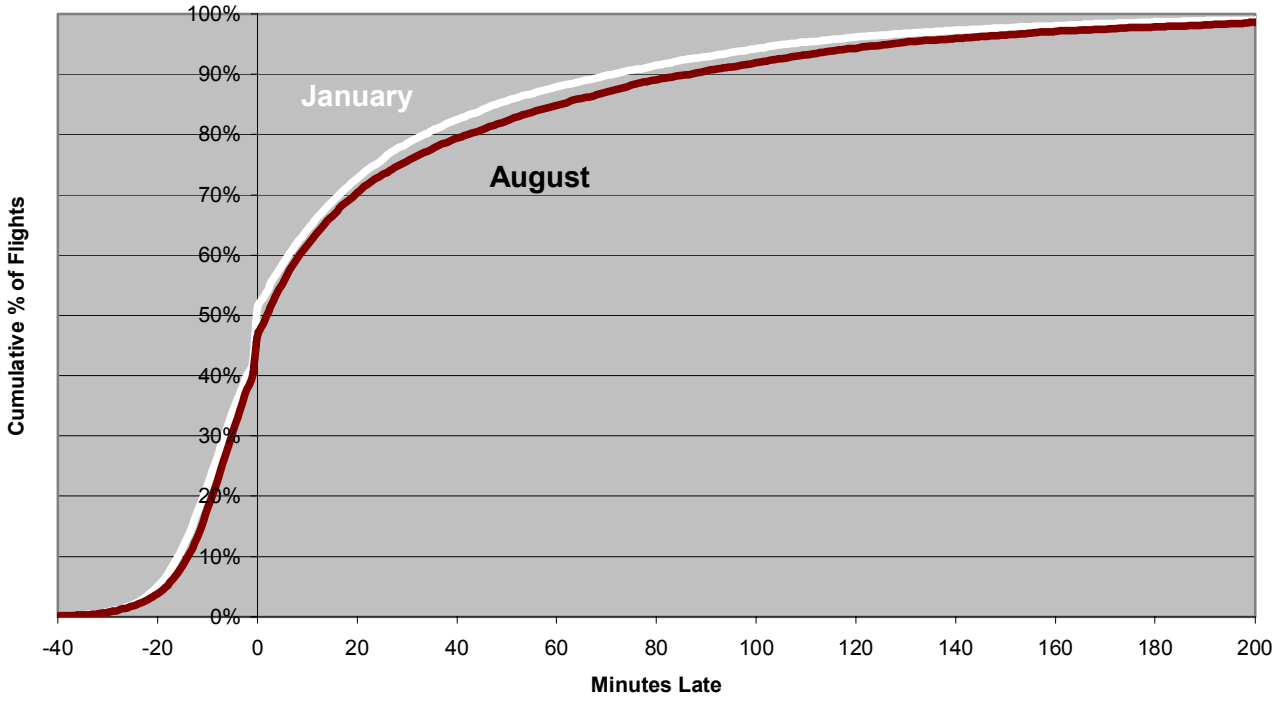
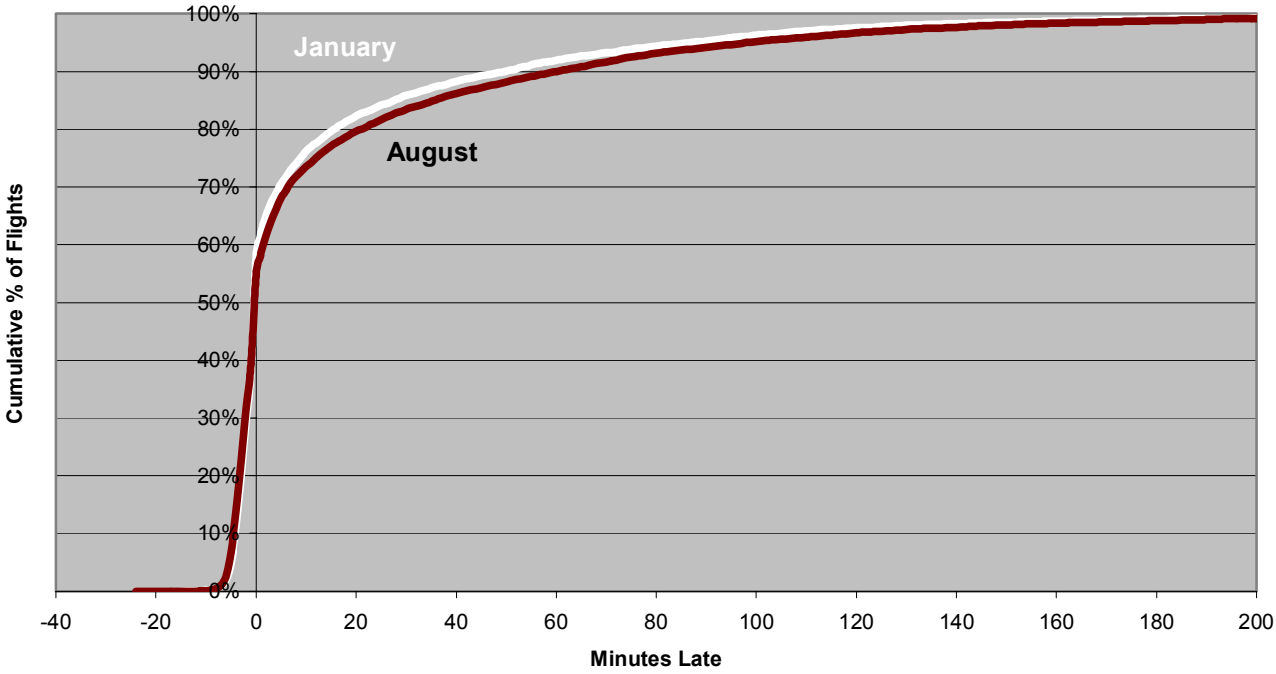


Figure 7-4 **Distribution of Departure Delays at SFO, 1999**



8. Recent Trends in the California Aviation System

Introduction

On September 11, 2001, the airplane hijackings and subsequent attacks on the World Trade Center in New York City and the Pentagon in Washington, D.C., instantaneously and permanently changed the aviation system in the United States. This chapter documents the impacts of the events of September 11th and subsequent changes in the national aviation system on California's aviation system and airports. We first consider post-September 11 changes in passenger, cargo, and parking activity. We turn next to flight operations, examining first aggregate numbers and then analyzing flight schedule changes at a more detailed level. Finally, we assess how California airport finances have been affected.

Changes in the aviation system since September 11th have unfolded rapidly and unpredictably. Any attempt to document these changes is quickly rendered obsolete by subsequent events. Many of the results in this chapter should already be updated, but the realities of publishing deadlines preclude this. Procedures for preparing and distributing updates of the information included in this chapter on a frequent and regular basis are presently under development.

Commercial Aviation

The drop in air passenger travel following the events of September 11 can be expected to have a number of significant economic impacts on both the aviation system and the broader California economy. Many airport revenues, including Passenger Facilities Charges, parking and other ground transportation fees, and concession revenues, are directly tied to passenger traffic. The service and concession providers suffer an even greater loss in revenue, since in many cases their entire revenue stream depends on passenger traffic. The changes in security requirements also impact concession revenues, since greeters and wellwishers have been excluded from some areas of the passenger terminal where many concessions are located. The broader economy is affected both by the loss of business that is directly dependent on air travel, such as tourism, as well as the more subtle loss of the consumer surplus that results from air trips. Of course, the drop in traffic directly affects the economics of the airlines themselves, which in the long run may

lead to higher fares (although in the short run fares may be reduced to lure passengers back). Finally, there is the loss of productivity and financial implications for both individuals and the state that arise when firms are forced to lay off employees.

While the drop in air passenger travel, and the resulting impact on airline revenues, has received a large amount of attention in both the popular and technical press, less attention has been given to recent trends in air cargo activity.

Passenger Traffic

In order to identify the extent of the drop in passenger traffic at California commercial airports and to track the progress of the recovery, air passenger statistics have been assembled on a monthly basis for the following airports:

- Burbank/Glendale/Pasadena
- Fresno Yosemite
- Los Angeles International
- Monterey Peninsula
- Oakland International
- Ontario International
- Orange County/John Wayne
- Redding
- Sacramento International
- San Diego International
- San Francisco International
- San Jose International
- San Luis Obispo
- Santa Barbara

These include all airports in the state with over 1 million annual enplanements, and between them account for over 95 percent of all passenger enplanements in the state. They also include a sample of smaller airports served predominantly by regional airlines with turboprop equipment. The level of total passenger traffic (enplanements and deplanements) at these 14

airports in August 2001 varied from over 6.6 million at Los Angeles International (LAX) to just over 14,000 at Redding. Five airports handled over a million passengers, while a further four handled over 100,000, as shown by Figure 8-1.

The total monthly passenger traffic at each of the 14 airports from August through December is shown for 2000 and 2001 in Table 8-1, while the corresponding percentage change in traffic from 2000 to 2001 is shown in Table 8-2. Compared to the previous year, passenger traffic across all 14 airports was up by 4.0 percent in August 2001. However, the growth varied widely from airport to airport, with passenger traffic at Metropolitan Oakland International (OAK) up 19 percent, while at San Francisco International (SFO) passenger traffic was down 5.1 percent.

Passenger traffic levels across all 14 airports plunged by 33 percent in September compared to the previous year, although of course the airlines were grounded for several days following September 11, and many passengers planning to travel in the following weeks may have cancelled their trips due to the uncertainty of how quickly the system would return to normal operation, and perhaps fears of other attacks. By the beginning of October the airlines had largely restored air service throughout the system, although they had reduced the number of flights by about 20 percent systemwide in an attempt to control their operating losses. These reductions were not uniform across all markets of course, and some lost more service than others. In many smaller markets, the airlines eliminated service with larger jet equipment and substituted turboprop or regional jet service operated by their regional airline partners. Across all 14 airports, passenger traffic levels in October were down 24 percent compared to the previous year. The recovery continued steadily during November and December, as shown in Table 8-2 and Figure 8-2.

The drop in passenger traffic and the subsequent recovery varied considerably from airport to airport, as shown in Table 8-2. Monterey Peninsula Airport (MRY) experienced the largest drop in September, compared to the previous year, of almost 40 percent, while Oakland International Airport had the smallest drop of only 23 percent, although it had also been experiencing the most rapid growth prior to September 11. By December, the drop in traffic compared to the previous year varied from only 3.3 percent at Oakland to 27 percent at Redding.

After a large initial drop in September, when all flights were suspended for several days, the systemwide traffic levels have shown a steady recovery toward the levels of the previous year. By this past March, traffic systemwide was down 11 percent below that of the previous year.

The recovery has not been the same across all the airports in the system, as shown in Figure 8-3, and in fact has been slightly slower at the two largest airports, LAX and SFO, than at most others. March 2002 traffic at these premier airports was down about 15 percent from the previous year, a loss that is about twice the average for the other airports. On the other hand, by March passenger traffic at some airports had already reached, or even exceeded, that of the previous year. These include Oakland, Sacramento, and Orange County where traffic had essentially reached levels of the previous year, as well as Fresno whose passenger traffic levels were running well above 2001 levels.

Air Cargo Activity

In addition to passenger traffic, data has been assembled on trends in air cargo traffic at the foregoing airports, as well as Sacramento Mather Airport, which only serves cargo flights. Both Oakland and Ontario International Airports serve as major regional hubs for express air cargo carriers (FedEx and UPS respectively), while Los Angeles and San Francisco International Airports serve as the principal gateways for international air cargo traffic into and out of the state. Air cargo is traditionally considered to include air freight, air express, and air mail. Airports generally report air freight traffic levels separately from air mail and include air express in the air freight statistics. For the purposes of the current study, only the trends in air freight traffic were considered. The monthly weight of air freight enplaned and deplaned at these 15 airports in 2000 and 2001 is shown in Table 8-3, while the percentage change from 2000 to 2001 is shown in Table 8-4.

In contrast to passenger traffic, air freight traffic does not appear to be significantly affected by the aftermath of September 11, apart from a small reduction in traffic in September itself, no doubt due to the suspension of service for several days. While air freight traffic in the last half of 2001 is significantly lower than the corresponding months of the previous year, this appears to have begun well before September 11 and is most likely due to the slowdown in the economy. Air freight traffic in August 2001 was down 16 percent compared to 22.5 percent in

September and 15 percent in October. This reduction remained relatively unchanged through December, as shown in Figure 8-4. Results for early 2002, however, suggest that a recovery is underway. By March, air freight traffic was only five percent below 2001 levels.

As with passenger traffic, the strength of the recovery as of March 2002 has varied across the airports, as shown in Table 8-4 and Figure 8-5. Sacramento and Monterey showed significant increases in air freight traffic over the previous year. SFO experienced the largest reduction from the previous year, still down 21 percent in March. Air freight traffic at LAX, which handled by far the largest amount of air freight of any of the airports, has generally followed statewide trends with declines exceeding system averages between November and February but smaller than average losses in the other months.

Within a month of the events of September 11, air freight traffic levels compared to the previous year were already higher than in August, and this relative growth has continued through March of this year, when air freight traffic was only 5 percent below that of the previous year. However, some care is needed in interpreting these data, because the monthly traffic levels are being compared to a period when air freight traffic was declining, which will tend to inflate the apparent growth.

Airport Ground Access

In addition to the effect on air passenger traffic and air cargo activity, the changes in the aviation industry after September 11 have also had a significant impact on airport ground access traffic volumes and mode use. Apart from the drop in vehicle trips due to lower numbers of air passengers, the new security measures that have been put in place have affected the use of airport parking in two significant ways. First, the new rules prevent wellwishers and greeters from accessing the gate area, while the time required for security screening (or at least the perception of the time required) encourages passengers to proceed through security screening as early as possible. In addition, at many airports, many of the food and beverage concessions likely to be used by those waiting for flights are located on the airside of security screening. The combined effect of these factors appears to have reduced the number of wellwishers bringing air parties to the airport by private vehicle who park for a short time to accompany the air passengers into the terminal, and resulted in a corresponding increase in the proportion of air passengers dropped off

without parking the vehicle. Analogous changes have occurred for greeters of arriving passengers.

The second effect is the ban on parking within 300 feet of a terminal building. At many airports this has resulted in the loss of a significant number of short-term parking spaces, leading to the short-term parking lot filling up at busy times, even with the lower traffic volume. At some airports, most notably Los Angeles International, the existing short-term lots or parking structures were closed completely, forcing all passengers to park in more distant long-term lots. The greater walking distances involved, even if space is still available in the short-term lot, and the added inconvenience of having to use a shuttle bus if the only available parking is in remote lots, have discouraged short-term parking by wellwishers and caused a higher proportion of passengers being dropped off or picked up at the curb.

The resulting drop in the use of parking has adversely impacted airport revenues, a significant proportion of which derives from parking fees. In addition to an overall reduction in the number of vehicles parked, there has been revenue dilution because of the reduced availability of premium short-term parking spots. Figure 8-6 illustrates the change in parking revenues at one of the airports for which detailed ground access information is available, Metropolitan Oakland International Airport (OAK), compared to the previous year. Figure 8-7 shows the change in the use of airport parking (excluding off-airport lots) at OAK from 2000 to 2001, controlling for the change in the level of passenger traffic. This clearly shows the drop in use of parking, beyond the reduction due to the lower level of air passenger traffic. Changes in the proportion of vehicles parking in the various lots at OAK in each year are shown in Figures 8-8 and 8-9. As shown in these figures, from September on there was a significant reduction in the use of the hourly (short-term) lot and a corresponding increase in the use of the daily (long-term) lot. The reduction in the use of the more distant economy lot reflected the general drop in use of parking. Similar patterns have been found at other airports.

Changes in the composition of the passenger traffic may also affect the use of airport parking. Passengers departing on non-business trips are less likely to park for the duration of their trip, or if they do park are more likely to use the most economical parking available, both because such trips are often longer than business trips and because such passengers are generally more cost sensitive than business travelers, who often have their travel expenses paid by their

employer or clients. There was a significant drop in parking use in relation to air passenger traffic even before September 11, as shown in Figure 8-7 for August 2001 compared to the previous year, and a corresponding increase in the use of public transport. Figure 8-10 shows the use the shuttle bus to the nearest Bay Area Rapid Transit (BART) station (AirBART shuttle) compared to the previous year. While the use of parking was lower than the previous year, the use of AirBART has increased. These trends became more pronounced after September, although the reduction in parking was noticeably greater than the increase in AirBART use, suggesting a significant increase in air passengers being dropped off or picked up at the terminal curb.

Corporate Aviation

There is some evidence to indicate that some types of general aviation activity actually benefited from the struggles experienced on the commercial side of the industry after the events of September 11, 2001. The National Business Aviation Association has reported that interest in business aviation increased as companies looked for ways to avoid increased ground time spent at commercial airports due to security procedures. According to an "Air Charter Guide" survey conducted after September 11th, demand for air charter service went up 30 percent while 84 percent of respondents confirmed that inquiries into this type of service have remained high since October of 2001. These increases in demand are seen both in established customers as well as customers new to air charter services. According to Honeywell, fractional operators also experienced increases in business and have had to hire more pilots to meet the demand.

While there are no published data available specifically addressing how the phenomenon described above is impacting California, anecdotal evidence was obtained through conversations with management at various airports throughout California. It appears as though the demand for business/corporate and charter flights in the state increased in the aftermath of the terrorist attacks. This evidence does seem to suggest that affects seen nationwide are also affecting many of California's airports.

For example, at Oakland International Airport, the fixed-base operator, Kaiser Air, reports that business is almost double what it was before September 11th. People are being drawn towards corporate and charter services, despite somewhat higher monetary costs associated with using them, because they are afraid of flying on commercial airlines and want to avoid processing

delays at the airports. Similar situations exist at smaller airports like Redding and Oxnard. While this evidence does seem to support a demand shift, the extent of this shift is still unclear and the whole effect must be looked at more closely before any definite conclusions can be made. Subsequent research will attempt to look at this phenomenon in more detail.

Operations

Table 8-5 is a summary of weekly commercial flights by California flight segment compiled for August, September, and October of 2000 and 2001. Only flight segments involving LAX, ONT, SAN, SFO, and SJC are included; these are the only California airports included in the ASPM database from which these data were obtained. Plots comparing the trends in traffic for the three month period in each of the two study years can be seen in Figures 8-11 through 8-20.

Three major scenarios can be seen among the plots. In all cases dramatic decreases in 2001 traffic can be seen immediately following September 11th followed by a rebound in October traffic to levels at or somewhat below 2000 levels. The three scenarios differ in how traffic looks prior to the terrorist attacks. The first scenario shows August 2001 traffic at higher levels than those for 2000. This pattern is exhibited by the LAX to SFO and LAX to SJC pairs. The second scenario shows August 2001 traffic at lower levels than those for 2000. This pattern is exhibited by the LAX to SAN and SAN to SJC pairs. The final major scenario shows August 2001 traffic at or very near levels for 2000. This pattern is exhibited by the LAX to ONT and SAN to SFO pairs. While it might be expected that traffic would remain below 2000 levels after September 11th, there are some exceptions to this that can be seen in the data. There were actually a few O-D pairs where traffic rebounded to levels higher than those for 2000 after September 11th. This pattern is exhibited by the ONT to SFO and ONT to SJC pairs. Flight data for the ONT to SAN pair is erratic and hard to draw any conclusions from. Also, the SFO to SJC pair must be disregarded in this analysis because of low traffic levels caused by the close proximity of the two airports to each other.

Table 8-6 shows total operations for the state of California and the entire United States for October and December of both 2000 and 2001. The total operations are broken down into four main categories of operations: air carrier, air taxi, general aviation, and military. Table 8-7 shows

percent changes in total operations for California and the United States from October and December of 2000 to October and December of 2001.

Figure 8-21 compares the total operations for California in October of 2000 with those for October of 2001. Figure 8-22 compares the total operations for the entire United States in October of 2000 with those for October of 2001. Figure 8-23 compares the total operations for California in December of 2000 with those for December of 2001. Figure 8-24 compares the total operations for the entire United States in December of 2000 with those for December of 2001. In each plot, total operations are shown as a sum of the four main categories of operations.

In each case, general aviation operations account for the majority of total operations for each month and year. Also, each plot shows a decline in the number of total operations found in both California and the entire United States from 2000 to 2001. In California, however, the number of operations found showed only a minor drop from October of 2000 to October of 2001 while the trend in the rest of the country showed a much more significant decline in operations for the month of October. By December, however, the pattern had reversed, with California having a 13 percent loss in operations while nationwide there was essentially no change. The discrepancies were fairly consistent across the different operations categories, with the exception of air carrier operations, where California and U.S. declines were roughly equal. Interestingly, California airports had substantial losses in general aviation and military flights in December, while nationally these types of operations registered strong growth.

Tables 8-8 to 8-11 show categorized operations that occurred at California airports in October and December of 2000 and 2001. The six largest air carrier airports in California are highlighted. These tables were used to derive Figures 8-25 and 8-26, which plot, on a log scale, 2000 and 2001 operations for the two months. Surprisingly, many of the smaller airports had considerably more operations in October 2001 than in October 2000 (Figure 8-25). Only the larger commercial airports showed a consistent pattern of decline. By December (Figure 8-26), however, the losses in operations had spread throughout the system, with the exception of just a handful of smaller airports.

Table 8-12 shows summarized operations data for those six airports. Figures 8-27 to 8-32 are derived from Table 8-12 and show categorized monthly operations during October and December of 2000 and 2001 at California's six largest air carrier airports. Airports like LAX,

SAN, and SFO are clearly dominated by air carrier and air taxi operations while airports like OAK, SJC, and ONT show much more significant general aviation activity. While total operations dropped at all airports after September 11th, the general make-up of the operations remained consistent across all airports.

Table 8-13 shows percent changes in operations at California's six largest air carrier airports from October and December of 2000 to October and December of 2001. Figures 8-33 and 8-34 were derived from Table 8-13 and show both the drops in total operations as well as a breakdown of the changes into selected operations categories. Figure 8-33 shows that overall operations in California decreased somewhat in October from 2000 to 2001. These same declines were seen in December on a somewhat larger scale. The exception to this was ONT, which saw a seven percent increase in total operations from October of 2000 to October of 2001. Figure 8-34 shows that the changes in individual operations categories are somewhat inconsistent. However, the air carrier changes are most important due to the dominance of the air carrier markets at the six airports included in the data.

Tables 8-14 to 8-19 show categorized weekly operations at California's six largest air carrier airports for August, September, and October. Tables 8-20 to 8-25 show categorized 2001 weekly operations as a percentage of 2000 weekly operations for August, September, and October. Table 8-26 shows a summary of total weekly operations at California's six largest air carrier airports for August, September, and October. Table 8-27 shows 2001 weekly operations as a percentage of 2000 operations at those six airports for August, September, and October. Figures 8-35 to 8-40 show categorized weekly 2001 operations as percentages of weekly 2000 operations for California's six largest air carrier airports for August, September, and October.

Table 8-27 coupled with Figures 8-35 to 8-40 show the expected drop in operations at most of the airports after September 11, 2001. Most of the trends in the figures are fairly consistent among operations categories, but it is worth mentioning that military activity at those airports supporting military operations, while erratic throughout the study period, increased for the most part after the terrorist attacks in New York.

Airport On-Time Performance, Delays, and Cancellations

Table 8-28 shows average daily arrival delay (against schedule for commercial passenger flights) for the state of California and the entire United States for October and December of both 2000 and 2001. Figure 8-41 compares the average daily arrival delay for California airports with that found in the entire United States for the months of October and December in 2000 and 2001.

The average delay found in California in October of 2000 was significantly higher than that for the entire United States in October of 2000. In October of 2001, however, the average delay was very similar for both California and the entire United States but was greatly reduced when compared to 2001 numbers. December of 2001 showed an overall reduction in average delay when compared to 2001 numbers similar to that seen for October, but in both 2000 and 2001, the average delay was similar when comparing California to the entire United States. In fact, average delay was somewhat higher for the United States than that for California in December of 2000 while the reverse was true for December of 2001.

Impact on Service Patterns

This section reports on a more detailed analysis of changes in California's scheduled airline services in the aftermath of September 11th. To investigate these changes, we obtained airline schedules for five California airports—LAX, ONT, SAN, SFO, and SJC. These five are the only California airports for which schedule data are available from the Aviation Service Performance Management (ASPM) web site maintained by the FAA, from which we drew our data. The schedules were obtained for a total of eight days: two each in the months of October 2000, October 2001, December 2000, and December 2001. We selected the Wednesday and Friday in the middle weeks of these months. The former tends to be a relatively light schedule day, while the latter is generally the busiest day of the week. The ASPM database provides complete schedules for domestic services but not international ones; we thus confine our analysis to the domestic services.

Origin-Destination Service Frequency

We consider first the changes in service frequency, as shown in Tables 8-29 to 8-33. Each table presents, for a given California airport, the changes in daily arriving flights between 2000 and 2001, by origin airport. Origin airports are individually identified when, for at least one of the four months considered, there were at least 3 arriving flights per day. Origins not meeting this criterion are placed in an "Other" category. LAX (Table 8-29) had an overall decline in domestic service of 18 percent for the month of October and 26 percent for the month of December. Seven origin airports had service cuts of 50 percent or more between December 2000 and December 2001. These origins include three California airports--Bakersfield, Ontario, and Santa Rosa—along with the close-in Dallas and Houston airports: Love Field and Houston Hobby. Anchorage and Wilmington, Ohio (a cargo airport served by Airborne Express) round out the list of the largest service cuts. On, the other hand, several origins registered service gains, most notably Maui, Honolulu, Oxnard, and Andrews Air Force Base.

Total arrivals at SFO (Table 8-30) declined about 20 percent for both October and December. Most of the biggest reductions were from airports in the western U.S., including ONT, SAN, BUR, EUG, and PHX. Only three airports—SBP, HNL, and SMF—have seen increased service to SFO between December 2000 and December 2001.

Compared with SFO and LAX, other California airports registered more modest cuts in service. Flights to SAN (Table 8-31) declined 13 percent. Only three markets—SFO, LAX, and ATL—had flight reductions of over 10 percent. There were also sizable service gains for certain markets, including SLC, LAS, and OAK. In the case of SJC (Table 8-32), the reduction was even smaller, just 9 percent for December. The SJC markets with the largest declines are all interstate, medium-hall, ones, such as AUS, PHX, SEA, and DEN. Several intrastate destinations, including BUR and ONT, saw substantial increases in service from SJC. Finally, ONT (Table 8-33), like SJC, had a service decline of less than 10 percent. Here, the sharpest cuts were to major west coast airports include SFO, LAX, SEA, and SLC. Those cuts are largely offset by increases in service from smaller airports such as SMF and SJC.

Airlines

Table 8-34 summarizes changes in the number of flights flown to the five California airports by different airlines, as well as totals across all of the five. Overall, there was a 15 percent reduction in flights between October 2000 and October 2001, and a 20 percent reduction when December 2000 and December 2001 are compared. United and its regional affiliate Sky West have cut the most flights, together accounting for over half of the approximately 400 flights that were eliminated. United cutbacks are especially deep, amounting to a 39 percent reduction in its December schedule, including reductions of 47 percent at LAX, 49 percent at SJC, and 64 percent at ONT. This retrenchment has made Southwest Airlines, which cut service only 6 percent, the leading carrier in California. With that exception, along with those for the cargo carriers FDX and UPS and those in the catch-all "Other" category, every airline cut service 15 percent or more in December 2001 compared to the previous December. Particularly noteworthy changes include the complete elimination of TWA flights (which reflects its absorption into AAL), Southwest's abandonment of SFO (completed before 9/11), Northwest's shift of flights from SFO to SJC, sharp cuts by UAL/SKW at ONT, virtually ceding that passenger market to SWA, and UAL shifting much of its SJC service over to its partner SKW.

Equipment

Table 8-35 summarizes changes in equipment between 2000 and 2001. In general, the service cuts have involved older aircraft types such as the B737-200 (42 percent fewer flights), Embraer 120 (30 percent), noise retrofitted B73Q (38 percent) and B72Q (54 percent), and MD90 (77 percent). On the other hand, there has been a dramatic increase in the use of the Canadair Regional Jet (from 7 to 41 flights between December 2000 and December 2001). Flights using B737-800s and A319s have also increased.

Statistical Analysis of the Schedule Reduction

In this section, we discuss statistical models the post-9/11 schedule changes to California airports. These models allow us to better identify the factors that have shaped these changes. To illustrate, the following models might characterize what has happened:

- The *isomorphic* model is that flights were cut by the same percentage across-the-board, irrespective of origin, destination, or airline;
- The *airport effects* model posits that schedules were reduced by a percentage that is determined the combination of an origin airport effect and a destination airport effect;
- The *airline effects* model is that each airline drew down its schedule across-the-board by a carrier-specific percentage;
- The *segment density* model is that the percentage schedule reduction for a flight segment depends on the original frequency of the segment;
- The *segment distance* model predicts that the percentage schedule reduction for a flight segment depends on the length of the segment.

In fact, no one of these models is likely to be very accurate. It is more likely that the cuts observed reflect some combination of the effects identified above. The goal here is to determine, within the limits of the data available, what that combination is.

We begin by considering changes in flights at the segment level between December 2000 and December 2001. For the segment level analysis, we count all the non-stop flights between two airports, ignoring which airline performed them. The first model we estimate is:

$$\Delta F_{ij}^{2000,2001} = (\alpha_i + \alpha_j + \partial \cdot G2G_{ij} + \pi F_{ij}^{2000}) \cdot F_{ij}^{2000}$$

where:

$\Delta F_{ij}^{2000,2001}$	is the change in total non-stop flights from airport i to airport j between December 2000 and December 2001 (sum of Tuesday and Friday schedules);
α_i	is a fixed effect for airport i, to be estimated;
$G2G$	is the average scheduled gate-to-gate time for the flight segment in December 2000, in minutes;
F_{ij}^{2000}	is the number of segment flights in December 2000 (sum of Tuesday and Friday schedules);
∂, π	are coefficients to be estimated.

The α_i's in this model are airport effects; two such effects will be active for any given segment—one for its origin and one for its destination. To reduce the number of such effects to be estimated, we reclassified as "Other" all airports not belonging to a set consisting of the five California airports whose schedules are being analyzed—LAX, SFO, SAN, SJC, and ONT--along with the airports that originate the most flights to these destinations, including DEN, DFW, JFK, LAS, OAK, ORD, PDX, PHX, SEA, SMF. The ∂ coefficient measures the effect of segment length. Finally, π captures the effect of segment frequency. A positive value for π means that flights are cut disproportionately from high-frequency segments.

Estimation results for two variants of the model appear in Table 8-36. The ∂ coefficient estimate is small and statistically insignificant in the full model, probably because it is correlated with the airport fixed effects. The ∂ term is therefore excluded from the second version of the model. The π coefficient is positive and significant at the .05 level, implying that, all else equal, higher frequency segments had disproportionately large cuts in service. In particular, if a segment has eight more flights in December 2000 than another, otherwise identical, segment, its percentage service cut would be expected to be greater by about 1.

The remaining coefficients reflect the percentage reductions in operations associated with different airports. The differences among these coefficients imply that, of the factors considered in this analysis, the airport effects are the most important. Among the five destination airports, there is a clear correlation between airport size and the magnitude of the airport effect. LAX and SFO have the largest effects, followed by SAN, while ONT and SJC have the smallest effects. Based on these results, a segment to LAX would be expected to have a service cut 14-15 percent greater than an otherwise identical segment to SJC. Among the origins, airport effects range from –19 percent for JFK to +23 percent for SMF. Other origins with positive effects include OAK and LAS, while DEN, PDX, and the catch-all "Other" category, like JFK, have double-digit negative percentage values.

Table 8-37 illustrates how the estimated model is used to predict service cuts on specific service segments. The airport effects for the segment origin and destination are added, and then combined with the effect of segment flight frequency. In these examples, and more generally, it is the destination airport effect that predominates. Table 8-38 confirms this by decomposing the service reductions to the five destination airports into destination airport, origin airport, and segment density components. The table shows that LAX has comparatively high cuts arising from each of these effects. Not only is its own destination effect strong, but it also has a disproportionate number of flights from origins with strong negative effects, and higher-than-average segment flight frequencies to boot.

While the above models give some insight into the factors that affect the post-9/11 schedule reductions, they do not address the central role of airlines in making schedule reduction decisions. To consider this, we must look at the data at the airline segment level, rather than the aggregate segment level. To do this, we adapt the previous model as follows:

$$\Delta F_{ija}^{2000,2001} = (\alpha_i + \alpha_j + \beta_a + \partial \cdot G2G_{ij} + \pi F_{ija}^{2000}) \cdot F_{ija}^{2000} + \theta F_{ij}^{2000}$$

where:

$\Delta F_{ija}^{2000,2001}$	is the change in total non-stop flights from airport i to airport j by airline a between December 2000 and December 2001 (sum of Tuesday and Friday schedules);
α_i	is a fixed effect for airport i, to be estimated;
β_a	is a fixed effect for airline a, to be estimated;
$G2G$	is the average scheduled gate-to-gate time for the flight segment in December 2000, in minutes;
F_{ij}^{2000}	is the number of segment flights in December 2000 (sum of Tuesday and Friday schedules);
∂, π, θ	are coefficients to be estimated.

This model adds a set of fixed effects for different airlines. As before, we reduce the number of effects to be estimated by lumping airlines with relatively few flights to California into a catch-all "Other" category. In addition to the airline fixed effects, this model incorporates a term based on the total frequency on the flight segment. This allows for the possibility that each individual airline reduced its schedule partly in response to the total supply of flights on a given segment, rather than simply considering its own flights.

Initial estimation results that the gate-to-gate time and airline segment frequency term are insignificant. We therefore dropped these from the model. Estimation results for the new model appear in Table 8-39. Many of the individual estimates are insignificant, but statistical tests decisively reject hypotheses that the destination airport, origin airport, or airline effects are zero. Among the airlines, the largest effects are for United (-26 percent), Sky West (-5 percent), Alaska (-13 percent), and American (-11 percent). Airport effects, in general, have smaller magnitudes than in the previous model. For example, the LAX effect goes from –12 percent to –6 percent, the JFK effect from –22 to +4 percent, and the SMF effect from +22 to +2 percent. The reason for these differences is that effects attributed to airports in the previous model are now attributed to

airlines. For example, the cuts in service to LAX are in large part the result of the cuts in service by United, Sky West, and American. The airport effects that remain large (and at least marginally significant) in the airline segment model include DEN (-15 percent), SEA (-16 percent), and Other (-13 percent).

The most statistically significant effect in the model is total frequency. Its value of about –2 percent means that the number of flights cut by an airline on a segment would increase by 2 for every increase of 100 flights offered by all airlines on the segment. In other words, airlines have cut their schedules in part based on competitors' flight frequency as opposed to just their own.

Table 8-40 uses the airline segment model to decompose flight reductions at each of the five California airports. Overall, the carrier and destination effects are the most important ones. These effects generally account between a half and a third of the total flights eliminated. About 20 percent of the cuts are associated with the total frequency effect. Finally, the destination effect has resulted in cuts at some airports—for example 118 flights in the case of LAX—while adding flights at others, including SFO (61 flights) and SJC (26 flights).

The airline segment model has an adjusted R^2 of 0.68. It thus accounts for most, but by no means all, of the variation in airline service cuts observed in our data set. The residual variation reflects the presence of second order effects, for example airline-airport effects and origin-destination effects. While these could be modeled, the plethora of coefficients that would have to be estimated would not contribute much additional understanding.

In summary, the models presented here elucidate patterns of post-9/11 reductions in services to California airports. The schedule changes have not been simple proportionate cuts, but the patterns of change can be approximated quite well with relatively simple models based on segment origin, destination, airline, and the amount pre-9/11 service. Estimates for these models suggest that each of these factors has a significant effect on the cuts observed, but that the most important ones are the origin airport and the airline. The California destinations that have seen the greatest service cuts, such as LAX and SFO, have incurred these losses primarily as a result of the airlines serving them and the airports to which they have flights, rather than local factors.

Changes in Temporal Patterns

The operational impact of post-9/11 schedule changes depend more on the temporal pattern of the schedule than on the total number of flights. To compare temporal patterns, we plot arrival rates throughout the day on corresponding Fridays in December 2000 and December 2001, for LAX and SFO. We associate an arrival rate with each flight by determining the time interval over which that flight and 19 previous flights are scheduled to arrive, and converting this into an hourly rate. We then plot arrival rate against the scheduled arrival time of the associated flight. The results for LAX and SFO appear in Figures 8-42 and 8-43, respectively.

LAX shows a very sharp drop in the level of peaking, with the highest rates reduced from over 120 in December 2000 to around 80 in 2001. The times of the largest peaks have also changed, from 12:00 to around 10:00 in the morning and from 21:30 to 21:00 in the evening. Several smaller peaks, including ones at 7:20, 13:10, and 14:20 have disappeared in the December 2001 schedule. SFO presents a different story. Peak rates are essentially the same in both periods, at around 50 arrivals per hour. The schedule reductions have affected the minimum rates more than the maximum ones. In December 2000, these rates generally remained above 25 per hour, while in 2001 they are more generally around 20.

Airport Financial Impacts

Another important aspect to the impacts of September 11, 2001, on California's aviation system is financial in nature. More specifically, it is important to understand how revenue and expenses at various airports in California changed as a result of the terrorist attacks and resulting changes in security requirements and shifts in passenger demand. To do this, financial information was gathered from various airports in California. Data were requested from a wide range of facilities to capture the impacts on both large commercial facilities as well as small general aviation airports. The following contains analyses of these collected data and sheds some light onto how airports throughout California were impacted by the events of September 11th.

Table 8-41 is a summary of all data collected from those airports responding to our requests for information. It must be noted that, due to the recent nature of it, much of the information received is preliminary and subject to change. Of the five airports able to provide data, SFO is by far the largest, having an average monthly revenue over the study period of

almost $45 million and average monthly expenses of almost $42 million. The smallest airport is RDD (Redding), having an average monthly revenue of just under $60,000. The other airports in the list exhibit monthly revenue and expense figures ranging from two to eight million dollars.

Figure 8-44 shows the revenues for all airports in this study for the months before September 11, 2001, and the months after. Figure 8-45 shows the expenses for all airports in this study for the months before September 11, 2001, and the months after. Figures 8-46 through 8-51 show the monthly revenues and expenses for each of the airports in the study for periods both before and after the terrorist attacks. The first two plots allow for comparisons to be made between airports while the latter set of plots allow for each airport to be analyzed individually and in more detail. While no monthly information was available for BUR (Burbank), the airport reports a $2.3 million total increase in expenses and $4.8 million total loss of revenue in the period from September 11th through May of 2002. A project planned to expand the airport's facilities to house new security equipment and personnel will cost approximately $6.5 million.

There are no general conclusions that can be applied to the entire state of California based on these data. Rather, the financial impacts seem to vary depending on the size and type of airport. While all airports in the study showed a loss in revenue in September due to the restrictions placed on the aviation system by the FAA immediately following the terrorist attacks, larger airports like SFO and SAN showed a further decline in revenue for October due to the drop in commercial traffic resulting from airline schedule reductions and decreased passenger demand. But both OAK and SNA (John Wayne in Orange County) were somehow able to recover more quickly from the hits taken in September and showed increases in revenue for October. OAK, for example, may have been better off because of the strong presence of Southwest Airlines at the airport. The impacts on expenses are, however, more consistent with increases shown at all airports in the study in the months following the terrorist attacks as new security regulations required airports to install new equipment and hire new personnel to handle changes in security procedures.

It is interesting to note that SFO's revenue and expense profiles are very different from most of the other airports in the study. Unlike most of the other airports, revenues and expenses at SFO were both decreasing prior to September 11th. And while most of the airports in this study recovered to regain some profit by the end of 2001, revenue at SFO was still lower than expenses

for December. Revenues at OAK and SNA never dropped below expenses but profits were diminished somewhat in the months following September 11th. SAN also exhibited a unique profile, showing a large negative difference between revenue and expenses for October and November but then alternating between monthly surpluses and deficits through February, when expenses seemed to stabilize and revenues began an upward trend. By March, the operating surplus generated at SAN was about half of what it was in July. At SJC, revenues fluctuated some after September but for the most part remained consistent. Expenses, on the other hand, fluctuated in a manner similar to those at SAN with October, December, and April showing especially high expense figures.

In general, it is reasonable that larger airports are more negatively impacted by the terrorist attacks than smaller facilities. One reason for this is that the fear of flying applies mostly to those people having to fly on larger aircraft that might be potential targets for terrorists. This factor mostly applies to those facilities where large air carriers, like United and American Airlines, dominate. Another reason is that general aviation operations have not been impacted as drastically as commercial operations and because smaller airports generally have a larger proportion of general aviation operations, they haven't been as negatively impacted as larger airports where commercial operations dominate.

A further, less quantitative, discussion must be devoted to these smaller airports (like RDD). In most cases, it was extremely difficult to obtain specific and complete revenue and expense information from smaller airports. But in talking with people at these facilities, it became clear that the impacts on general aviation were for the most part not negative and were in many cases positive. A shift in demand from commercial aviation to charter and private flights resulting from people (primarily business travelers) wanting to avoid the risk and inconvenience of flying on larger carriers resulted in traffic and revenues increasing at many of the smaller airports. And the fact that many of the new security requirements didn't apply to smaller operations means that smaller facilities were less susceptible to increases in expenses after September 11th and thus actually benefited as a result of the terrorist attacks.

It must be noted that the data obtained for these analyses do not allow for historical comparison. Thus, it is unclear whether or not seasonal factors that impact the finances at these various airports annually were at work in the periods looked at here. Also, other random effects

may have been involved that aren't inherently obvious from the data collected for this study. In the case of RDD, for example, revenue increased in October, not due to demand shifts resulting from the terrorist attacks, but due instead to increased fuel consumption as a result of air tankers based at the facility operating in response to wildfires. In any case, there are many more discrete factors that impact the various financial details at each individual airport than was looked at in this study. A more complete and in-depth analysis of the financial aspects at each airport could give a more complete picture of what happened at the airport as a result of the events of September 11th. In general, smaller airports, while impacted significantly in the period immediately after September 11th, have since returned to operating very much as usual. Large airports are the ones who have been subjected to the new regulations and scrutiny and are much more susceptible to demand shifts and are more influenced by the national economy. So, while the economic outlook for California's general aviation airports is generally pretty good, it remains uncertain for many of California's larger airports. And while revenues at many airports may recover to levels similar to those seen before September 11th, the expenses associated with improving security and meeting new regulations may continue well into the future.

Conclusions

California, while geographically distant from the events of September 11, was clearly not insulated from their effects. Many of the causalities, of course, were California residents. Moreover, as shown in this paper, the effects of the attack on the aviation system have hit the state with as much force as the rest of the nation. As of December 2001, passenger traffic, cargo traffic, and flight operations at California airports remained well below their levels in the previous year. California flight operations showed a slower initial recovery than national totals, although this partly reflected a higher level of flight activity in the state in late 2000, which increased the apparent reduction after September 2001.

Within California, effects have varied considerably, with several airports, including the two largest ones, losing about 20 percent of their commercial service, while others have experienced smaller reductions or, in a few cases, actually gained in terms of commercial service. In general, however, the changes imply less revenue for airports and concessionaires, reduced service convenience, and a loss in the private and corporate economic benefits that derive from air travel.

These economic impacts diffuse throughout the whole economy. The picture on the general aviation side of things is somewhat more optimistic, with trends showing possible increases in business aviation and charter activity nationwide and throughout California.

Traffic levels in the California aviation system appear well on the way to recovering from the dramatic effect of the terrorist attacks on September 11. By March of this year, passenger traffic systemwide was down about 11 percent from the previous year, having recovered over half of the 24 percent drop in October. The recovery has been fairly steady, and if current trends continue, it would appear that passenger traffic levels will reach those experienced in the previous year (prior to September) by late summer or early fall of this year.

The recovery of air freight traffic is also continuing at a steady rate, and if the current trends continue, systemwide traffic levels are likely to exceed those in 2001 by about June of this year. Indeed, the air freight traffic systemwide in January of this year was only 1 percent below that of the previous year. Freight trends are more of a reflection of general economic factors than of the September 11th tragedy.

The impacts of the reduction in aviation activity on airline and airport revenues, and the implications for airport development plans, are now becoming clearer. For most airports, it appears that if the current rate of recovery continues, traffic will return to the levels experienced in 2000 by the end of 2002 or early in 2003. This suggests that the development plans that were put on hold in the immediate aftermath of September 11 will need to be reactivated in the near future. However, this will be constrained by two factors. The first are the large financial losses incurred by both the airlines and airports in the months since September 2001, and the second are the costs involved in meeting the new security requirements. These two effects may induce airports to defer capacity expansion plans longer than they might otherwise, leading to a return to the levels of congestion and delay experienced in the recent past.

Table 8-1
Passenger Traffic at Selected California Airports

Airport	Aug 2000	Sep	Oct	Nov	Dec	Jan 2001	Feb	Mar
BUR	434,043	388,804	405,858	403,305	396,238	362,272	343,243	396,568
FAT	95,452	80,733	91,473	85,790	73,814	67,022	68,140	75,148
LAX	6,398,977	5,362,577	5,528,111	5,367,764	5,425,737	5,143,935	4,647,243	5,601,931
MRY	41,747	39,758	44,259	41,153	32,913	31,983	34,262	39,596
OAK	1,013,726	882,534	929,831	914,716	900,278	844,497	793,708	974,903
ONT	635,931	527,180	574,696	574,092	555,746	512,334	487,507	595,715
RDD	12,323	11,126	11,925	11,279	11,447	9,712	8,791	11,054
SAN	1,508,950	1,242,355	1,341,290	1,294,081	1,256,381	1,193,260	1,130,835	1,368,005
SBA	73,228	61,037	69,966	67,099	59,903	57,306	54,401	64,444
SBP	28,804	25,353	27,979	27,536	25,787	22,584	21,190	25,700
SFO	3,935,798	3,294,335	3,403,047	3,244,947	3,114,495	2,827,827	2,539,801	2,981,515
SJC	1,262,223	1,085,770	1,144,952	1,135,694	1,135,519	1,021,008	965,478	1,178,829
SMF	746,983	637,799	685,712	674,762	644,340	573,257	553,728	679,816
SNA	721,262	604,019	653,110	633,345	606,327	568,514	533,455	645,447
Total	**16,909,447**	**14,243,380**	**14,912,209**	**14,475,563**	**14,238,925**	**13,235,511**	**12,181,782**	**14,638,671**

Airport	Aug 2001	Sep	Oct	Nov	Dec	Jan 2002	Feb	Mar
BUR	446,530	251,470	347,122	349,445	344,109	341,514	319,962	379,921
FAT	91,274	60,084	80,179	69,760	68,451	70,872	67,338	79,693
LAX	6,627,525	3,589,558	3,934,549	4,039,875	4,352,194	4,201,337	3,880,663	4,800,669
MRY	42,256	24,083	32,369	29,343	25,377	26,700	27,049	31,050
OAK	1,205,921	676,551	885,680	877,990	870,658	838,343	797,153	973,479
ONT	686,203	382,334	522,607	500,165	497,272	472,220	452,582	554,734
RDD	14,062	7,823	9,899	8,874	8,349	7,999	7,136	8,251
SAN	1,592,487	865,378	1,099,947	1,138,396	1,110,885	1,070,974	1,007,335	1,272,683
SBA	74,562	43,340	56,836	52,114	50,272	52,053	47,626	60,217
SBP	31,436	18,211	22,196	22,501	22,096	21,087	20,697	24,759
SFO	3,733,133	2,055,759	2,285,751	2,300,255	2,329,301	2,284,066	2,018,536	2,525,892
SJC	1,440,812	735,423	872,759	868,659	871,736	819,739	791,578	962,023
SMF	819,478	476,787	628,073	620,079	599,832	561,083	546,329	678,790
SNA	783,600	403,467	553,194	584,293	571,876	552,496	527,943	637,612
Total	**17,589,279**	**9,590,268**	**11,331,161**	**11,461,749**	**11,722,408**	**11,320,483**	**10,511,927**	**12,989,773**

Table 8-2
Percentage Change in Passenger Traffic from 2000 to 2001

Airport	Aug 2001	Sep	Oct	Nov	Dec	Jan 2002	Feb	Mar
BUR	2.9	-35.3	-14.5	-13.4	-13.2	-5.7	-6.8	-4.2
FAT	-4.4	-25.6	-12.3	-18.7	-7.3	5.7	-1.2	6.0
LAX	3.6	-33.1	-28.8	-24.7	-19.8	-18.3	-16.5	-14.3
MRY	1.2	-39.4	-26.9	-28.7	-22.9	-16.5	-21.1	-21.6
OAK	19.0	-23.3	-4.7	-4.0	-3.3	-0.7	0.4	-0.1
ONT	7.9	-27.5	-9.1	-12.9	-10.5	-7.8	-7.2	-6.9
RDD	14.1	-29.7	-17.0	-21.3	-27.1	-17.6	-18.8	-25.4
SAN	5.5	-30.3	-18.0	-12.0	-11.6	-10.2	-10.9	-7.0
SBA	1.8	-29.0	-18.8	-22.3	-16.1	-9.2	-12.5	-6.6
SBP	9.1	-28.2	-20.7	-18.3	-14.3	-6.6	-2.3	-3.7
SFO	-5.1	-37.6	-32.8	-29.1	-25.2	-19.2	-20.5	-15.3
SJC	14.1	-32.3	-23.8	-23.5	-23.2	-19.7	-18.0	-18.4
SMF	9.7	-25.2	-8.4	-8.1	-6.9	-2.1	-1.3	-0.2
SNA	8.6	-33.2	-15.3	-7.7	-5.7	-2.8	-1.0	-1.2
Total	**4.0**	**-32.7**	**-24.0**	**-20.8**	**-17.7**	**-14.5**	**-13.7**	**-11.3**

Table 8-3
Air Freight Traffic at Selected California Airports
(000 Pounds)

Airport	Aug 2000	Sep	Oct	Nov	Dec	Jan 2001	Feb	Mar
BUR	6,873	5,404	6,349	6,260	5,512	6,674	6,217	6,351
FAT	3,174	3,316	3,736	4,028	4,346	3,362	3,210	3,000
LAX	342,964	329,604	369,134	341,882	375,458	275,188	287,432	327,884
MHR	13,018	10,940	15,293	14,238	16,522	9,407	9,518	12,507
MRY	173	156	23	31	88	117	110	148
OAK	132,303	127,730	138,411	115,332	124,506	105,562	105,708	117,547
ONT	83,644	77,280	73,446	71,808	81,894	68,458	68,664	78,254
RDD	448	437	429	367	340	345	327	363
SAN	19,950	18,239	19,800	18,930	17,050	17,423	17,094	20,636
SBA	605	612	575	510	572	493	467	558
SBP	255	231	243	218	233	201	195	202
SFO	132,184	131,059	138,270	124,849	122,639	97,597	98,043	112,453
SJC	29,031	27,221	28,192	25,077	25,000	21,771	22,937	27,136
SMF	9,023	8,195	8,606	8,160	8,955	7,614	7,223	8,836
SNA	2,831	2,915	2,770	2,948	2,860	3,189	3,116	2,955
Total	**776,477**	**743,339**	**805,277**	**734,638**	**785,976**	**617,401**	**630,260**	**718,830**

Airport	Aug 2001	Sep	Oct	Nov	Dec	Jan 2002	Feb	Mar
BUR	6,110	4,694	5,289	5,346	4,801	6,406	5,582	6,176
FAT	2,828	2,715	2,972	2,887	3,838	2,655	2,602	2,939
LAX	301,612	271,290	317,224	299,740	311,354	267,358	254,318	316,044
MHR	11,322	8,396	11,437	12,131	11,470	7,333	12,538	11,077
MRY	107	113	171	154	177	158	154	176
OAK	107,858	92,355	115,294	111,324	122,212	113,965	104,069	117,448
ONT	58,680	66,674	80,686	72,486	99,446	78,146	73,426	79,788
RDD	379	279	352	372	345	323	314	341
SAN	21,625	18,262	21,464	21,215	22,665	20,283	19,546	21,156
SBA	539	349	525	511	462	449	382	458
SBP	215	130	194	183	204	219	200	201
SFO	100,948	77,027	88,385	80,000	79,996	76,346	78,780	89,179
SJC	27,910	22,176	28,010	25,077	22,038	23,947	22,719	26,006
SMF	8,807	9,346	11,491	10,911	10,207	11,373	9,794	11,070
SNA	2,582	2,256	2,479	2,423	2,714	2,278	2,346	2,600
Total	**651,523**	**576,061**	**685,972**	**644,760**	**691,929**	**611,239**	**586,770**	**684,658**

Table 8-4
Percentage Change in Air Freight Traffic from 2000 to 2001

Airport	Aug 2001	Sep	Oct	Nov	Dec	Jan 2002	Feb	Mar
BUR	-11.1	-13.1	-16.7	-14.6	-12.9	-4.0	-10.2	-2.8
FAT	-10.9	-18.1	-20.4	-28.3	-11.7	-21.0	-18.9	-2.0
LAX	-12.1	-17.7	-14.1	-12.3	-17.1	-2.8	-11.5	-3.6
MHR	-13.0	-23.3	-25.2	-14.8	-30.6	-22.0	31.7	-11.4
MRY	-38.2	-27.6	643.5	396.8	101.1	35.0	40.0	18.9
OAK	-18.5	-27.7	-16.7	-3.5	-1.8	8.0	-1.6	-0.1
ONT	-29.8	-13.7	9.9	0.9	21.4	14.2	6.9	2.0
RDD	-15.4	-36.3	-18.1	1.5	1.4	-6.3	-4.0	-6.0
SAN	8.4	0.1	8.4	12.1	32.9	16.4	14.3	2.5
SBA	-10.9	-43.1	-8.8	0.1	-19.3	-8.9	-18.2	-17.9
SBP	-15.7	-43.7	-20.2	-16.1	-12.4	9.0	2.6	-0.5
SFO	-23.6	-41.2	-36.1	-35.9	-34.8	-21.8	-19.6	-20.7
SJC	-3.9	-18.5	-0.6	0.0	-11.8	10.0	-1.0	-4.2
SMF	-2.4	14.0	33.5	33.7	14.0	49.4	35.6	25.3
SNA	-8.8	-22.6	-10.5	-17.8	-5.1	-28.6	-24.7	-12.0
Total	**-16.1**	**-22.5**	**-14.8**	**-12.2**	**-12.0**	**-1.0**	**-6.9**	**-4.8**

Table 8-5
Weekly Flights by O-D Pair

Number of Weekly Flights													
LAX to ONT	LAX to SAN	LAX to SFO	LAX to SJC	ONT to SAN	ONT to SFO	ONT to SJC	SAN to SFO	SAN to SJC	SFO to SJC	Week			Year
86	374	298	219	9	36	50	156	104	3	8/7	to	8/13	
85	362	297	212	8	40	49	154	105	1	8/14	to	8/20	
81	367	299	216	13	39	49	154	103	1	8/21	to	8/27	
82	345	266	199	9	34	47	152	99	0	8/28	to	9/3	
76	403	285	208	10	42	48	156	105	1	9/4	to	9/10	
72	403	277	213	11	41	50	153	105	3	9/11	to	9/17	2000
67	399	279	215	11	39	51	146	102	1	9/18	to	9/24	
68	418	293	218	10	38	51	143	102	1	9/25	to	10/1	
68	408	274	209	11	41	49	149	102	1	10/2	to	10/8	
74	445	271	207	10	37	49	144	104	2	10/9	to	10/15	
66	405	288	204	11	38	49	148	103	1	10/16	to	10/22	
71	429	263	208	8	36	49	140	103	1	10/23	to	10/29	
51	377	334	240	1	36	63	107	105	1	8/6	to	8/12	
57	378	335	231	7	36	60	105	107	0	8/13	to	8/19	
48	376	321	241	2	35	63	98	104	0	8/20	to	8/26	
47	346	304	223	9	33	62	96	103	0	8/27	to	9/2	
58	378	310	231	0	31	60	106	105	1	9/3	to	9/9	
24	172	114	95	2	8	30	30	54	0	9/10	to	9/16	2001
4	293	229	184	0	28	63	70	105	0	9/17	to	9/23	
8	271	259	188	17	35	64	81	107	0	9/24	to	9/30	
36	284	227	200	11	38	65	82	102	1	10/1	to	10/7	
40	277	223	202	9	43	65	84	107	1	10/8	to	10/14	
38	267	216	198	9	42	65	87	103	1	10/15	to	10/21	
38	264	221	193	2	41	66	83	107	1	10/22	to	10/28	

Source: ASPM

Table 8-6
Total Operations

			Operations By Class				
Month	Category	Year	Air Carrier	Air Taxi	General Aviation	Military	Total Operations
October	California	2000	149,069	69,891	518,273	8,251	745,484
		2001	131,685	67,485	519,739	9,101	728,010
	National	2000	1,303,978	939,091	3,430,141	250,639	5,923,849
		2001	1,085,490	922,405	3,183,727	266,280	5,457,902
December	California	2000	147,294	67,311	498,405	7,118	720,128
		2001	124,047	58,931	440,457	6,596	630,031
	National	2000	1,241,042	851,798	2,481,497	181,288	4,755,625
		2001	1,077,161	846,690	2,617,298	197,614	4,738,763

Source: OPSNET

Table 8-7

Percent Change in Total Operations from 2000 to 2001

Month	Category	Operations By Class				Total Operations
		Air Carrier	Air Taxi	General Aviation	Military	
October	California	-11.7	-3.4	0.3	10.3	-2.3
	National	-16.8	-1.8	-7.2	6.2	-7.9
December	California	-15.8	-12.4	-11.6	-7.3	-12.5
	National	-13.2	-0.6	5.5	9.0	-0.4

Source: OPSNET

Table 8-8

California Operations for October of 2000

	Operations by Class				Total
Facility	Air Carrier	Air Taxi	General Aviation	Military	Operations
APC	0	163	11,075	3	11,241
BFL	11	4,092	13,124	132	17,359
BUR	4,777	2,444	5,627	19	12,867
CIC	0	522	3,414	149	4,085
CMA	0	265	12,969	0	13,234
CNO	0	26	10,975	37	11,038
CRQ	0	1,443	18,478	945	20,866
EMT	0	215	13,389	35	13,639
FAT	1,320	3,781	18,880	939	24,920
FUL	0	20	6,647	0	6,667
HHR	0	123	5,705	0	5,828
HWD	0	41	12,232	4	12,277
LAX	49,299	17,396	1,566	195	68,456
LGB	954	488	27,016	73	28,531
LVK	0	52	18,921	37	19,010
MHR	1,101	1,248	4,499	878	7,726
MOD	0	1,397	7,078	40	8,515
MRY	17	2,592	5,261	101	7,971
MYF	0	675	16,324	18	17,017
OAK	13,098	3,465	20,358	204	37,125
ONT	8,226	2,401	2,921	7	13,555
OXR	0	1,223	5,203	85	6,511
PAO	0	0	17,798	0	17,798
PMD	10	42	1,103	2,294	3,449
POC	0	112	19,916	1	20,029
PSP	578	2,214	4,527	50	7,369
RAL	0	59	6,449	6	6,514
RDD	0	1,300	4,753	112	6,165
RHV	0	0	18,270	1	18,271
SAC	0	489	8,744	12	9,245
SAN	13,022	3,882	1,415	43	18,362
SBA	723	2,744	9,620	85	13,172
SBP	0	1,307	6,923	83	8,313
SCK	0	19	4,700	77	4,796
SDM	0	8	8,471	255	8,734
SEE	0	4	14,920	0	14,924
SFO	27,846	5,699	2,143	203	35,891
SJC	13,162	1,494	10,918	8	25,582
SMF	7,698	1,770	3,643	599	13,710
SMO	0	678	12,150	101	12,929
SMX	7	998	5,156	87	6,248
SNA	7,220	1,161	23,469	66	31,916
SNS	0	208	7,837	21	8,066
SQL	0	0	12,892	6	12,898
STS	0	590	9,449	12	10,051
TOA	0	0	12,993	44	13,037
TVL	0	0	0	0	0
VNY	0	825	32,296	26	33,147
WHP	0	0	9,772	106	9,878
WJF	0	216	6,284	52	6,552

Source: OPSNET

Table 8-9

California Operations for October of 2001

	Operations by Class				Total
Facility	Air Carrier	Air Taxi	General Aviation	Military	Operations
APC	0	353	11,977	36	12,366
BFL	56	3,867	13,367	153	17,443
BUR	4,713	2,683	6,211	49	13,656
CIC	0	571	3,618	225	4,414
CMA	0	252	15,606	18	15,876
CNO	0	45	12,123	23	12,191
CRQ	0	1,156	15,833	121	17,110
EMT	1	209	12,110	10	12,330
FAT	1,664	2,983	11,522	1,051	17,220
FUL	0	4	6,079	3	6,086
HHR	0	129	5,519	29	5,677
HWD	0	134	12,558	24	12,716
LAX	39,803	14,132	1,067	251	55,253
LGB	891	772	27,298	73	29,034
LVK	0	95	16,868	1	16,964
MHR	389	1,092	4,152	851	6,484
MOD	2	1,314	7,249	54	8,619
MRY	2	2,698	5,551	89	8,340
MYF	0	559	16,657	13	17,229
OAK	13,297	3,836	17,518	20	34,671
ONT	8,295	1,995	3,211	6	13,507
OXR	0	1,169	4,737	44	5,950
PAO	0	39	16,240	0	16,279
PMD	63	49	891	3,129	4,132
POC	3	110	20,680	6	20,799
PSP	481	2,156	6,125	52	8,814
RAL	0	76	8,619	6	8,701
RDD	4	1,217	4,797	59	6,077
RHV	0	1	21,372	0	21,373
SAC	0	310	10,576	37	10,923
SAN	11,990	2,798	1,103	243	16,134
SBA	767	2,581	10,227	52	13,627
SBP	0	1,369	8,338	51	9,758
SCK	0	92	8,187	533	8,812
SDM	0	6	9,226	604	9,836
SEE	0	5	13,837	7	13,849
SFO	22,442	5,679	1,196	216	29,533
SJC	12,062	2,522	6,366	14	20,964
SMF	7,714	2,092	2,736	500	13,042
SMO	0	1,349	9,096	133	10,578
SMX	5	858	5,332	50	6,245
SNA	7,041	1,548	23,481	7	32,077
SNS	0	48	6,647	9	6,704
SQL	0	58	13,758	2	13,818
STS	0	614	10,243	15	10,872
TOA	0	28	10,940	97	11,065
TVL	0	166	1,059	34	1,259
VNY	0	1,411	41,883	29	43,323
WHP	0	4	9,412	4	9,420
WJF	0	251	6,521	68	6,840

Source: OPSNET

Table 8-10

California Operations for December of 2000

	Operations by Class				Total
Facility	Air Carrier	Air Taxi	General Aviation	Military	Operations
APC	0	72	9,482	45	9,599
BFL	41	3,328	7,236	51	10,656
BUR	4,870	2,448	5,954	37	13,309
CIC	0	529	2,435	82	3,046
CMA	0	183	14,156	0	14,339
CNO	0	7	14,129	10	14,146
CRQ	0	1,249	16,679	560	18,488
EMT	0	214	14,014	30	14,258
FAT	1,290	3,517	10,313	823	15,943
FUL	0	0	6,796	0	6,796
HHR	0	115	5,685	0	5,800
HWD	0	54	11,196	1	11,251
LAX	47,892	17,172	1,355	190	66,609
LGB	894	415	26,311	56	27,676
LVK	0	20	20,377	10	20,407
MHR	1,150	1,219	2,786	798	5,953
MOD	0	912	4,085	20	5,017
MRY	5	2,526	6,007	88	8,626
MYF	0	595	18,902	7	19,504
OAK	13,569	3,885	19,080	6	36,540
ONT	9,040	2,608	2,890	1	14,539
OXR	0	1,131	5,546	102	6,779
PAO	0	0	17,252	0	17,252
PMD	0	71	857	2,209	3,137
POC	0	142	19,102	6	19,250
PSP	997	2,544	4,698	39	8,278
RAL	0	43	7,825	2	7,870
RDD	2	1,235	3,797	86	5,120
RHV	0	0	17,276	9	17,285
SAC	0	452	8,027	30	8,509
SAN	12,621	3,808	1,145	125	17,699
SBA	774	2,777	11,035	81	14,667
SBP	2	1,400	6,675	19	8,096
SCK	2	7	4,763	236	5,008
SDM	0	15	9,514	554	10,083
SEE	0	3	14,451	12	14,466
SFO	26,881	5,341	1,624	131	33,977
SJC	12,847	1,232	9,146	10	23,235
SMF	7,464	1,649	1,555	355	11,023
SMO	0	556	11,762	78	12,396
SMX	3	960	6,662	54	7,679
SNA	6,944	1,179	20,671	9	28,803
SNS	0	73	6,315	15	6,403
SQL	0	0	13,145	0	13,145
STS	6	495	9,525	14	10,040
TOA	0	5	12,884	50	12,939
TVL	0	0	0	0	0
VNY	0	711	35,616	13	36,340
WHP	0	0	10,349	0	10,349
WJF	0	414	7,320	64	7,798

Source: OPSNET

Table 8-11

California Operations for December of 2001

	Operations by Class				Total
Facility	Air Carrier	Air Taxi	General Aviation	Military	Operations
APC	0	123	7,819	22	7,964
BFL	31	2,750	8,167	102	11,050
BUR	4,515	2,413	5,662	19	12,609
CIC	0	484	1,759	63	2,306
CMA	0	216	13,044	8	13,268
CNO	0	33	11,421	6	11,460
CRQ	0	1,053	16,345	95	17,493
EMT	4	199	11,189	8	11,400
FAT	1,373	2,505	6,653	724	11,255
FUL	0	0	7,947	4	7,951
HHR	0	51	6,433	55	6,539
HWD	0	58	10,061	42	10,161
LAX	36,365	13,637	1,052	190	51,244
LGB	771	745	25,470	46	27,032
LVK	0	118	14,238	2	14,358
MHR	783	1,005	1,945	956	4,689
MOD	0	982	4,460	35	5,477
MRY	6	1,719	3,789	102	5,616
MYF	3	514	17,338	36	17,891
OAK	12,770	3,428	13,064	10	29,272
ONT	8,319	2,076	2,521	0	12,916
OXR	0	973	5,561	66	6,600
PAO	0	4	13,441	0	13,445
PMD	35	14	698	1,969	2,716
POC	0	123	18,807	0	18,930
PSP	740	2,035	5,153	72	8,000
RAL	0	63	8,211	4	8,278
RDD	0	1,100	2,962	21	4,083
RHV	0	2	17,309	0	17,311
SAC	3	232	5,530	23	5,788
SAN	11,328	2,892	950	128	15,298
SBA	1,030	2,177	8,973	66	12,246
SBP	0	1,381	5,939	74	7,394
SCK	0	69	5,014	188	5,271
SDM	0	23	9,235	470	9,728
SEE	0	2	12,261	13	12,276
SFO	20,916	5,135	950	171	27,172
SJC	10,798	1,804	6,038	11	18,651
SMF	7,490	1,852	1,595	357	11,294
SMO	0	883	10,858	156	11,897
SMX	1	752	4,732	42	5,527
SNA	6,766	1,056	21,335	9	29,166
SNS	0	47	4,507	18	4,572
SQL	0	4	10,625	0	10,629
STS	0	413	6,395	8	6,816
TOA	0	22	11,692	89	11,803
TVL	0	236	448	37	721
VNY	0	1,329	36,097	26	37,452
WHP	0	0	8,884	6	8,890
WJF	0	199	5,880	47	6,126

Source: OPSNET

Table 8-12
California Operations at the Six Largest Air Carrier Airports

Month	Year	Facility	Operations by Class				Total Operations
			Air Carrier	Air Taxi	General Aviation	Military	
October	2000	LAX	49,299	17,396	1,566	195	68,456
		OAK	13,098	3,465	20,358	204	37,125
		ONT	8,226	2,401	2,921	7	13,555
		SAN	13,022	3,882	1,415	43	18,362
		SFO	27,846	5,699	2,143	203	35,891
		SJC	13,162	1,494	10,918	8	25,582
	2001	LAX	39,803	14,132	1,067	251	55,253
		OAK	13,297	3,836	17,518	20	34,671
		ONT	8,295	1,995	3,211	6	13,507
		SAN	11,990	2,798	1,103	243	16,134
		SFO	22,442	5,679	1,196	216	29,533
		SJC	12,062	2,522	6,366	14	20,964
December	2000	LAX	47,892	17,172	1,355	190	66,609
		OAK	13,569	3,885	19,080	6	36,540
		ONT	9,040	2,608	2,890	1	14,539
		SAN	12,621	3,808	1,145	125	17,699
		SFO	26,881	5,341	1,624	131	33,977
		SJC	12,847	1,232	9,146	10	23,235
	2001	LAX	36,365	13,637	1,052	190	51,244
		OAK	12,770	3,428	13,064	10	29,272
		ONT	8,319	2,076	2,521	0	12,916
		SAN	11,328	2,892	950	128	15,298
		SFO	20,916	5,135	950	171	27,172
		SJC	10,798	1,804	6,038	11	18,651

Source: OPSNET

Table 8-13
Percent Change in California Operations

Month	Facility	Operations by Class				Total Operations
		Air Carrier	Air Taxi	General Aviation	Military	
October	LAX	-19.3	-18.8	-31.9	28.7	-19.3
	OAK	1.5	10.7	-14.0	-90.2	-6.6
	ONT	0.8	-16.9	9.9	-14.3	-0.4
	SAN	-7.9	-27.9	-22.0	465.1	-12.1
	SFO	-19.4	-0.4	-44.2	6.4	-17.7
	SJC	-8.4	68.8	-41.7	75.0	-18.1
December	LAX	-24.1	-20.6	-22.4	0.0	-23.1
	OAK	-5.9	-11.8	-31.5	66.7	-19.9
	ONT	-8.0	-20.4	-12.8	-100.0	-11.2
	SAN	-10.2	-24.1	-17.0	2.4	-13.6
	SFO	-22.2	-3.9	-41.5	30.5	-20.0
	SJC	-15.9	46.4	-34.0	10.0	-19.7

Source: OPSNET

Table 8-14
Weekly Operations at LAX

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	11,294	3,614	363	50	15,321	11,090	4,057	307	27	15,481
8/13	to	8/19	11,215	3,790	381	49	15,435	11,151	3,959	305	25	15,440
8/20	to	8/26	11,288	3,756	286	52	15,382	11,046	3,999	336	40	15,421
8/27	to	9/2	10,665	3,917	257	42	14,881	10,894	3,774	319	41	15,028
9/3	to	9/9	11,313	3,724	282	38	15,357	10,680	3,905	286	45	14,916
9/10	to	9/16	11,253	3,956	321	54	15,584	4,712	2,023	157	31	6,923
9/17	to	9/23	11,077	4,002	412	48	15,539	9,181	3,412	212	54	12,859
9/24	to	9/30	11,201	3,996	342	37	15,576	9,337	3,270	166	88	12,861
10/1	to	10/7	11,316	3,935	392	45	15,688	9,149	3,269	230	70	12,718
10/8	to	10/14	11,078	4,051	367	41	15,537	9,053	3,183	225	55	12,516
10/15	to	10/21	11,140	3,718	333	58	15,249	9,018	3,098	252	60	12,428
10/22	to	10/28	11,084	3,959	331	33	15,407	8,904	3,174	236	34	12,348

Source: OPSNET

Table 8-15
Weekly Operations at OAK

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	2,762	842	4,903	2	8,509	3,334	954	3,872	137	8,297
8/13	to	8/19	2,861	805	4,905	4	8,575	3,545	895	3,880	29	8,349
8/20	to	8/26	2,876	840	5,591	1	9,308	3,111	835	3,941	0	7,887
8/27	to	9/2	2,792	771	4,748	5	8,316	3,107	839	4,090	3	8,039
9/3	to	9/9	2,729	719	5,095	1	8,544	3,144	758	4,755	8	8,665
9/10	to	9/16	2,850	782	5,314	0	8,946	1,446	492	920	3	2,861
9/17	to	9/23	2,910	758	5,010	1	8,679	2,953	889	1,516	12	5,370
9/24	to	9/30	2,858	732	5,406	5	9,001	3,036	924	4,026	3	7,989
10/1	to	10/7	2,976	786	4,515	78	8,355	3,100	869	3,944	5	7,918
10/8	to	10/14	3,098	689	5,353	119	9,259	2,978	795	3,820	5	7,598
10/15	to	10/21	2,895	808	4,612	2	8,317	2,975	924	4,255	7	8,161
10/22	to	10/28	2,930	927	3,860	0	7,717	2,896	777	3,950	3	7,626

Source: OPSNET

Table 8-16
Weekly Operations at ONT

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	1,871	599	605	5	3,080	1,895	401	752	0	3,048
8/13	to	8/19	1,893	720	756	1	3,370	1,949	435	801	0	3,185
8/20	to	8/26	1,822	577	873	0	3,272	1,886	414	643	1	2,944
8/27	to	9/2	1,815	478	664	3	2,960	1,878	429	807	0	3,114
9/3	to	9/9	1,806	532	602	0	2,940	1,808	368	691	6	2,873
9/10	to	9/16	1,894	553	725	2	3,174	979	269	439	0	1,687
9/17	to	9/23	1,912	509	620	2	3,043	1,757	340	505	1	2,603
9/24	to	9/30	1,887	490	648	4	3,029	1,904	395	652	4	2,955
10/1	to	10/7	1,832	565	645	3	3,045	1,862	449	714	0	3,025
10/8	to	10/14	1,852	582	557	0	2,991	1,876	462	649	1	2,988
10/15	to	10/21	1,860	561	610	2	3,033	1,895	449	855	2	3,201
10/22	to	10/28	1,896	501	816	0	3,213	1,841	423	643	0	2,907

Source: OPSNET

Table 8-17
Weekly Operations at SAN

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	3,036	667	330	15	4,048	3,097	849	342	25	4,313
8/13	to	8/19	3,034	680	405	14	4,133	3,163	883	298	11	4,355
8/20	to	8/26	3,055	699	259	29	4,042	3,101	843	253	31	4,228
8/27	to	9/2	2,970	657	238	23	3,888	3,029	801	217	27	4,074
9/3	to	9/9	2,969	785	329	19	4,102	3,081	852	274	31	4,238
9/10	to	9/16	2,964	823	252	13	4,052	1,327	496	88	54	1,965
9/17	to	9/23	2,969	819	326	18	4,132	2,607	735	252	86	3,680
9/24	to	9/30	2,984	851	294	21	4,150	2,864	684	218	64	3,830
10/1	to	10/7	2,970	847	365	10	4,192	2,724	643	245	67	3,679
10/8	to	10/14	2,945	918	342	13	4,218	2,764	654	217	46	3,681
10/15	to	10/21	2,937	863	305	10	4,115	2,736	634	305	67	3,742
10/22	to	10/28	2,943	876	270	6	4,095	2,591	599	220	49	3,459

Source: OPSNET

Table 8-18
Weekly Operations at SFO

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	6,590	1,489	567	44	8,690	6,676	1,298	368	57	8,399
8/13	to	8/19	6,567	1,581	567	46	8,761	6,641	1,329	361	60	8,391
8/20	to	8/26	6,552	1,504	417	45	8,518	6,588	1,205	324	43	8,160
8/27	to	9/2	6,338	1,418	379	45	8,180	6,402	1,229	321	31	7,983
9/3	to	9/9	6,392	1,387	515	58	8,352	6,405	1,260	379	67	8,111
9/10	to	9/16	6,357	1,300	543	30	8,230	2,387	814	130	45	3,376
9/17	to	9/23	6,365	1,349	687	35	8,436	5,090	1,284	216	43	6,633
9/24	to	9/30	6,389	1,289	482	57	8,217	5,374	1,409	241	55	7,079
10/1	to	10/7	6,367	1,359	505	69	8,300	5,148	1,254	294	45	6,741
10/8	to	10/14	6,272	1,285	533	42	8,132	5,081	1,324	267	55	6,727
10/15	to	10/21	6,379	1,323	501	36	8,239	5,058	1,262	232	45	6,597
10/22	to	10/28	6,162	1,145	437	41	7,785	5,069	1,291	275	51	6,686

Source: OPSNET

Table 8-19
Weekly Operations at SJC

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000					Weekly Ops in Aug., Sep., and Oct. 2001				
			Air Carrier	Air Taxi	General Aviation	Military	Total	Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	2,766	249	2,911	22	5,948	3,263	393	2,355	14	6,025
8/13	to	8/19	2,698	271	2,790	6	5,765	3,286	462	2,376	3	6,127
8/20	to	8/26	2,856	348	2,903	7	6,114	3,090	416	1,904	13	5,423
8/27	to	9/2	2,792	343	2,435	1	5,571	3,112	433	1,878	2	5,425
9/3	to	9/9	2,827	251	3,145	5	6,228	3,116	432	2,114	2	5,664
9/10	to	9/16	2,889	386	2,730	7	6,012	1,348	379	605	2	2,334
9/17	to	9/23	2,852	394	2,807	2	6,055	2,544	539	873	2	3,958
9/24	to	9/30	2,903	323	2,790	2	6,018	2,805	535	1,562	1	4,903
10/1	to	10/7	2,969	346	2,892	1	6,208	2,756	564	1,691	2	5,013
10/8	to	10/14	2,945	354	2,144	5	5,448	2,899	551	1,425	6	4,881
10/15	to	10/21	3,000	320	2,692	0	6,012	2,707	566	1,357	2	4,632
10/22	to	10/28	2,924	328	2,114	1	5,367	2,533	576	1,269	1	4,379

Source: OPSNET

Table 8-20
2001 Ops as % of 2000 Ops at LAX

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	98	112	85	54	101
8/13	to	8/19	99	104	80	51	100
8/20	to	8/26	98	106	117	77	100
8/27	to	9/2	102	96	124	98	101
9/3	to	9/9	94	105	101	118	97
9/10	to	9/16	42	51	49	57	44
9/17	to	9/23	83	85	51	113	83
9/24	to	9/30	83	82	49	238	83
10/1	to	10/7	81	83	59	156	81
10/8	to	10/14	82	79	61	134	81
10/15	to	10/21	81	83	76	103	82
10/22	to	10/28	80	80	71	103	80

Source: OPSNET

Table 8-21
2001 Ops as % of 2000 Ops at OAK

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	121	113	79	6,850	98
8/13	to	8/19	124	111	79	725	97
8/20	to	8/26	108	99	70	0	85
8/27	to	9/2	111	109	86	60	97
9/3	to	9/9	115	105	93	800	101
9/10	to	9/16	51	63	17	---	32
9/17	to	9/23	101	117	30	1,200	62
9/24	to	9/30	106	126	74	60	89
10/1	to	10/7	104	111	87	6	95
10/8	to	10/14	96	115	71	4	82
10/15	to	10/21	103	114	92	350	98
10/22	to	10/28	99	84	102	---	99

Source: OPSNET

Table 8-22
2001 Ops as % of 2000 Ops at ONT

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	101	67	124	0	99
8/13	to	8/19	103	60	106	0	95
8/20	to	8/26	104	72	74	---	90
8/27	to	9/2	103	90	122	0	105
9/3	to	9/9	100	69	115	---	98
9/10	to	9/16	52	49	61	0	53
9/17	to	9/23	92	67	81	50	86
9/24	to	9/30	101	81	101	100	98
10/1	to	10/7	102	79	111	0	99
10/8	to	10/14	101	79	117	---	100
10/15	to	10/21	102	80	140	100	106
10/22	to	10/28	97	84	79	---	90

Source: OPSNET

Table 8-23
2001 Ops as % of 2000 Ops at SAN

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	102	127	104	167	107
8/13	to	8/19	104	130	74	79	105
8/20	to	8/26	102	121	98	107	105
8/27	to	9/2	102	122	91	117	105
9/3	to	9/9	104	109	83	163	103
9/10	to	9/16	45	60	35	415	48
9/17	to	9/23	88	90	77	478	89
9/24	to	9/30	96	80	74	305	92
10/1	to	10/7	92	76	67	670	88
10/8	to	10/14	94	71	63	354	87
10/15	to	10/21	93	73	100	670	91
10/22	to	10/28	88	68	81	817	84

Source: OPSNET

Table 8-24
2001 Ops as % of 2000 Ops at SFO

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	101	87	65	130	97
8/13	to	8/19	101	84	64	130	96
8/20	to	8/26	101	80	78	96	96
8/27	to	9/2	101	87	85	69	98
9/3	to	9/9	100	91	74	116	97
9/10	to	9/16	38	63	24	150	41
9/17	to	9/23	80	95	31	123	79
9/24	to	9/30	84	109	50	96	86
10/1	to	10/7	81	92	58	65	81
10/8	to	10/14	81	103	50	131	83
10/15	to	10/21	79	95	46	125	80
10/22	to	10/28	82	113	63	124	86

Source: OPSNET

Table 8-25
2001 Ops as % of 2000 Ops at SJC

Week (2001)			Air Carrier	Air Taxi	General Aviation	Military	Total
8/6	to	8/12	118	158	81	64	101
8/13	to	8/19	122	170	85	50	106
8/20	to	8/26	108	120	66	186	89
8/27	to	9/2	111	126	77	200	97
9/3	to	9/9	110	172	67	40	91
9/10	to	9/16	47	98	22	29	39
9/17	to	9/23	89	137	31	100	65
9/24	to	9/30	97	166	56	50	81
10/1	to	10/7	93	163	58	200	81
10/8	to	10/14	98	156	66	120	90
10/15	to	10/21	90	177	50	---	77
10/22	to	10/28	87	176	60	100	82

Source: OPSNET

Table 8-26
Total Weekly Operations at California Airports

Week (2001)			Weekly Ops in Aug., Sep., and Oct. 2000						Weekly Ops in Aug., Sep., and Oct. 2001					
			LAX	OAK	ONT	SAN	SFO	SJC	LAX	OAK	ONT	SAN	SFO	SJC
8/6	to	8/12	15,321	8,509	3,080	4,048	8,690	5,948	15,481	8,297	3,048	4,313	8,399	6,025
8/13	to	8/19	15,435	8,575	3,370	4,133	8,761	5,765	15,440	8,349	3,185	4,355	8,391	6,127
8/20	to	8/26	15,382	9,308	3,272	4,042	8,518	6,114	15,421	7,887	2,944	4,228	8,160	5,423
8/27	to	9/2	14,881	8,316	2,960	3,888	8,180	5,571	15,028	8,039	3,114	4,074	7,983	5,425
9/3	to	9/9	15,357	8,544	2,940	4,102	8,352	6,228	14,916	8,665	2,873	4,238	8,111	5,664
9/10	to	9/16	15,584	8,946	3,174	4,052	8,230	6,012	6,923	2,861	1,687	1,965	3,376	2,334
9/17	to	9/23	15,539	8,679	3,043	4,132	8,436	6,055	12,859	5,370	2,603	3,680	6,633	3,958
9/24	to	9/30	15,576	9,001	3,029	4,150	8,217	6,018	12,861	7,989	2,955	3,830	7,079	4,903
10/1	to	10/7	15,688	8,355	3,045	4,192	8,300	6,208	12,718	7,918	3,025	3,679	6,741	5,013
10/8	to	10/14	15,537	9,259	2,991	4,218	8,132	5,448	12,516	7,598	2,988	3,681	6,727	4,881
10/15	to	10/21	15,249	8,317	3,033	4,115	8,239	6,012	12,428	8,161	3,201	3,742	6,597	4,632
10/22	to	10/28	15,407	7,717	3,213	4,095	7,785	5,367	12,348	7,626	2,907	3,459	6,686	4,379

Source: OPSNET

Table 8-27
Total 2001 Operations as a % of Total 2000 Operations at California Airports

Week (2001)			LAX	OAK	ONT	SAN	SFO	SJC
8/6	to	8/12	101	98	99	107	97	101
8/13	to	8/19	100	97	95	105	96	106
8/20	to	8/26	100	85	90	105	96	89
8/27	to	9/2	101	97	105	105	98	97
9/3	to	9/9	97	101	98	103	97	91
9/10	to	9/16	44	32	53	48	41	39
9/17	to	9/23	83	62	86	89	79	65
9/24	to	9/30	83	89	98	92	86	81
10/1	to	10/7	81	95	99	88	81	81
10/8	to	10/14	81	82	100	87	83	90
10/15	to	10/21	82	98	106	91	80	77
10/22	to	10/28	80	99	90	84	86	82

Source: OPSNET

Table 8-28
Arrival Delay, 2000 and 2001

Category	Month	Year	Average Arrival Delay (min.)
California	October	2000	21.35
		2001	8.90
	December	2000	19.51
		2001	12.33
National	October	2000	12.96
		2001	8.56
	December	2000	21.37
		2001	10.54

Source: ASPM

Table 8-29

Change in Flights to LAX, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
TOTAL	**904.5**	**737.5**	**928.5**	**689.5**	-18%	-26%
LAS	58.0	48.0	54.5	45.0	-17%	-17%
SAN	59.0	36.5	69.0	42.0	-38%	-39%
PHX	52.0	36.5	52.5	35.0	-30%	-33%
OAK	40.0	31.0	39.0	31.0	-23%	-21%
SFO	46.5	34.5	46.0	31.0	-26%	-33%
SJC	32.0	29.0	33.5	29.0	-9%	-13%
ORD	33.0	28.0	31.0	24.0	-15%	-23%
SEA	23.5	17.5	21.5	21.0	-26%	-2%
FAT	25.5	23.0	25.0	20.0	-10%	-20%
SBA	23.5	22.0	29.5	19.0	-6%	-36%
SLC	16.5	15.5	16.5	17.0	-6%	*3%*
PSP	21.0	23.5	27.0	16.5	*12%*	-39%
DEN	22.5	20.5	24.5	16.0	-9%	-35%
HNL	12.0	17.0	10.5	16.0	*42%*	*52%*
JFK	28.0	16.0	27.5	16.0	-43%	-42%
DFW	23.5	16.5	21.5	15.0	-30%	-30%
EWR	17.5	12.0	15.0	14.0	-31%	-7%
SMF	16.5	13.5	14.0	14.0	-18%	0%
SBP	13.5	10.5	17.5	12.5	-22%	-29%
MRY	16.5	18.0	19.5	12.0	*9%*	-38%
IAH	13.0	9.0	13.0	10.0	-31%	-23%
PDX	15.0	10.0	15.0	9.5	-33%	-37%
TUS	9.5	9.5	9.0	9.0	0%	0%
BOS	12.5	8.0	12.0	8.0	-36%	-33%
IAD	12.0	11.0	10.5	8.0	-8%	-24%
MEM	7.5	6.5	9.0	7.5	-13%	-17%
ABQ	7.5	7.5	7.5	7.0	0%	-7%
ATL	10.5	9.0	11.0	7.0	-14%	-36%
MCI	7.5	7.0	7.0	7.0	-7%	0%
RNO	10.0	7.0	10.0	7.0	-30%	-30%
OXR	1.5	6.0	2.5	6.5	*300%*	*160%*
BFL	11.0	11.5	13.5	6.0	*5%*	**-56%**
CRQ	10.0	8.0	11.0	6.0	-20%	-45%
DTW	7.0	6.0	5.5	6.0	-14%	*9%*
IND	5.0	4.5	5.0	6.0	-10%	*20%*

Table 8-29 (cont.)

Change in Flights to LAX, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
MSP	9.0	8.0	7.0	6.0	-11%	-14%
ONT	6.5	6.0	12.0	6.0	-8%	**-50%**
STL	10.0	6.0	9.5	6.0	-40%	-37%
OGG	5.0	5.0	5.0	5.5	0%	*10%*
PHL	9.5	7.0	9.0	5.5	-26%	-39%
SMX	8.5	7.5	8.5	5.5	-12%	-35%
MCO	7.0	6.0	7.0	5.0	-14%	-29%
MIA	7.0	6.0	7.0	5.0	-14%	-29%
CVG	5.0	4.5	4.5	4.5	-10%	0%
ELP	5.0	4.0	5.5	4.5	-20%	-18%
AUS	5.0	4.0	4.5	4.0	-20%	-11%
BNA	5.0	4.0	4.0	4.0	-20%	0%
IPL	5.0	4.5	5.0	4.0	-10%	-20%
PIT	5.0	3.0	5.0	4.0	-40%	-20%
YUM	5.0	3.5	7.0	4.0	-30%	-43%
CLE	4.0	3.0	4.0	3.5	-25%	-13%
MDW	4.0	4.0	4.5	3.5	0%	-22%
BOI	3.0	2.0	3.0	3.0	-33%	0%
CLT	5.0	3.0	4.0	3.0	-40%	-25%
IYK	2.5	3.0	3.0	3.0	*20%*	0%
KOA	3.0	3.0	2.5	3.0	0%	*20%*
AFW	1.5	3.0	1.5	2.0	*100%*	*33%*
ANC	7.5	9.0	7.0	2.0	*20%*	**-71%**
BWI	2.5	1.0	3.0	2.0	**-60%**	-33%
COS	2.0	3.0	3.0	2.0	*50%*	-33%
SAT	2.0	2.0	3.0	2.0	0%	-33%
VIS	3.0	1.5	2.5	2.0	**-50%**	-20%
HOU	2.0	1.0	3.5	1.0	**-50%**	**-71%**
ILN	2.5	1.0	3.0	0.5	**-60%**	**-83%**
DAL	8.0	0.0	3.5	0.0	**-100%**	**-100%**
STS	3.0	4.0	4.0	0.0	*33%*	**-100%**
OTH	31.5	25.5	36.5	27.0	-19%	-26%

Note: Percentages in **bold** represent cuts greater than or equal to 50%. Percentages in *italics* represent increases.

Table 8-30

Change in Flights to SFO, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
TOTAL	**494.0**	**394.5**	**477.0**	**377.5**	-20%	-21%
LAX	45.0	31.5	44.0	33.5	-30%	-24%
SEA	24.0	17.5	24.5	20.5	-27%	-16%
LAS	21.0	18.5	18.5	18.0	-12%	-3%
SMF	15.5	15.5	15.0	17.0	0%	*13%*
ORD	23.0	21.0	18.5	15.0	-9%	-19%
JFK	21.0	16.5	20.5	14.5	-21%	-29%
DEN	19.5	14.0	15.0	13.0	-28%	-13%
PDX	16.5	10.0	15.0	12.5	-39%	-17%
DFW	15.0	12.0	13.0	12.0	-20%	-8%
PHX	19.0	11.5	19.5	12.0	-39%	-38%
SNA	10.5	12.5	12.5	11.0	*19%*	-12%
SAN	22.0	13.5	22.0	10.5	-39%	**-52%**
MRY	8.5	9.0	9.5	9.5	*6%*	0%
ACV	10.0	9.0	10.0	9.0	-10%	-10%
FAT	10.5	6.0	10.0	9.0	-43%	-10%
EWR	13.5	7.0	12.0	8.0	-48%	-33%
SLC	9.5	7.0	11.0	8.0	-26%	-27%
HNL	7.0	7.5	6.5	7.5	*7%*	*15%*
IAH	9.0	7.0	8.5	7.0	-22%	-18%
RDD	8.0	7.0	8.0	7.0	-13%	-13%
BUR	11.5	7.5	11.0	6.5	-35%	-41%
ATL	9.0	7.5	8.0	6.0	-17%	-25%
BOS	9.5	7.0	9.0	6.0	-26%	-33%
IAD	10.0	8.0	11.5	6.0	-20%	-48%
SBP	4.5	3.5	5.0	6.0	-22%	*20%*
STL	6.5	5.0	6.0	5.5	-23%	-8%
MFR	4.5	5.0	5.0	5.0	*11%*	0%
MSP	8.5	5.5	7.5	5.0	-35%	-33%
PHL	7.0	6.0	6.0	5.0	-14%	-17%
RNO	4.0	4.5	4.5	4.5	*13%*	0%
CIC	5.0	4.0	5.0	4.0	-20%	-20%
MOD	5.0	4.0	5.0	4.0	-20%	-20%
PIT	5.5	4.0	5.0	4.0	-27%	-20%
SBA	4.0	5.5	5.0	4.0	*38%*	-20%
CVG	5.0	5.0	4.5	3.5	0%	-22%

Table 8-30 (cont.)
Change in Flights to SFO, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
BFL	3.0	2.0	3.0	3.0	-33%	0%
BOI	4.0	3.0	4.0	3.0	-25%	-25%
CLT	4.0	2.0	3.0	3.0	**-50%**	0%
DTW	4.5	4.0	4.0	3.0	-11%	-25%
EUG	4.5	4.0	5.0	3.0	-11%	-40%
MDW	2.5	3.0	3.0	3.0	*20%*	0%
MIA	4.0	4.0	4.0	3.0	0%	-25%
PSP	4.0	2.5	4.5	3.0	-38%	-33%
MEM	3.0	2.5	4.0	2.5	-17%	-38%
RDM	3.0	3.0	3.0	2.5	0%	-17%
CLE	3.0	2.0	2.5	2.0	-33%	-20%
OGG	2.0	3.0	2.0	2.0	*50%*	0%
BWI	3.0	1.0	3.0	1.0	**-67%**	**-67%**
ONT	5.5	6.0	5.5	0.0	*9%*	**-100%**
OTH	16.5	17.0	15.0	14.0	*3%*	-7%

Note: Percentages in **bold** represent cuts greater than or equal to 50%. Percentages in *italics* represent increases.

Table 8-31

Change in Flights to SAN, by Departure Airport, Month, and Year

	Average Scheduled Flights per Day				Percent Change	
Departure Airport	October 2000	October 2001	December 2000	December 2001	October 2000-2001	December 2000-2001
TOTAL	**269.0**	**233.5**	**279.0**	**242.0**	-13%	-13%
LAX	57.0	38.0	66.5	41.5	-33%	-38%
PHX	25.5	23.0	24.5	22.5	-10%	-8%
LAS	15.5	16.5	14.5	16.5	*6%*	*14%*
OAK	11.0	14.5	12.5	16.5	32%	32%
SJC	15.5	16.0	16.5	15.0	*3%*	-9%
SMF	11.0	11.5	11.0	12.0	*5%*	*9%*
DFW	13.5	10.0	11.0	10.5	-26%	-5%
ORD	11.5	10.0	11.0	10.0	-13%	-9%
SFO	19.0	11.0	19.5	9.5	-42%	**-51%**
DEN	8.5	7.5	9.0	8.5	-12%	-6%
SEA	8.0	5.5	7.0	6.5	-31%	-7%
SLC	5.0	4.0	5.0	5.5	-20%	*10%*
IAH	5.0	5.5	5.0	5.0	*10%*	0%
ABQ	3.0	5.0	4.0	4.0	*67%*	0%
ATL	4.0	4.0	5.0	4.0	0%	-20%
MSP	4.5	3.0	4.5	4.0	-33%	-11%
PDX	4.0	3.0	4.0	4.0	-25%	0%
STL	4.0	4.0	4.5	4.0	0%	-11%
TUS	3.5	3.5	3.5	4.0	0%	*14%*
PIT	3.0	3.0	3.0	3.0	0%	0%
IAD	3.0	2.0	2.5	2.5	-33%	0%
CVG	3.0	3.0	3.0	2.0	0%	-33%
EWR	3.0	2.0	3.0	2.0	-33%	-33%
JFK	3.0	2.0	3.0	2.0	-33%	-33%
MEM	2.5	2.0	3.0	2.0	-20%	-33%
PHL	3.0	2.0	2.0	2.0	-33%	0%
OTH	19.5	22.0	21.0	23.0	*13%*	*10%*

Note: Percentages in **bold** represent cuts greater than or equal to 50%. Percentages in *italics* represent increases.

Table 8-32
Change in Flights to SJC, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
TOTAL	**237.5**	**230.5**	**242.5**	**220.0**	-3%	-9%
LAX	33.0	29.5	33.5	29.0	-11%	-13%
SAN	15.5	15.5	15.5	16.0	0%	*3%*
SNA	16.5	14.5	15.0	14.0	-12%	-7%
LAS	12.5	13.0	12.0	12.5	*4%*	*4%*
PDX	13.5	11.0	13.5	11.5	-19%	-15%
ONT	7.0	10.0	8.0	10.0	*43%*	*25%*
ORD	12.0	9.0	9.5	10.0	-25%	*5%*
PHX	15.5	15.0	15.0	10.0	-3%	-33%
SEA	15.0	13.0	15.0	10.0	-13%	-33%
BUR	8.5	8.5	8.0	9.0	0%	*13%*
DEN	11.0	9.0	12.5	8.5	-18%	-32%
DFW	9.5	7.5	9.0	8.0	-21%	-11%
MHR	4.5	7.0	8.0	7.0	*56%*	-13%
RNO	7.5	6.0	6.5	6.5	-20%	0%
SLC	4.5	4.0	4.0	5.0	-11%	*25%*
SBA	3.0	5.0	4.0	4.5	67%	*13%*
HIO	0.0	4.0	0.0	4.0	---	---
AUS	4.5	3.0	5.0	3.0	-33%	-40%
IAH	4.0	3.0	4.5	3.0	-25%	-33%
ATL	2.0	2.0	3.0	2.0	0%	-33%
BOI	3.0	2.0	3.0	2.0	-33%	-33%
JFK	3.0	1.5	2.0	2.0	**-50%**	0%
MSP	3.0	2.0	3.0	2.0	-33%	-33%
STL	3.0	2.0	2.5	2.0	-33%	-20%
EWR	3.0	1.0	3.5	1.0	**-67%**	**-71%**
OTH	23.0	32.5	27.0	27.5	*41%*	*2%*

Note: Percentages in **bold** represent cuts greater than or equal to 50%. Percentages in *italics* represent increases.

Table 8-33

Change in Flights to ONT, by Departure Airport, Month, and Year

Departure Airport	Average Scheduled Flights per Day October 2000	October 2001	December 2000	December 2001	Percent Change October 2000-2001	December 2000-2001
TOTAL	**166.0**	**158.0**	**193.5**	**178.0**	-5%	-8%
PHX	22.5	23.5	23.5	23.5	*4%*	0%
OAK	15.0	18.5	17.0	16.5	*23%*	-3%
LAS	9.5	11.0	11.0	13.0	*16%*	*18%*
SMF	11.0	13.0	11.0	13.0	*18%*	*18%*
SJC	7.0	10.0	7.0	10.0	*43%*	*43%*
DFW	10.0	7.0	9.0	8.0	-30%	-11%
BUR	5.0	3.5	9.0	6.5	-30%	-28%
LAX	10.0	6.0	12.5	6.5	-40%	-48%
DEN	4.0	4.5	4.0	4.5	*13%*	*13%*
PDX	4.5	3.0	5.0	4.5	-33%	-10%
SLC	3.5	4.5	6.5	4.5	*29%*	-31%
IPL	3.5	3.5	5.0	4.0	0%	-20%
SDF	3.5	3.0	5.5	3.5	-14%	-36%
SEA	4.5	4.5	5.5	3.0	0%	-45%
MSP	2.0	2.0	4.0	2.5	0%	-38%
SBP	2.0	1.5	3.5	2.5	-25%	-29%
SMX	3.0	2.5	2.0	2.5	-17%	*25%*
ORD	2.0	1.0	3.0	1.5	**-50%**	**-50%**
STL	3.0	1.0	3.5	1.0	**-67%**	**-71%**
SFO	5.5	5.0	5.5	0.0	-9%	**-100%**
OTH	35.0	29.5	40.5	47.0	-16%	*16%*

Note: Percentages in **bold** represent cuts greater than or equal to 50%. Percentages in *italics* represent increases.

Table 8-34

Changes in Flights to California Airports, by Airline, Airport, Month, and Year

	Average Flights per Day							Percent Change in Flights, 2000 to 2001						
	Total to all Five Airports		December 2001, by Airport					Total to All Five Airports		December, by Airport				
Airline	Dec. 2000	Dec. 2001	LAX	SFO	SAN	SJC	ONT	Oct.	Dec.	LAX	SFO	SAN	SJC	ONT
TOTAL	**2120.5**	**1707**	**689.5**	**377.5**	**242**	**220**	**178**	**-15%**	**-20%**	**-26%**	**-21%**	**-13%**	**-9%**	**-8%**
SWA	343.5	323.5	112.5	0	77	73.5	60.5	-5%	-6%	-7%	-100%	-6%	5%	9%
UAL	458.5	281	99	144.5	21	12.5	4	-21%	-39%	-47%	-30%	-30%	-49%	-64%
SKW	291	232	122.5	76	17	9	7.5	-15%	-20%	-27%	-6%	-35%	125%	-38%
AAL	245.5	208	87.5	41.5	23.5	49.5	6	-24%	-15%	-25%	5%	7%	-21%	50%
DAL	100.5	85.5	38.5	19.5	15.5	6	6	-14%	-15%	-13%	-19%	-6%	-25%	-20%
EGF	110.5	80.5	57.5	0	23	0	0	-13%	-27%	-27%		-28%		
ASA	77.5	66	19.5	15	10.5	15	6	-20%	-15%	-15%	-17%	-5%	-19%	-14%
AWE	63	52	17	11	9.5	7.5	7	-8%	-17%	-31%	0%	-10%	-17%	-13%
COA	54	45	20.5	12	7	4	1.5	-23%	-17%	-9%	-17%	-13%	-43%	-25%
FDX	33	37	20	2	5	3	7	31%	12%	5%	0%	0%	100%	27%
NWA	48	37	16	9	6	4	2	-29%	-23%	-20%	-38%	-25%	33%	-20%
UPS	31.5	31.5	1.5	0	1.5	2.5	26	-6%	0%	0%		50%	0%	-2%
USA	37	27.5	10.5	10	7	0	0	-32%	-26%	-38%	-23%	0%		
TWA	36	0	0	0	0	0	0	-48%	-100%	-100%	-100%	-100%	-100%	-100%
OTH	191	200.5	67	37	18.5	33.5	44.5	-2%	5%	-5%	30%	19%	16%	-6%

Table 8-35

Changes in Equipment Between 2000 and 2001

	Average Flights per Day							Percent Change in Flights, 2000 to 2001						
	Total to All Five Airports		December 2001, by Airport					Total to All Five Airports		December, by Airport				
Aircraft	Dec. 2000	Dec. 2001	LAX	SFO	SAN	SJC	ONT	Oct.	Dec.	LAX	SFO	SAN	SJC	ONT
Total	**2,120.5**	**1,707.0**	**689.5**	**377.5**	**242.0**	**220.0**	**178.0**	**-15%**	**-20%**	**-26%**	**-21%**	**-13%**	**-9%**	**-8%**
B733	267.0	242.5	73.0	6.5	58.0	56.0	49.0	-11%	-9%	-25%	-57%	-2%	3%	18%
E120	288.0	201.5	102.5	71.5	17.0	4.0	6.5	-17%	-30%	-39%	-8%	-35%	0%	-46%
B737	323.0	186.5	67.5	69.5	22.5	15.5	11.5	-11%	-42%	-44%	-44%	-31%	-44%	-32%
B752	170.0	129.0	63.0	42.5	5.0	10.0	8.5	-21%	-24%	-21%	-3%	-67%	-46%	-32%
MD80	171.0	127.5	42.0	17.0	25.5	32.5	10.5	-38%	-25%	-44%	-21%	13%	-28%	50%
SF34	110.5	80.5	57.5	0.0	23.0	0.0	0.0	-13%	-27%	-27%		-28%		
A320	83.0	70.5	18.0	23.0	17.5	9.0	3.0	-16%	-15%	-45%	12%	17%	-22%	0%
A319	47.5	53.5	20.0	14.5	9.0	9.0	1.0	-3%	13%	-11%	61%	-14%	157%	-50%
B738	39.0	51.5	17.0	16.0	3.5	15.0	0.0	41%	32%	21%	60%	-61%	150%	
B757	67.0	49.0	23.5	17.5	7.0	0.0	1.0	-21%	-27%	-24%	-39%	17%	-100%	0%
CRJ2	2.0	41.0	28.5	4.5	0.0	7.0	1.0	600%	1950%		125%			
B735	46.5	40.5	8.5	0.5	8.0	14.5	9.0	-23%	-13%	-39%	-80%	-20%	-9%	125%
B763	37.0	37.0	14.5	8.0	6.0	0.0	8.5	-6%	0%	-17%	-11%	200%		0%
B767	29.5	33.5	15.0	18.0	0.5	0.0	0.0	0%	14%	3%	20%			
B734	41.0	30.0	7.5	8.0	5.0	7.5	2.0	-17%	-27%	0%	-30%	0%	-32%	-67%
DC10	35.0	29.0	17.0	3.0	3.5	2.5	3.0	-27%	-17%	-23%	-33%	75%	25%	-33%
B762	33.0	28.0	20.0	6.0	1.0	0.5	0.5	-31%	-15%	5%	-45%	0%	-50%	-50%
B72Q	41.5	17.0	8.0	0.0	2.0	2.0	5.0	-53%	-59%	-54%	-100%	-73%	-20%	-38%
B73Q	20.0	12.5	5.0	2.0	1.5	2.0	2.0	-44%	-38%	-38%	-20%		33%	-75%
MD90	23.5	5.5	0.0	0.0	2.5	0.0	3.0	-81%	-77%	-100%	-100%	-38%	-100%	50%
Other	199.0	230.0	78.5	45.0	23.0	31.5	52.0	13%	16%	17%	27%	48%	7%	1%
Missing	46.5	11.0	3.0	4.5	1.0	1.5	1.0	-32%	-76%	-82%	-76%	-78%	-25%	-75%

Table 8-36
Estimation Results, Segment Schedule Change Model

	Full Model			Model w/o Gate-to-Gate Time		
	Estimate	Std. Error	P-Value	Estimate	Std. Error	P-Value
Destination Airports Effects						
LAX	-12.47%	3.64%	0.001	-11.99%	3.42%	0.001
SFO	-10.76%	2.45%	0.000	-10.29%	2.15%	0.000
SAN	-9.05%	3.24%	0.006	-8.64%	3.06%	0.005
SJC	2.37%	2.64%	0.369	2.65%	2.54%	0.298
ONT	-5.57%	3.92%	0.156	-5.41%	3.89%	0.165
Origin Airport Effects						
DEN	-13.48%	5.37%	0.013	-12.82%	5.10%	0.013
DFW	-6.72%	6.10%	0.272	-5.72%	5.55%	0.304
JFK	-21.57%	7.14%	0.003	-19.50%	4.88%	0.000
LAS	9.93%	3.37%	0.004	10.34%	3.21%	0.001
OAK	5.32%	4.01%	0.186	5.68%	3.91%	0.148
PDX	-11.90%	6.53%	0.070	-11.47%	6.43%	0.076
PHX	-6.49%	3.15%	0.040	-6.01%	2.90%	0.039
SEA	-1.35%	4.81%	0.779	-0.76%	4.56%	0.868
SMF	22.39%	6.53%	0.001	22.52%	6.51%	0.001
Other	-10.70%	2.74%	0.000	-10.11%	2.30%	0.000
Other Effects						
Frequency	-0.12%	0.05%	0.009	-0.13%	0.05%	0.005
Gate-to-Gate Time	0.01%	0.02%	0.692			
Adjusted R^2	0.815			0.816		
Number of Observations	274			274		

Table 8-37
Flight Change Predictions Based on Segment Model, Example Flight Segments

Destination	Origin	Flights In Year 2000	Predicted Change in Flights, December 2000-2001, due to: Destination Effect	Origin Effect	Frequency Effect	Total, All Effects	Actual Change in Flights, December 2000-2001
LAX	DFW	43	-5.2	-2.5	-2.4	-10.0	-13
SAN	JFK	6	-0.5	-1.2	0.0	-1.7	-2
SFO	LAX	88	-9.1	-10.6	-10.0	-29.6	-21
ONT	DEN	8	-0.4	-1.0	-0.1	-1.5	1
SJC	SEA	30	0.8	-0.2	-1.2	-0.6	-10

Table 8-38
Flight Change Predictions Based on Aggregate Segment Model, California Airports

Destination	Flights In Year 2000	Predicted Change in Flights, December 2000-2001, due to: Destination Effect	Origin Effect	Frequency Effect	Total, All Effects	Actual Change in Flights, December 2000-2001
LAX	1852	-222	-124	-127	-473	-479
SFO	945	-97	-74	-37	-208	-208
SAN	550	-48	-32	-35	-115	-86
SJC	475	13	-38	-16	-42	-76
ONT	381	-21	-17	-9	-46	-48

Table 8-39
Estimation Results, Airline Segment Schedule Change Model

	Full Model		
	Estimate	Std. Error	P-Value
Destination Airports Effects			
LAX	-6.48%	3.46%	0.061
SFO	6.65%	4.07%	0.103
SAN	0.55%	3.09%	0.858
SJC	5.59%	4.46%	0.211
ONT	-1.23%	4.61%	0.789
Origin Airport Effects			
DEN	-15.16%	7.63%	0.047
DFW	0.76%	7.50%	0.920
JFK	3.88%	9.12%	0.671
LAS	-3.15%	7.75%	0.685
OAK	-6.53%	8.73%	0.454
PDX	-7.20%	7.73%	0.352
PHX	9.60%	8.31%	0.249
SEA	-15.89%	8.62%	0.066
SMF	1.74%	10.50%	0.868
Other	-13.06%	6.27%	0.038
Airline Effects			
AAL	-10.97%	6.59%	0.097
ASA	-12.62%	10.06%	0.210
AWE	-6.26%	8.97%	0.485
COA	3.81%	9.35%	0.684
DAL	5.53%	8.09%	0.495
EGF	-5.31%	6.51%	0.415
SKW	-14.85%	5.88%	0.012
SWA	5.62%	6.44%	0.383
UAL	-26.03%	6.25%	0.000
USA	-8.92%	12.17%	0.464
Other Effects			
Total Frequency	-1.76%	0.47%	0.000
Adjusted R^2	0.683		
Number of Observations	456		

Table 8-40

Flight Change Predictions Based on Airline Segment Model, California Airports

Airport	Flights In Year 2000[1]	Predicted Change in Flights, December 2000-2001, due to: Destination Effect	Origin Effect	Carrier Effect	Frequency Effect	Total, All Effects	Actual Change in Flights, December 2000-2001[2]
LAX	1821	-118	-174	-175	-115	-582	-563
SFO	924	61	-94	-145	-38	-216	-225
SAN	543	3	-55	-26	-28	-106	-95
SJC	460	26	-46	-25	-17	-63	-90
ONT	365	-5	-31	-7	-13	-56	-78

Notes:

1. Includes only flights for which carrier could be identified.
2. Considers only airline flight segments with 1 or more flights in December 2000.

Table 8-41

Revenue and Expense Information for Selected California Airports

	Year	2001						2002			
	Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Airport	Category	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)
OAK	Revenues	8,972,311	9,209,586	6,854,662	8,182,096	7,680,140	7,145,375	8,002,507	7,771,941	8,012,877	---
	Expenses	3,012,643	3,575,231	3,354,017	4,913,836	4,809,551	4,215,993	4,836,554	3,569,988	4,662,438	---
RDD	Revenues	51,277	70,479	---	79,611	---	37,777	---	---	---	---
	Expenses	---	---	---	---	---	---	---	---	---	---
SAN	Revenues	8,308,000	9,708,000	8,688,000	5,609,000	6,284,000	7,631,000	7,989,000	8,293,000	8,743,000	---
	Expenses	5,475,000	6,065,000	6,798,000	9,445,000	9,098,000	7,081,000	8,947,000	7,024,000	7,172,000	---
SFO	Revenues*	53,928,009	51,217,293	46,419,495	35,373,915	40,773,124	40,806,127	---	---	---	---
	Expenses*	48,809,612	33,804,402	36,612,271	38,155,127	45,482,883	47,598,968	---	---	---	---
SJC	Revenues	5,224,813	9,374,316	7,423,917	7,620,004	7,180,650	6,372,697	7,704,629	6,855,126	7,062,458	7,575,675
	Expenses	3,761,047	4,670,686	5,091,190	7,933,052	4,320,318	8,704,217	4,800,373	3,829,275	3,965,041	7,021,715
SNA	Revenues**	5,047,067	6,544,650	4,454,680	6,348,804	5,667,848	6,151,682	6,958,930	6,149,822	7,116,803	7,106,655
	Expenses**	60,485	2,305,018	2,279,338	2,794,156	2,410,628	2,998,067	4,896,863	3,802,968	2,923,754	3,306,098

* Unadjusted and unaudited

** Operating only

Figure 8-1
Passenger Traffic at California Airports
August 2001

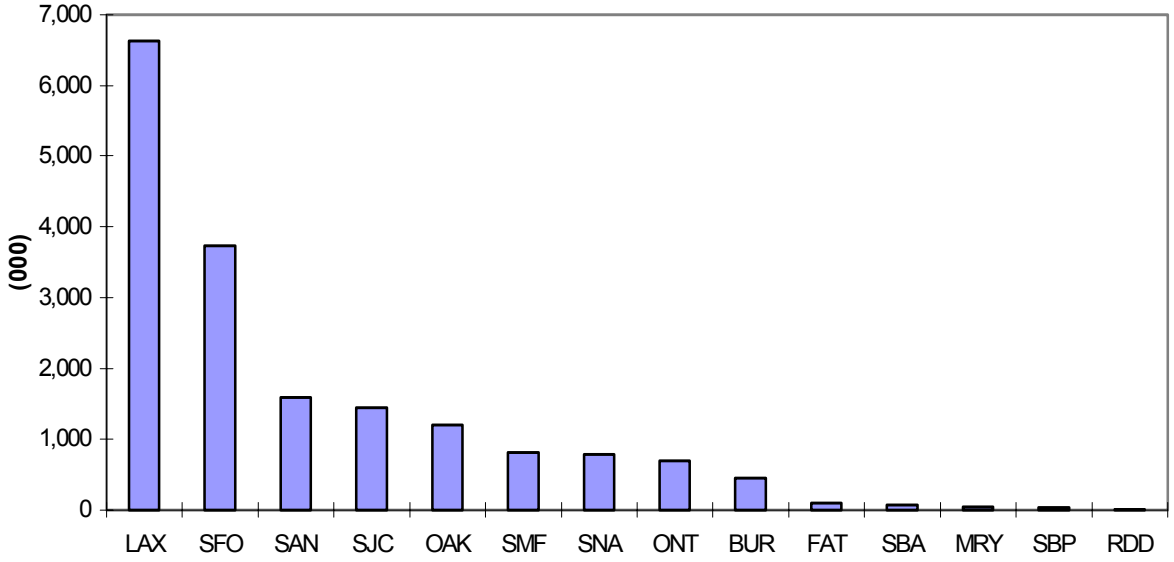


Figure 8-2
Change in Passenger Traffic from Previous Year, by Month

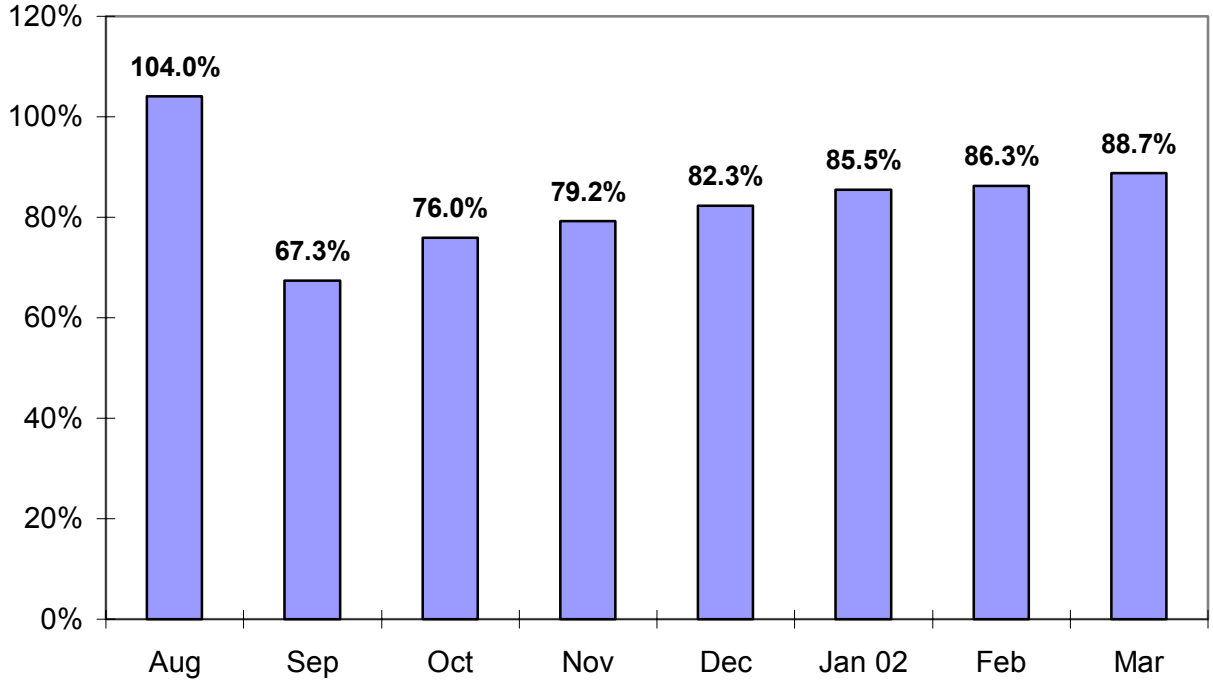


Figure 8-3
Change in Air Passenger Traffic from Previous Year – March 2002
(Airports Ordered by Passenger Traffic in August 2001)

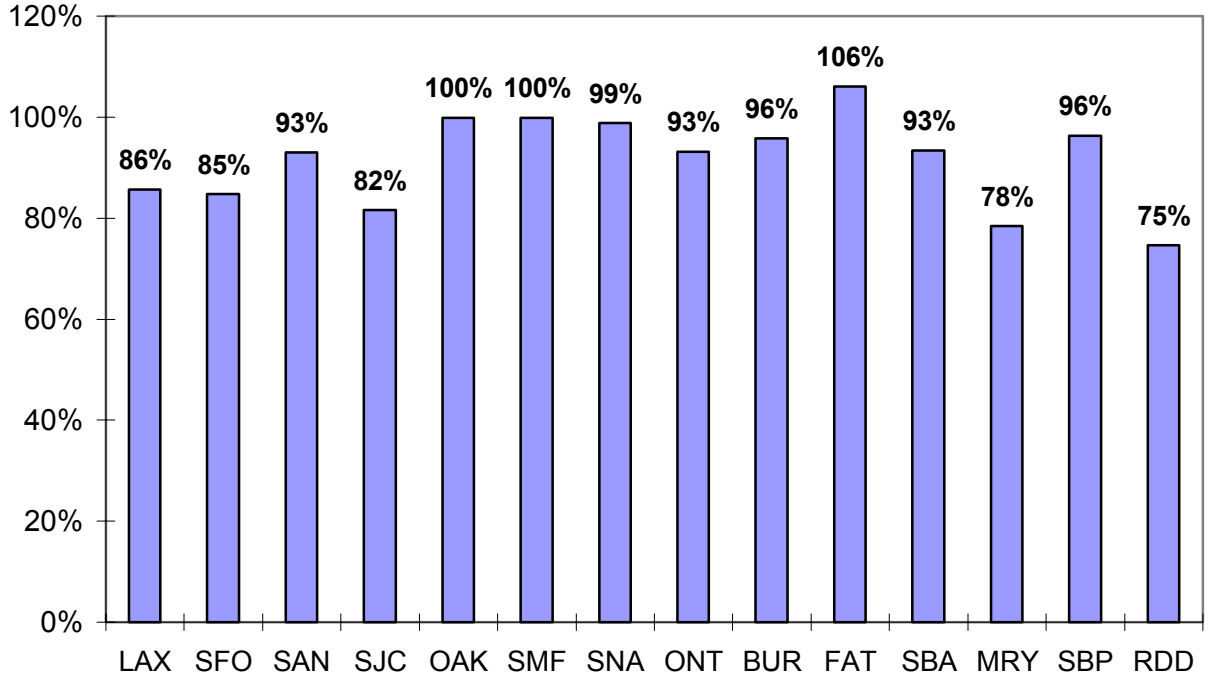


Figure 8-4
Change in Air Freight Traffic from 2000

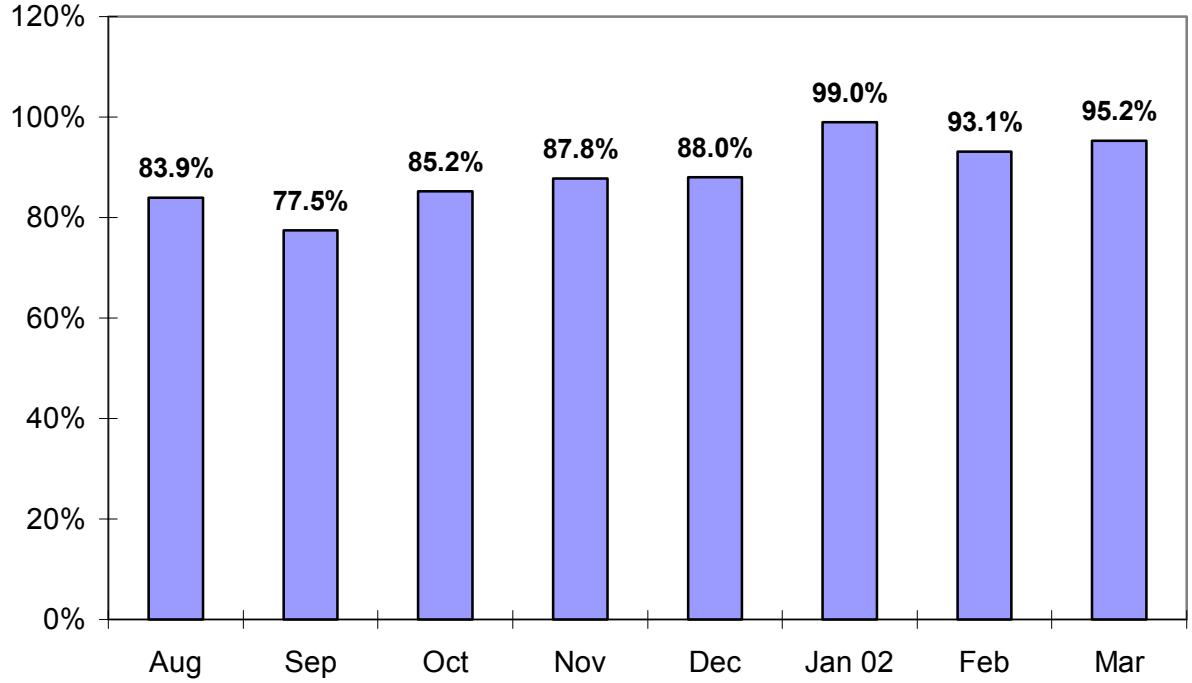


Figure 8-5
Change in Air Freight Traffic from Previous Year – March 2002
(Airports Ordered by Air Freight Traffic in August 2001)

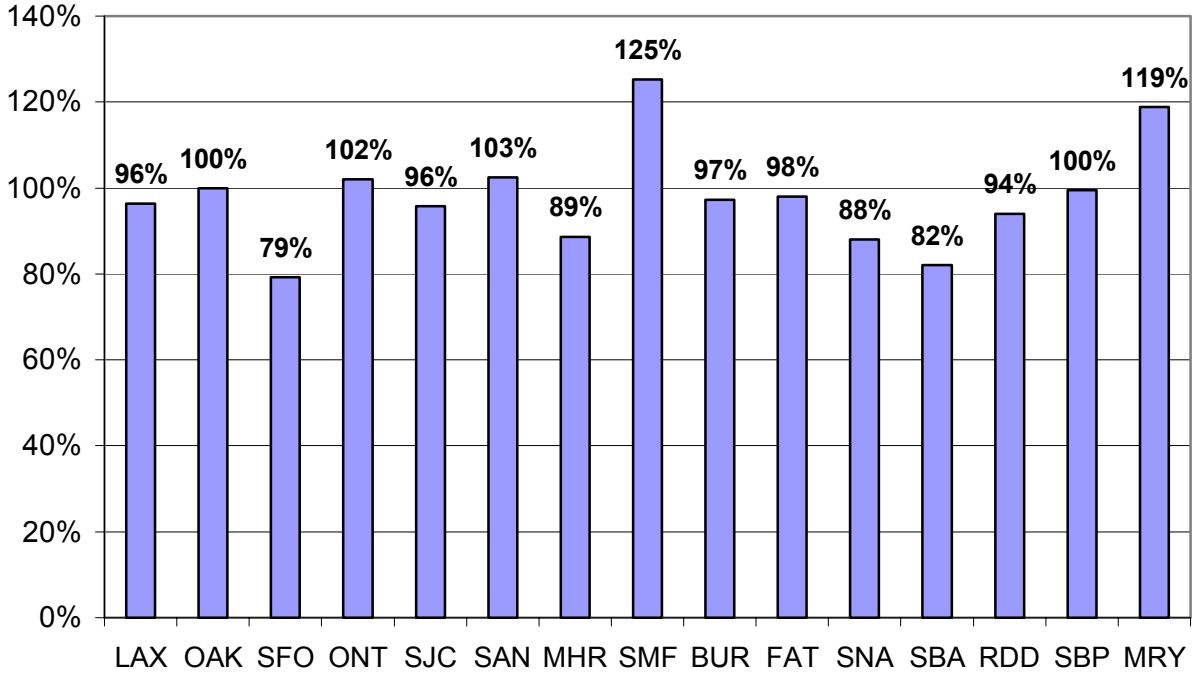


Figure 8-6
Parking Revenue
Metropolitan International Airport

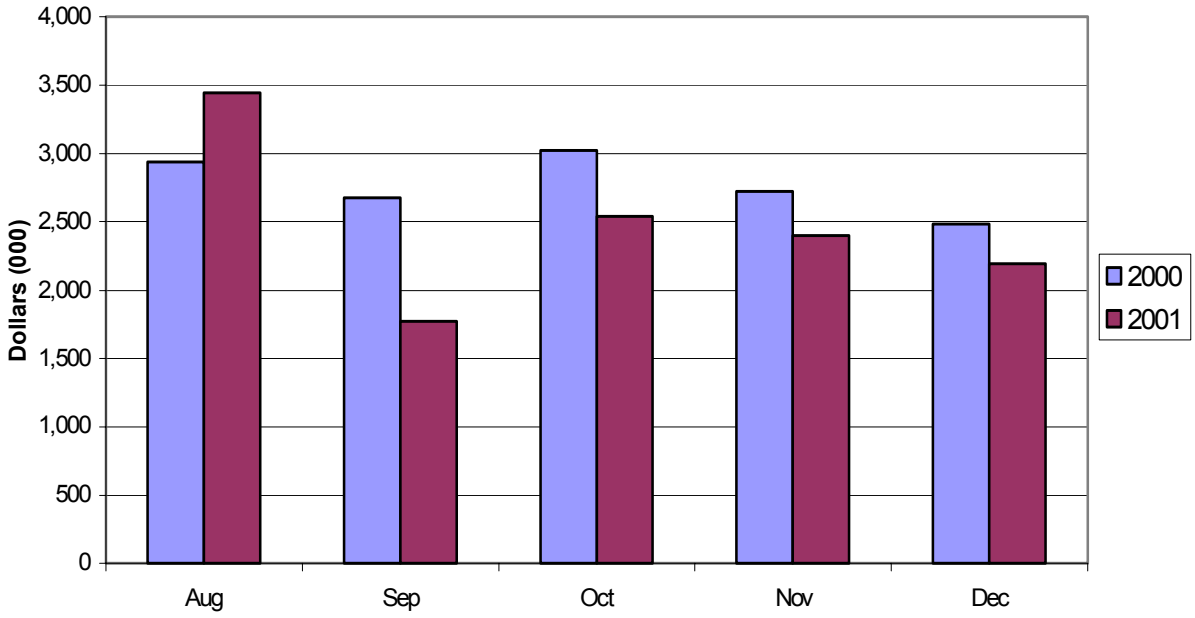


Figure 8-7
Use of Airport Parking
Metropolitan Oakland International Airport

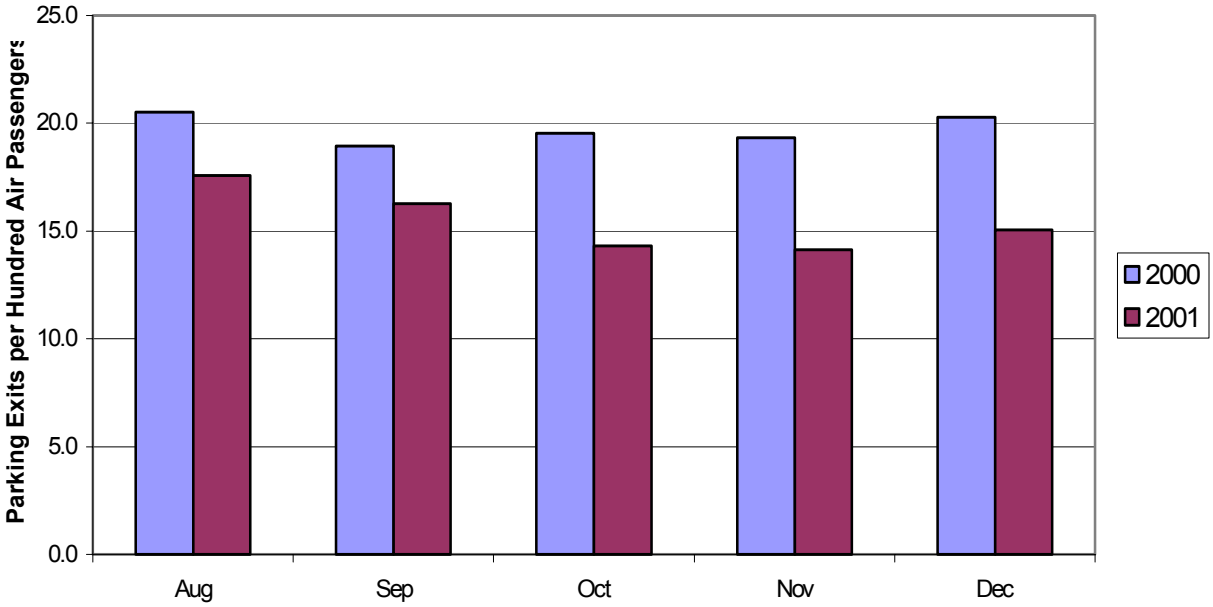


Figure 8-8
Use of Parking Lots
Metropolitan Oakland International Airport - 2000

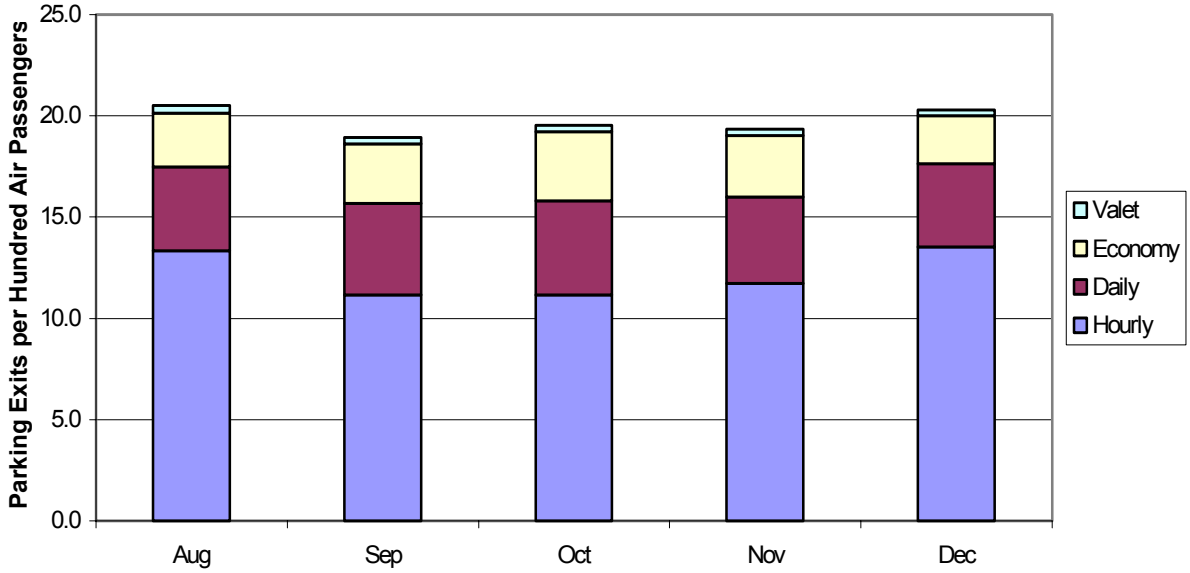


Figure 8-9
Use of Parking Lots
Metropolitan Oakland International Airport - 2001

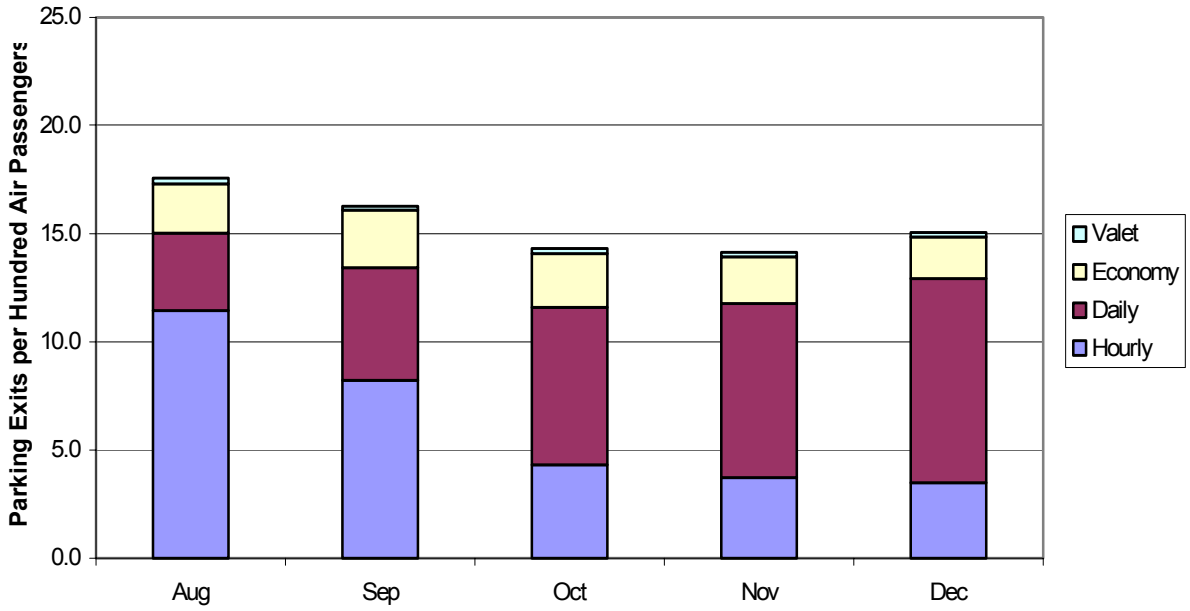


Figure 8-10
AirBART Ridership
Metropolitan Oakland International Airport

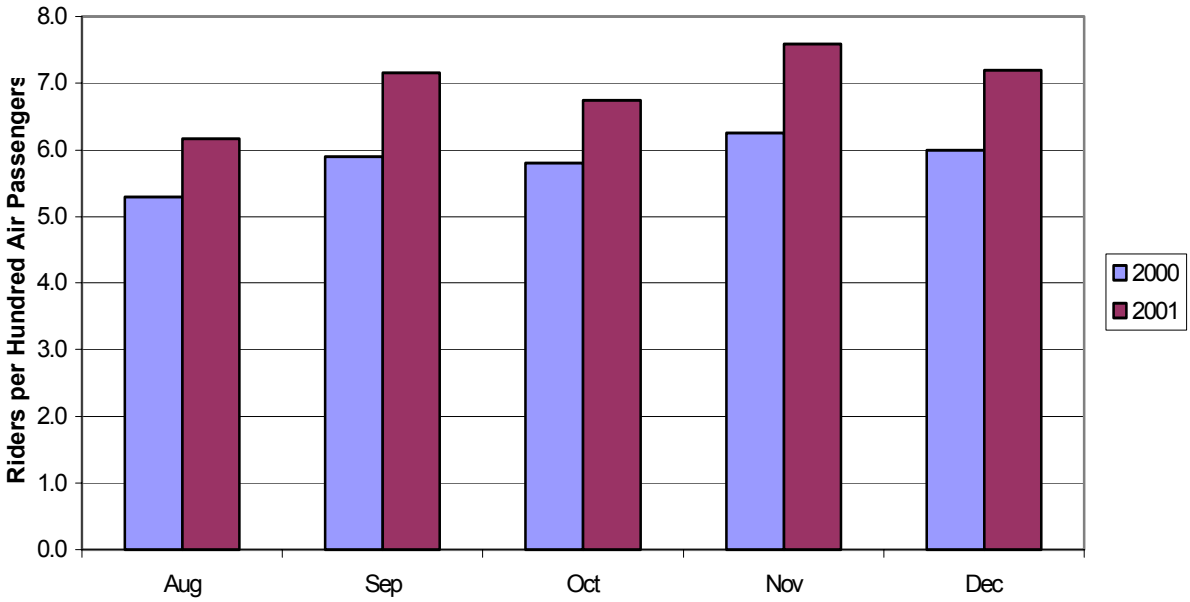


Figure 8-11
Weekly Flights from LAX to ONT

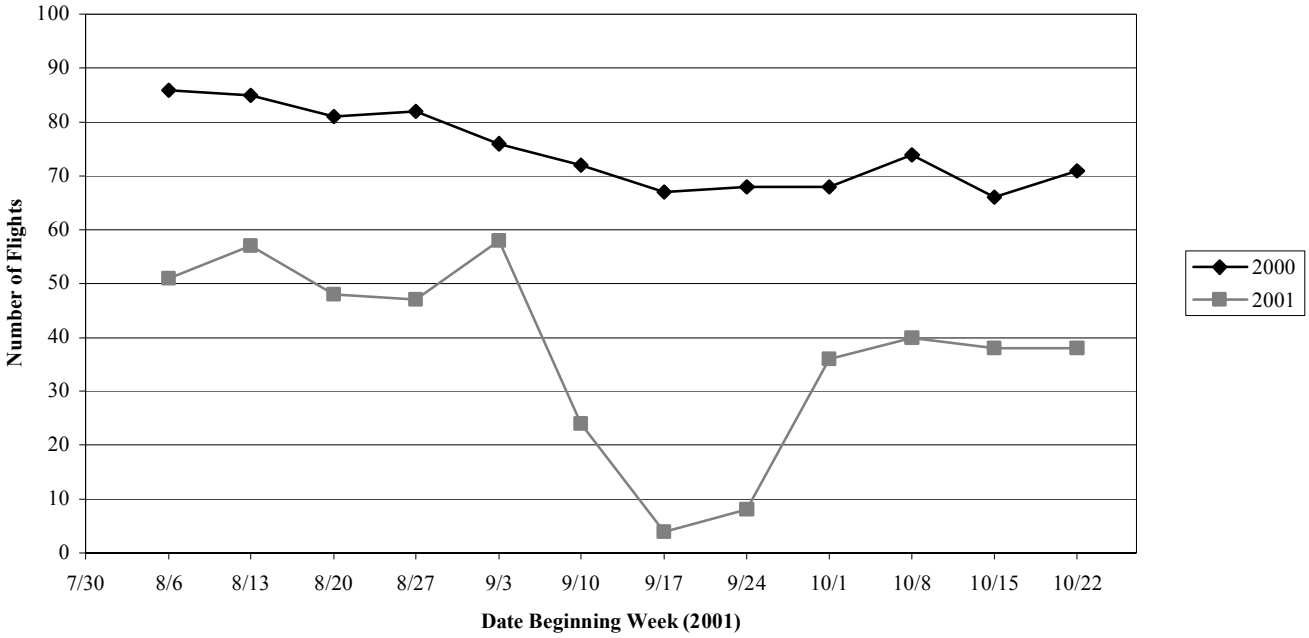


Figure 8-12
Weekly Flights from LAX to SAN

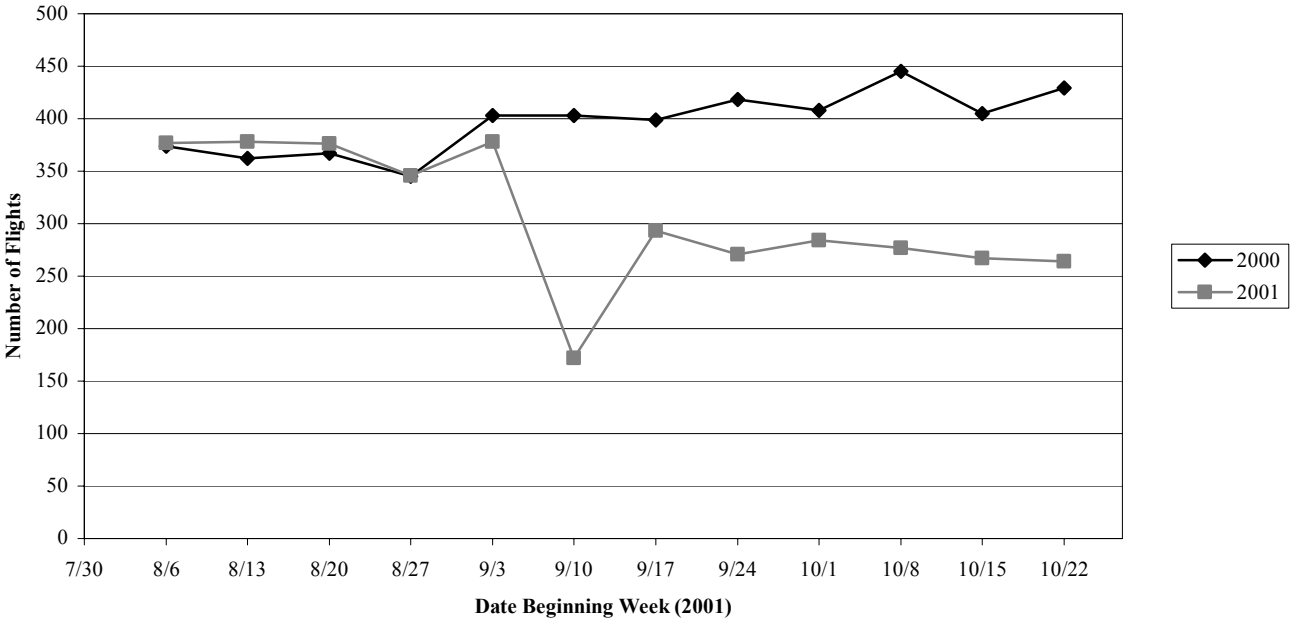


Figure 8-13
Weekly Flights from LAX to SFO

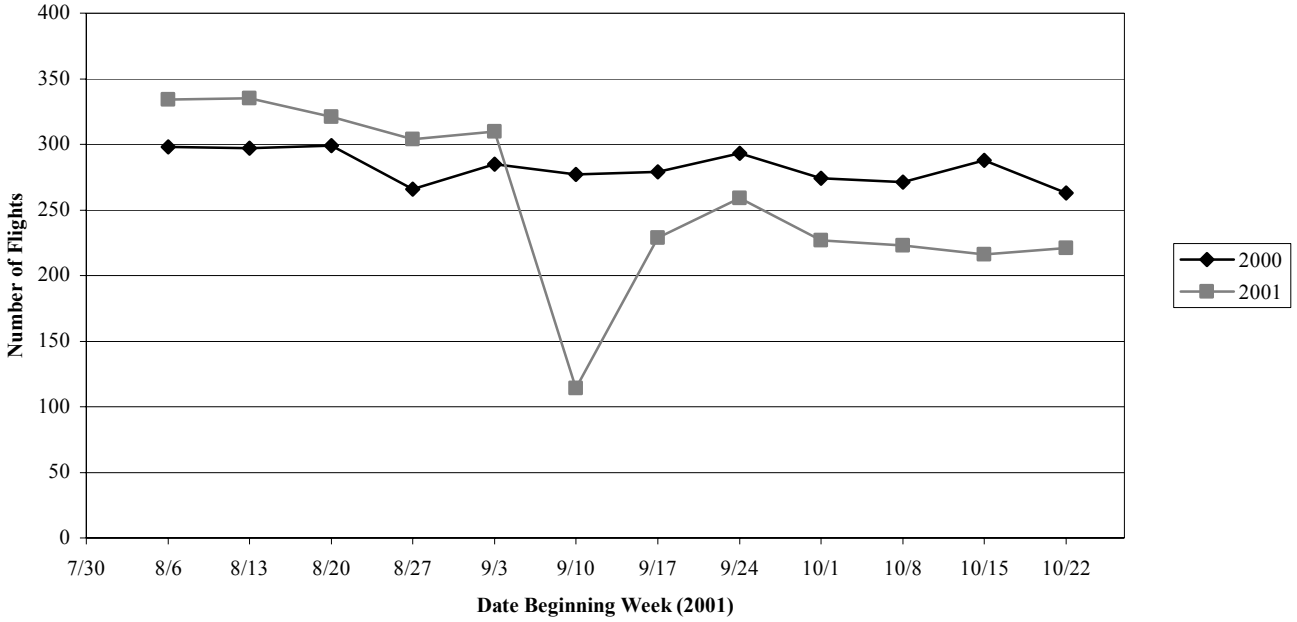


Figure 8-14
Weekly Flights from LAX to SJC

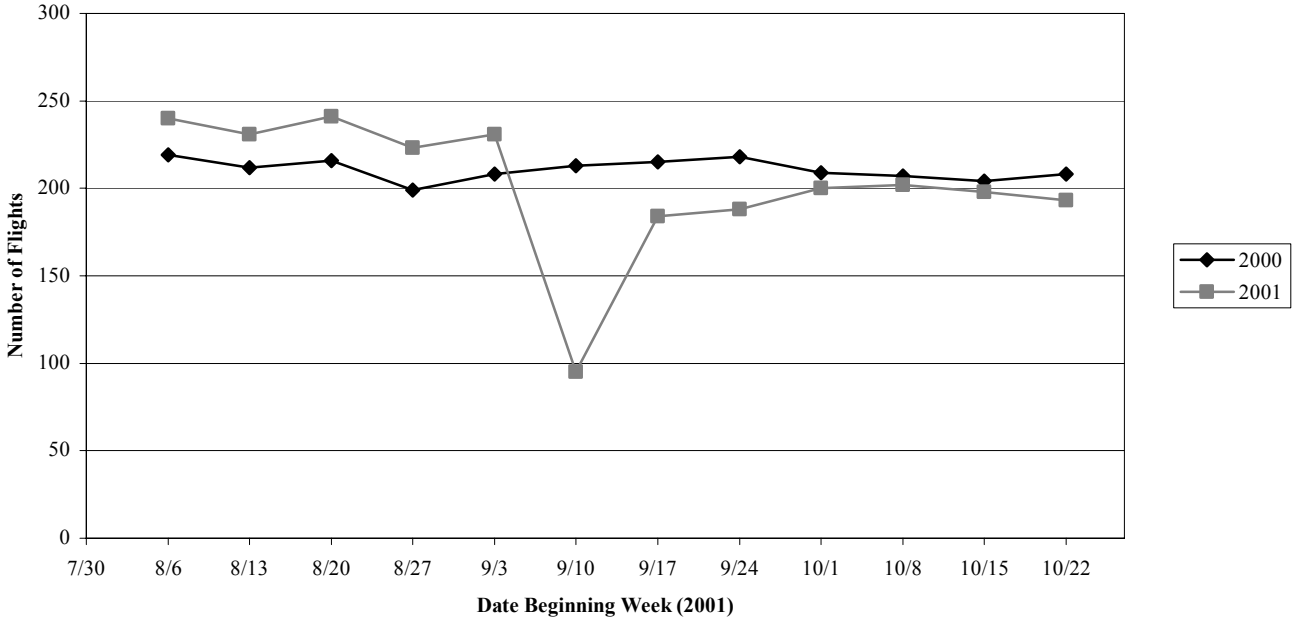


Figure 8-15
Weekly Flights from ONT to SAN

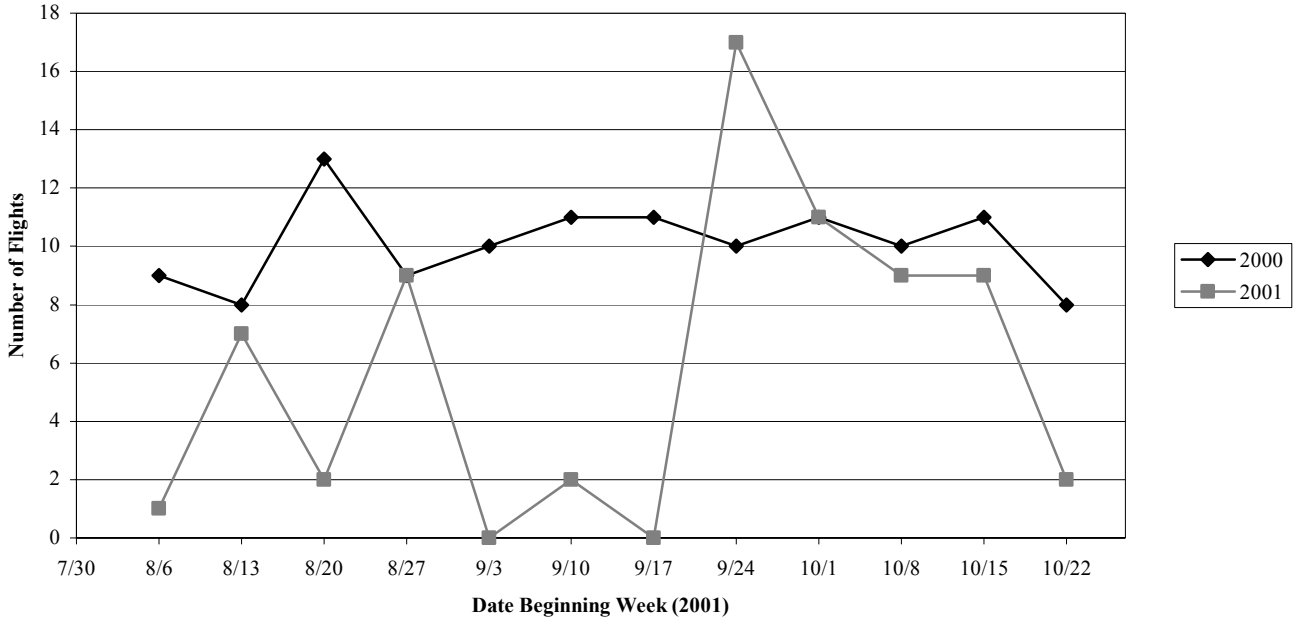


Figure 8-16
Weekly Flights from ONT to SFO

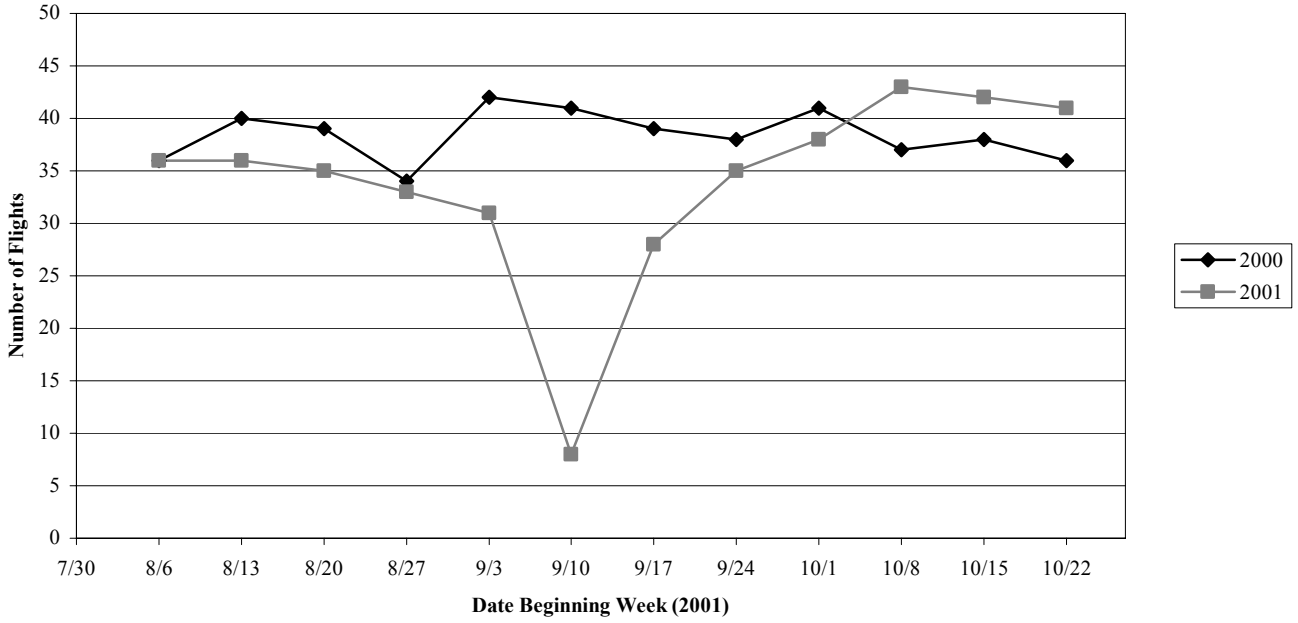


Figure 8-17
Weekly Flights from ONT to SJC

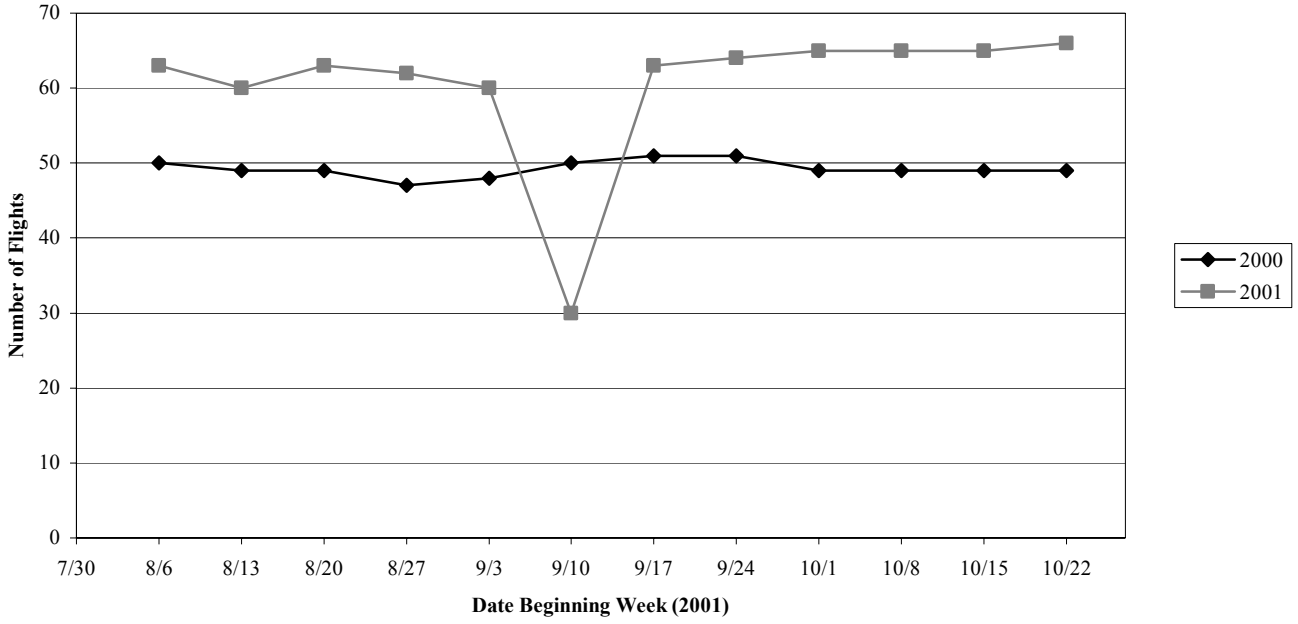


Figure 8-18
Weekly Flights from SAN to SFO

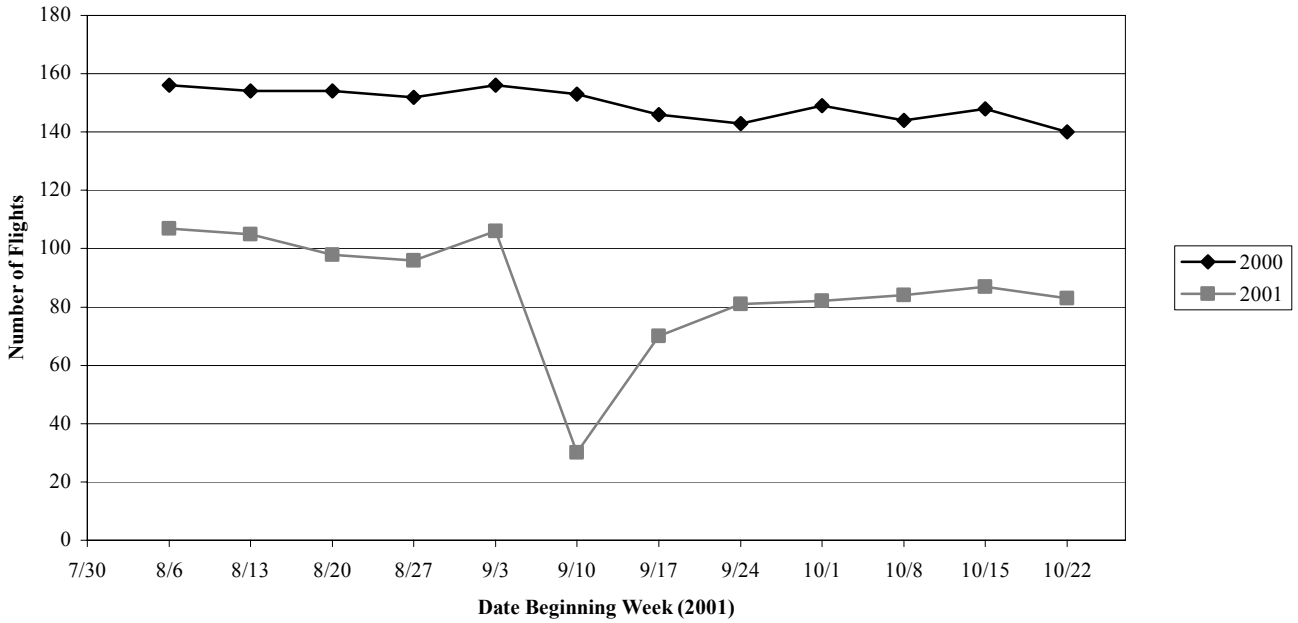


Figure 8-19
Weekly Flights from SAN to SJC

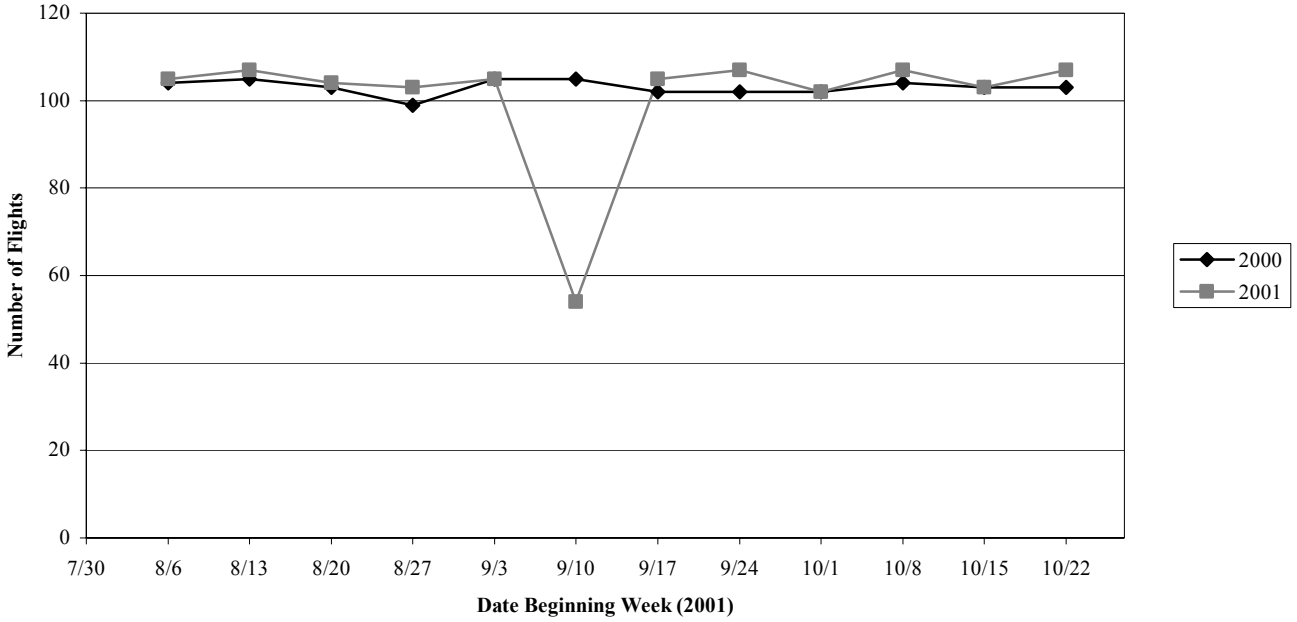


Figure 8-20
Weekly Flights from SFO to SJC

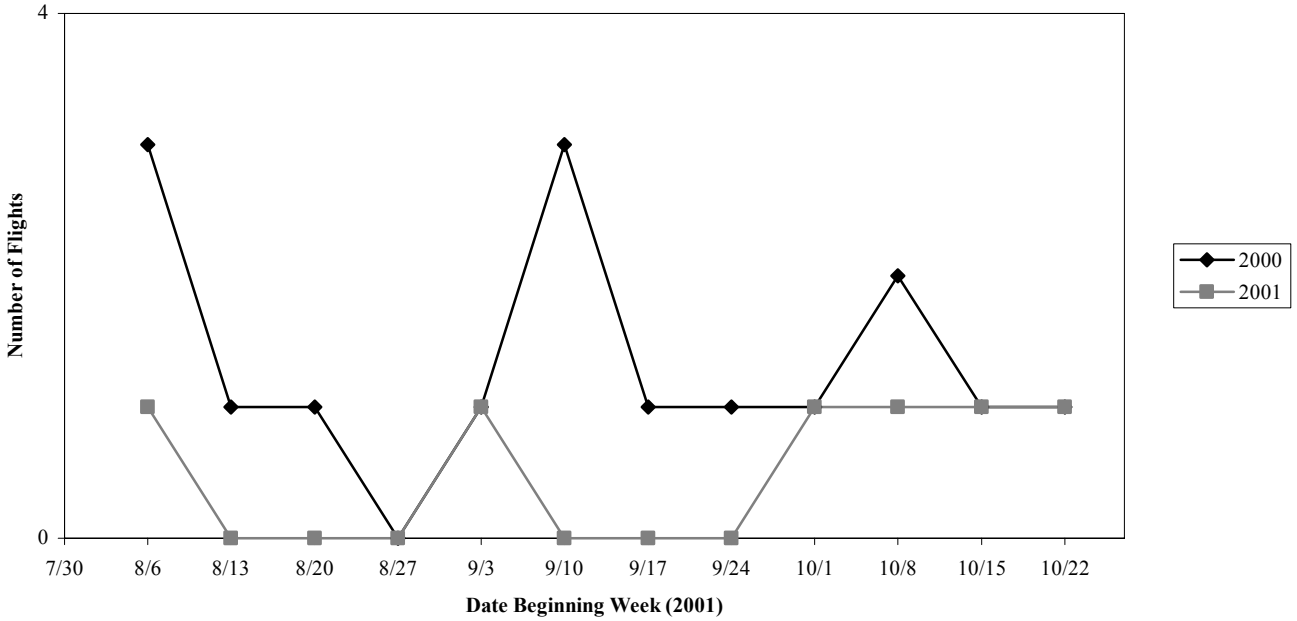


Figure 8-21
Total Operations in California During the Month of October

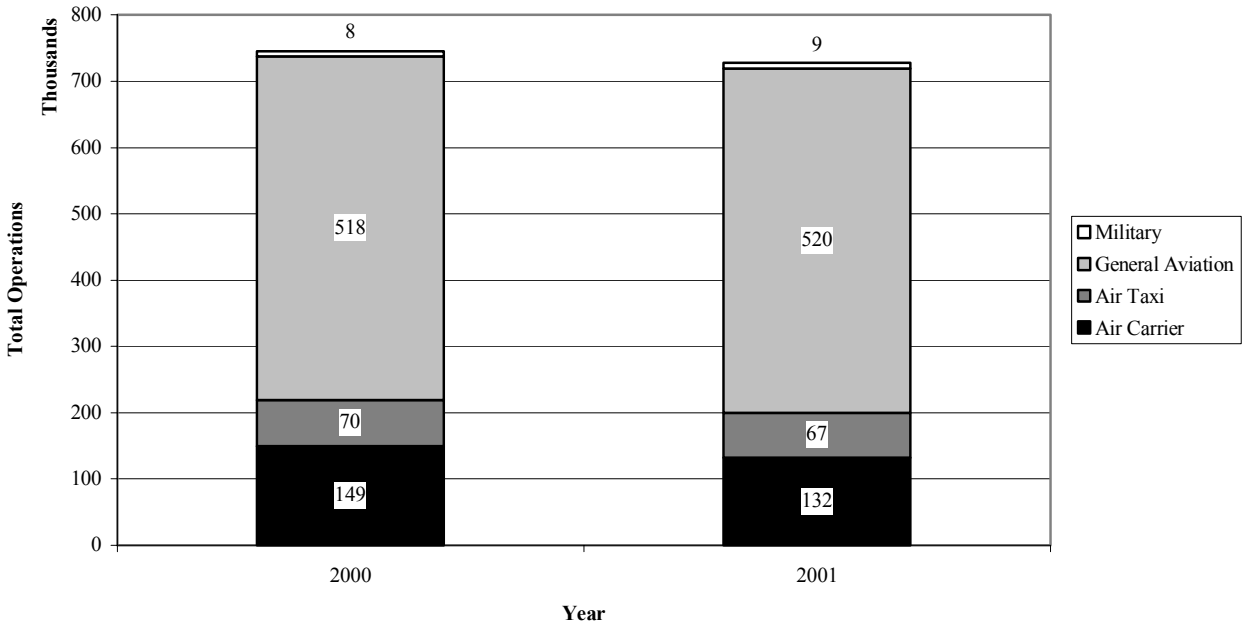


Figure 8-22
Total Operations in the United States During the Month of October

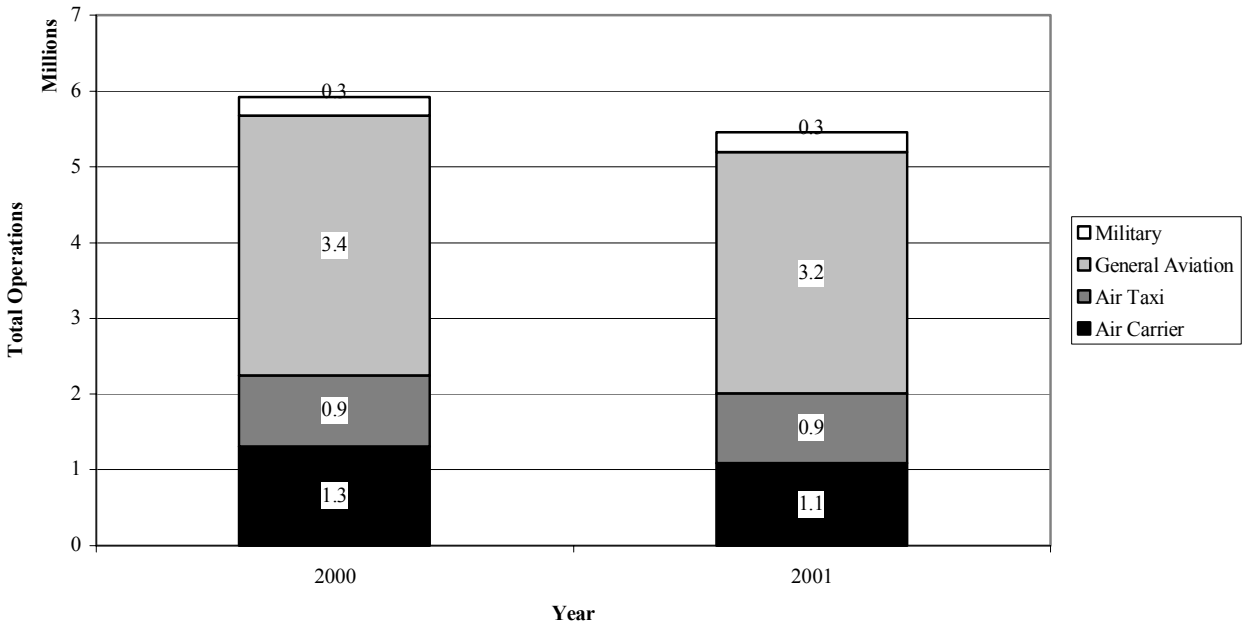


Figure 8-23
Total Operations in California During the Month of December

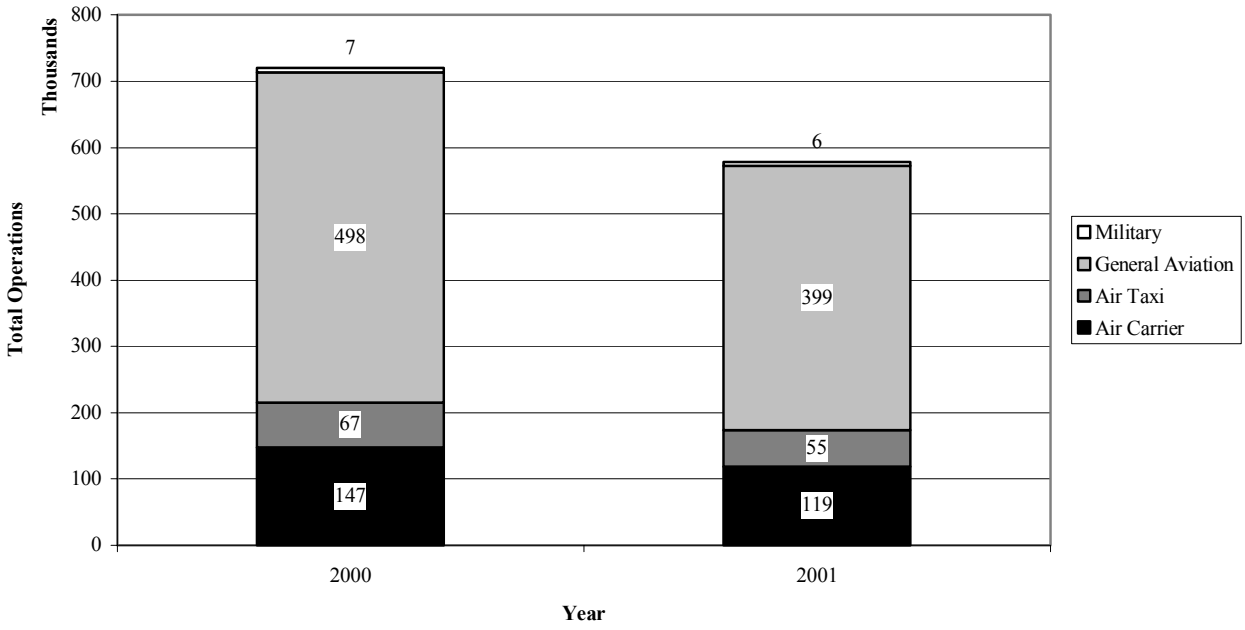


Figure 8-24
Total Operations in the United States During the Month of December

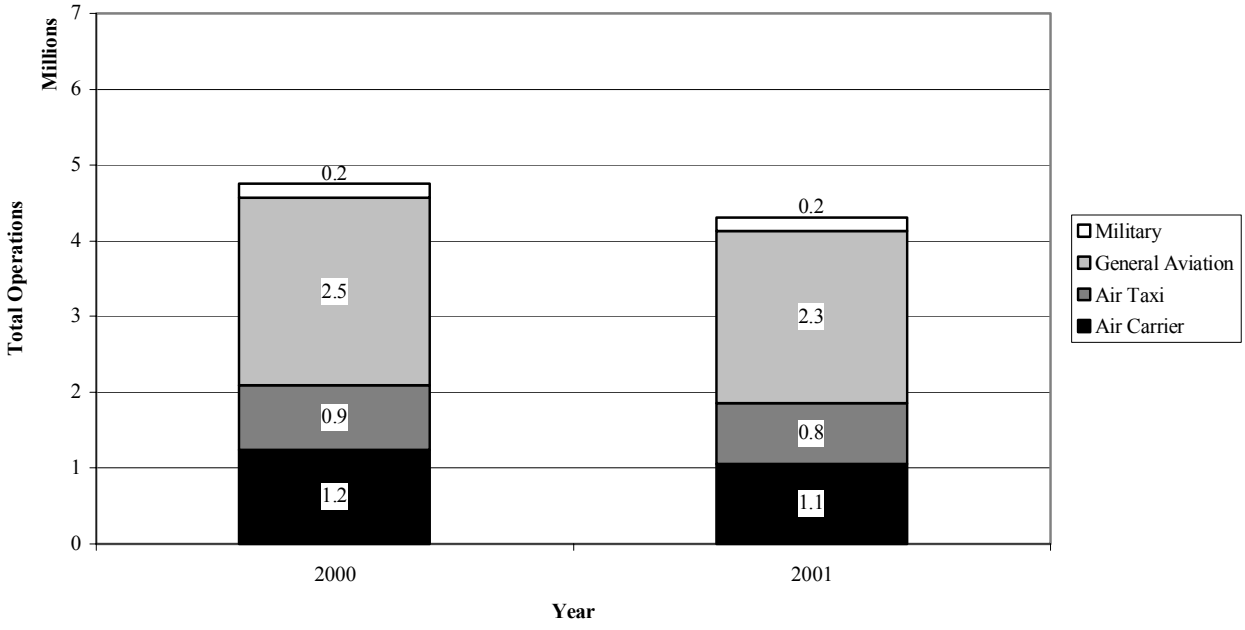


Figure 8-25
Log Scale Plot of October Operations

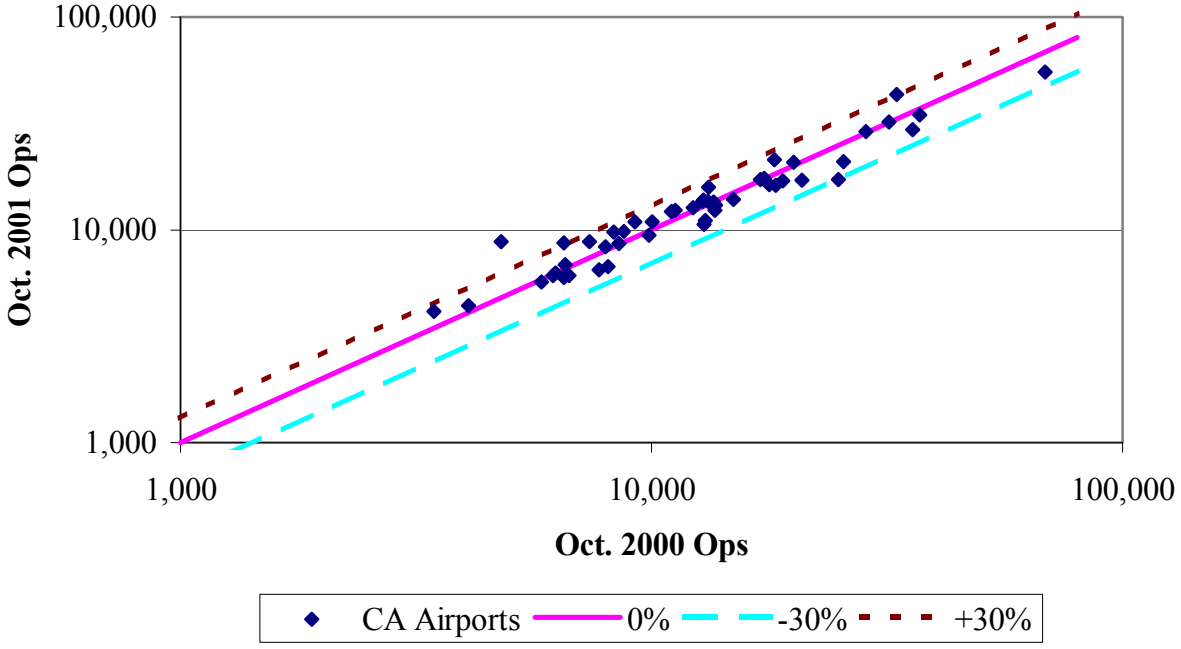


Figure 8-26
Log Scale Plot of December Operations

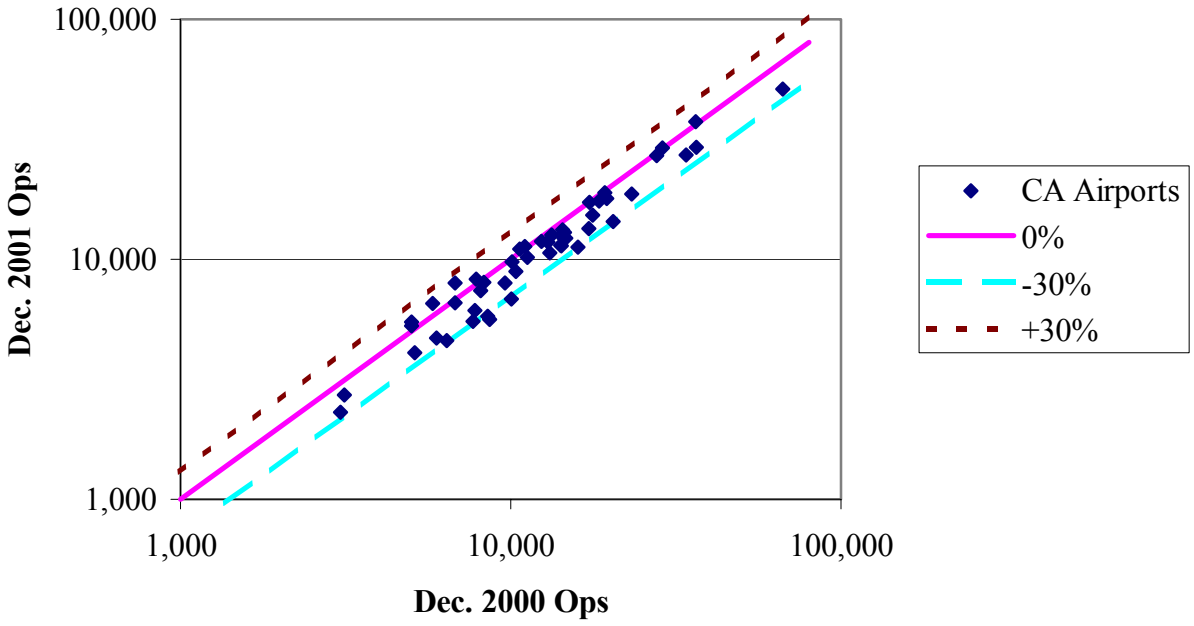


Figure 8-27
Operations at LAX

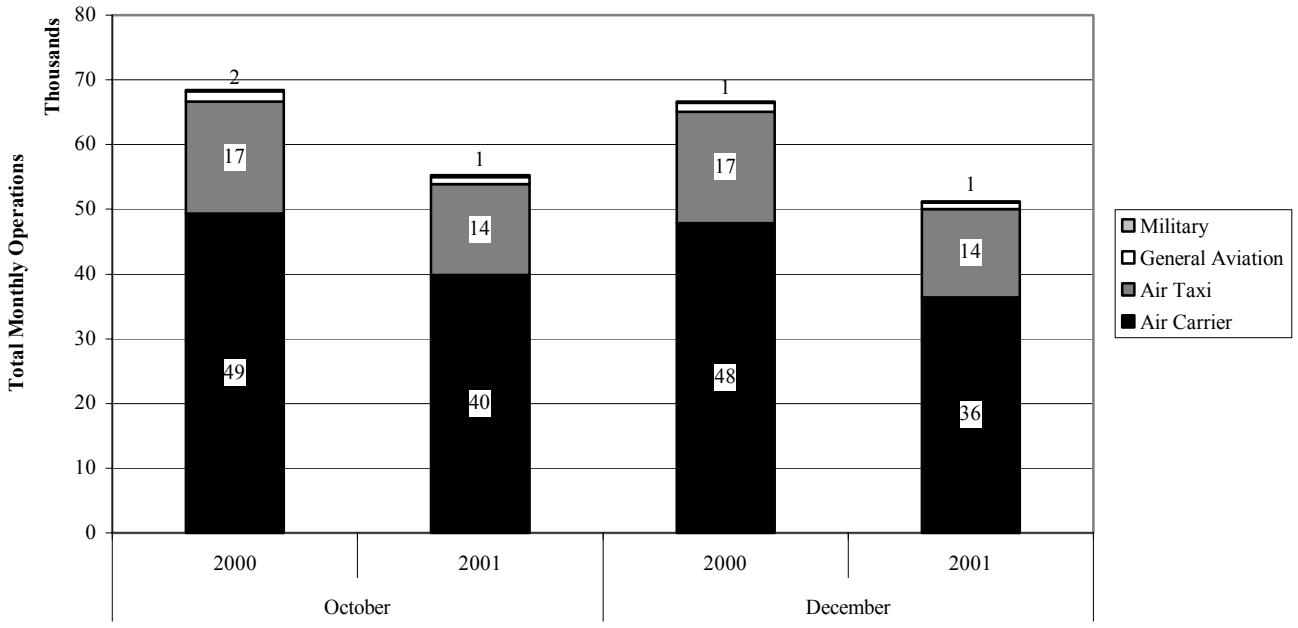


Figure 8-28
Operations at OAK

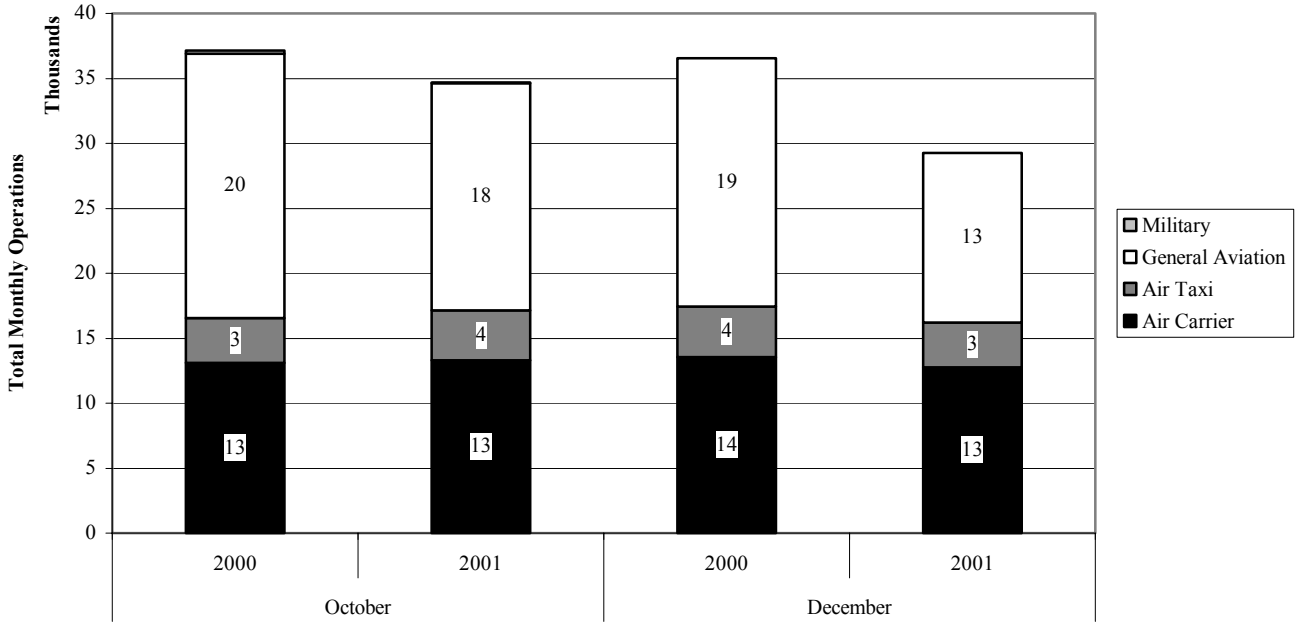


Figure 8-29
Operations at ONT

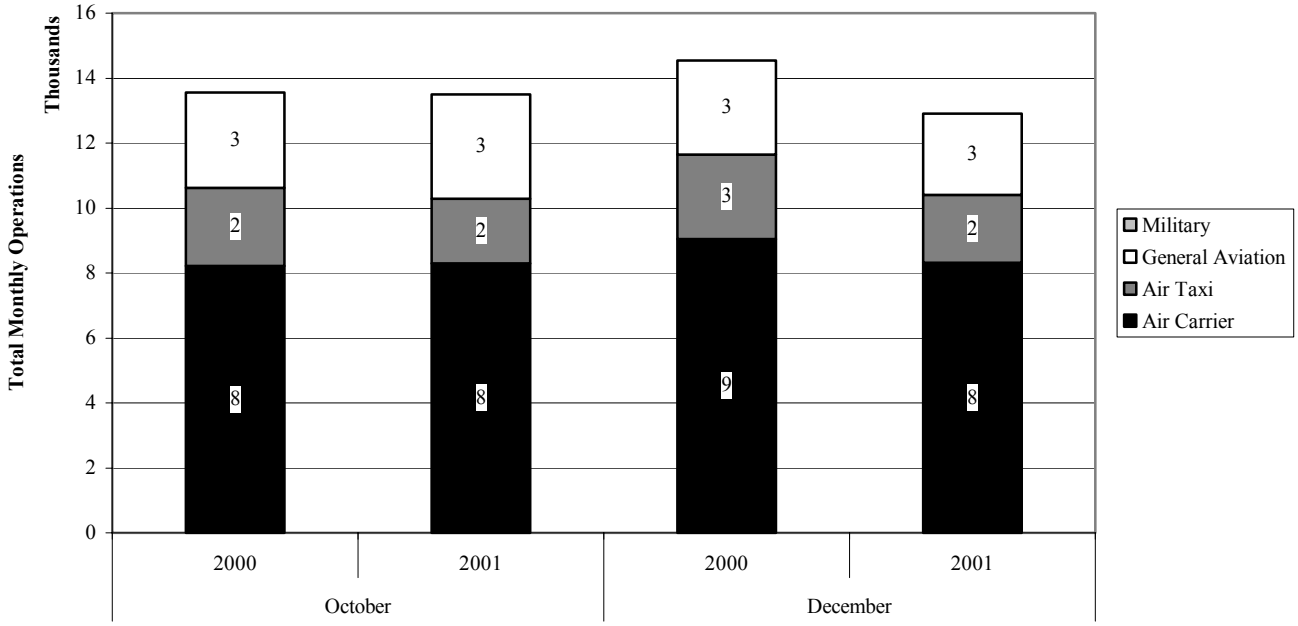


Figure 8-30
Operations at SAN

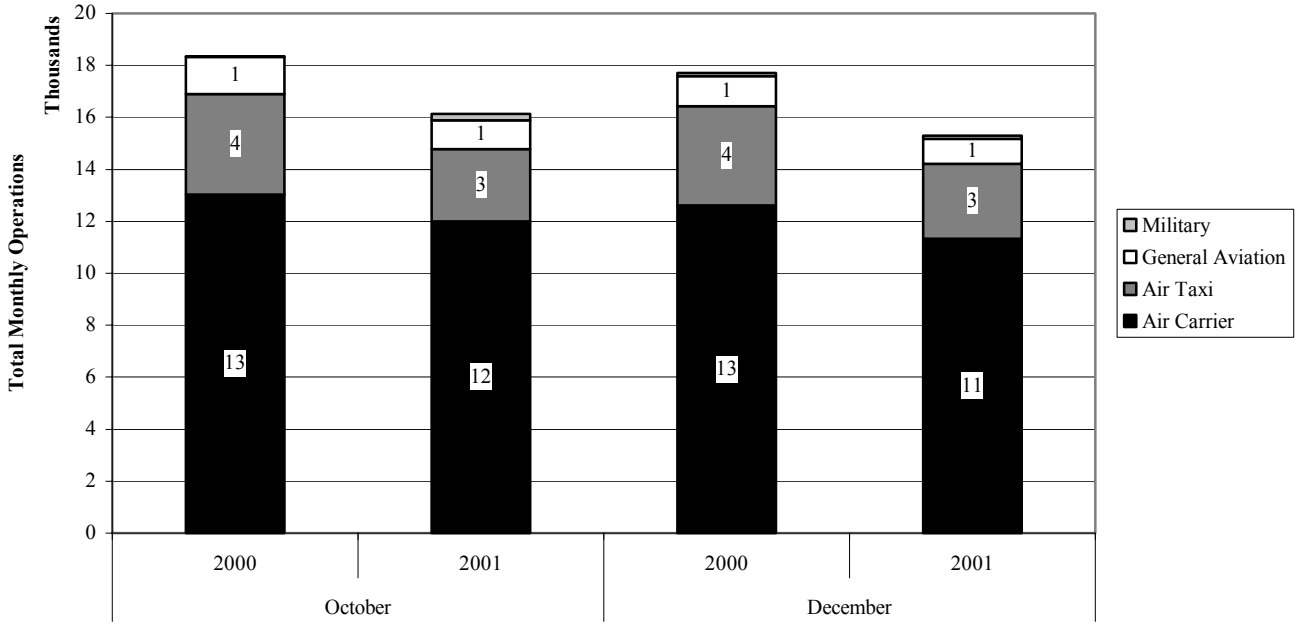


Figure 8-31
Operations at SFO

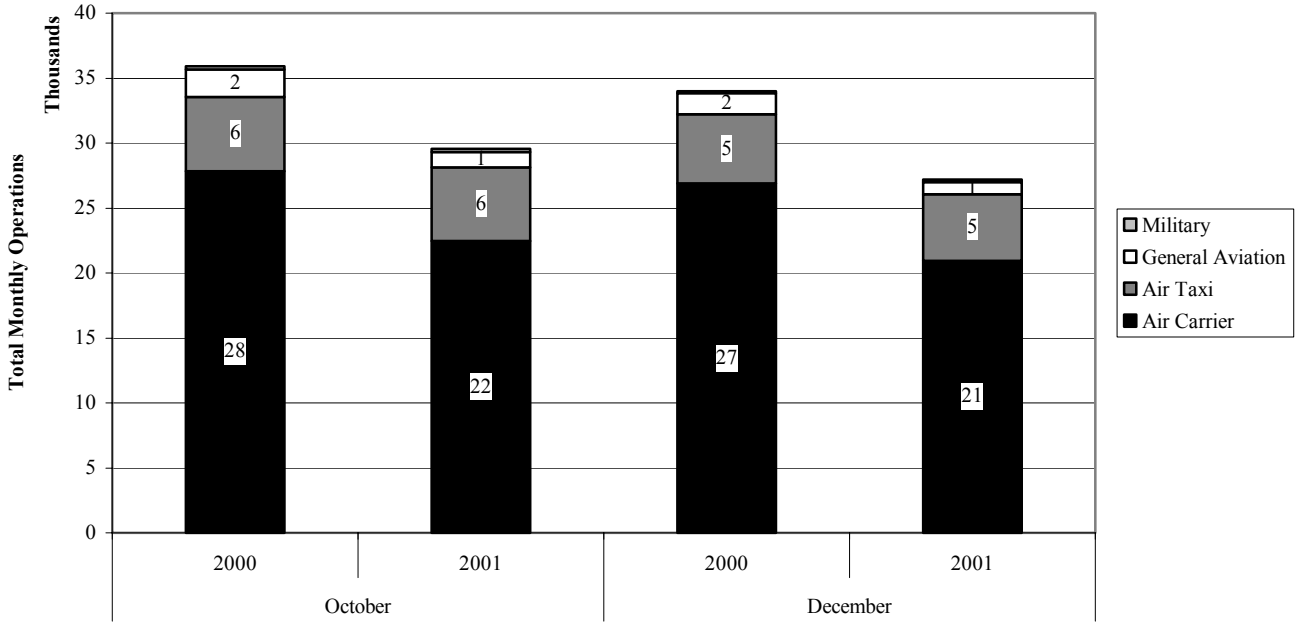


Figure 8-32
Operations at SJC

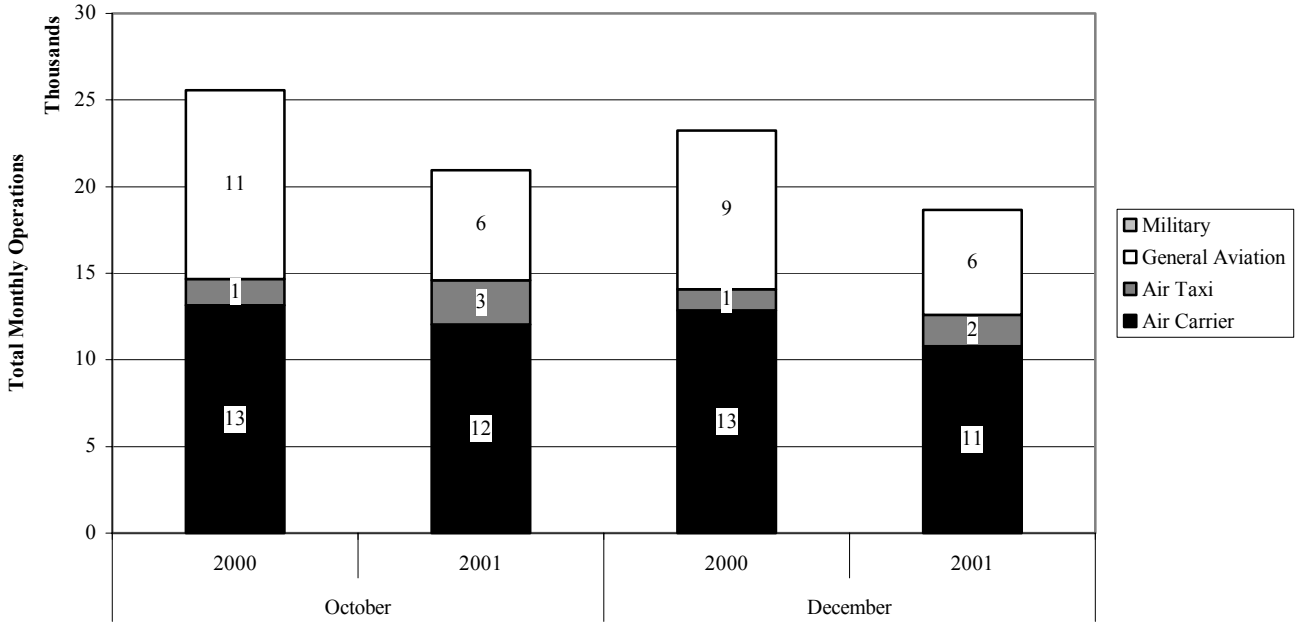


Figure 8-33
Percent Change in Total Operations from 2000 to 2001 for October and December

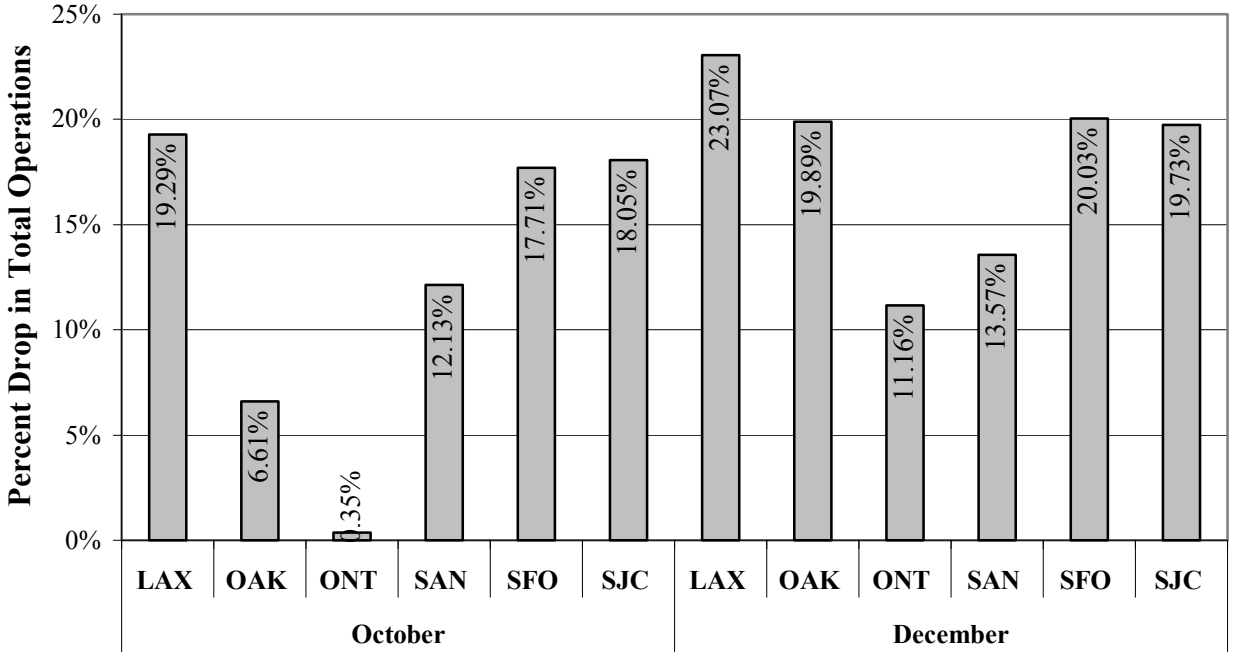


Figure 8-34
Percent Change in Operations from 2000 to 2001 by Category for October and December

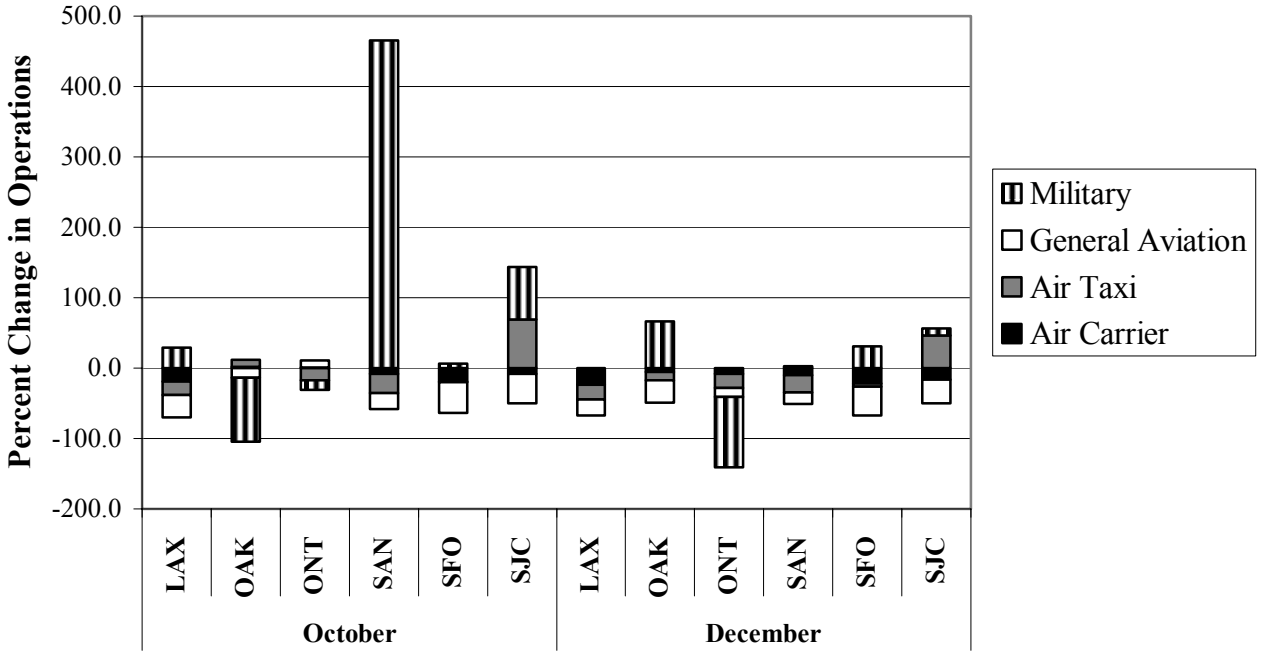


Figure 8-35
Weekly Operations at LAX

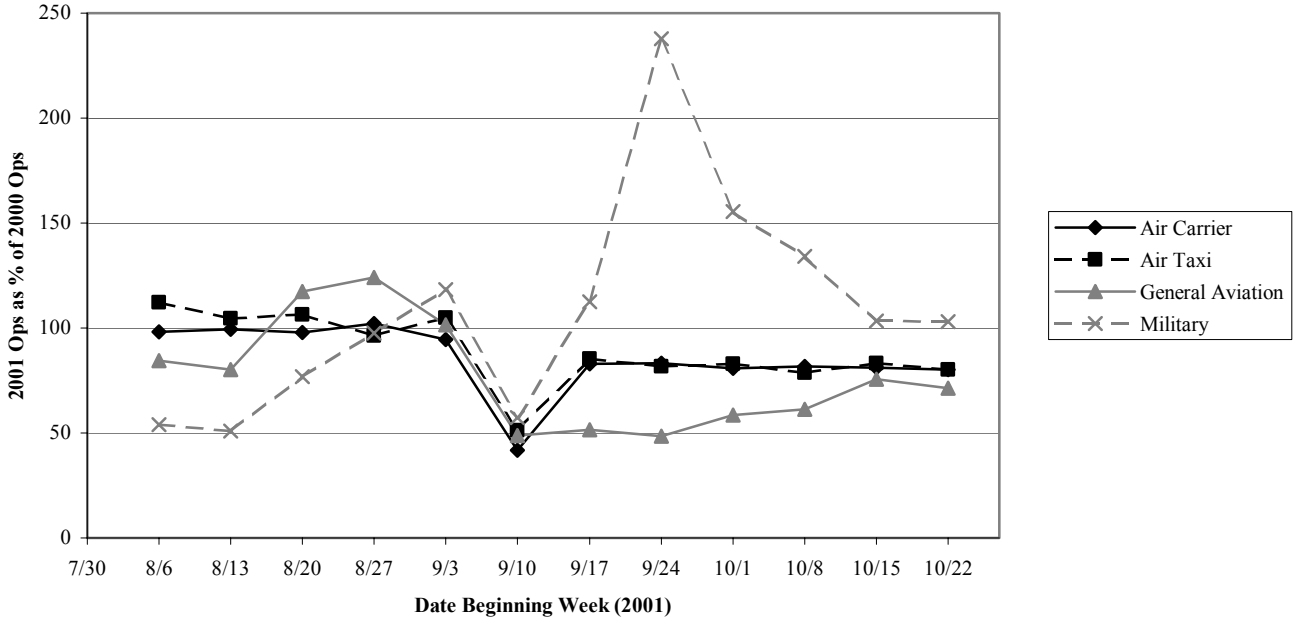


Figure 8-36
Weekly Operations at OAK

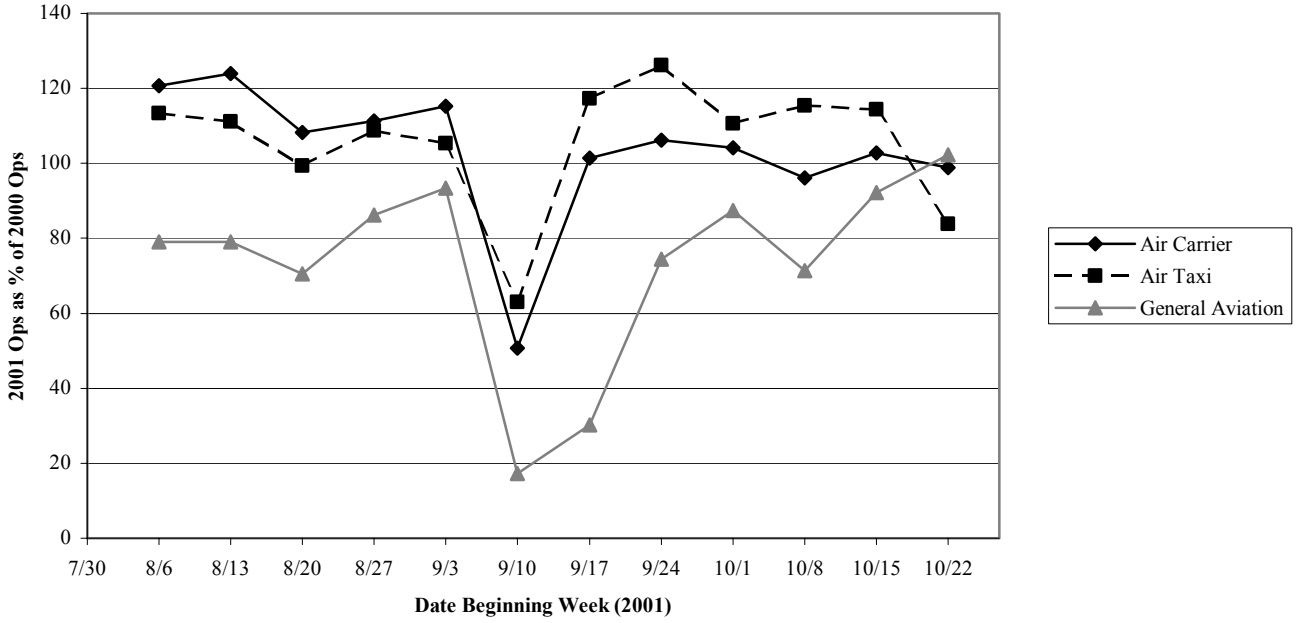


Figure 8-37
Weekly Operations at ONT

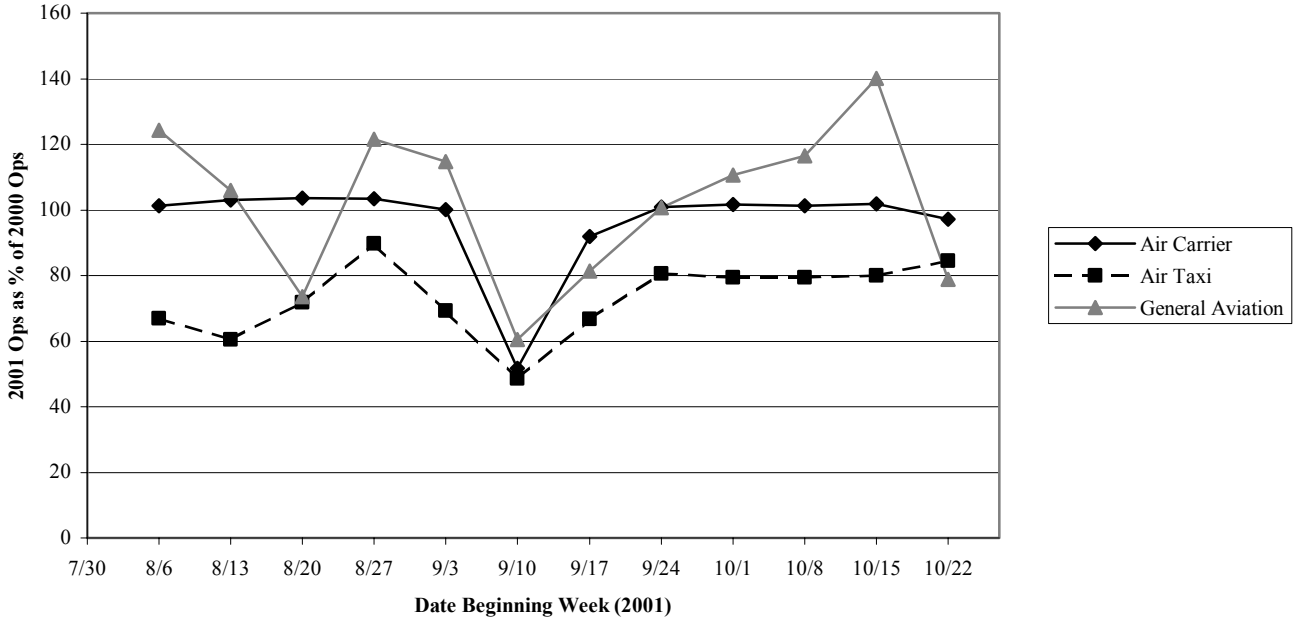


Figure 8-38
Weekly Operations at SAN

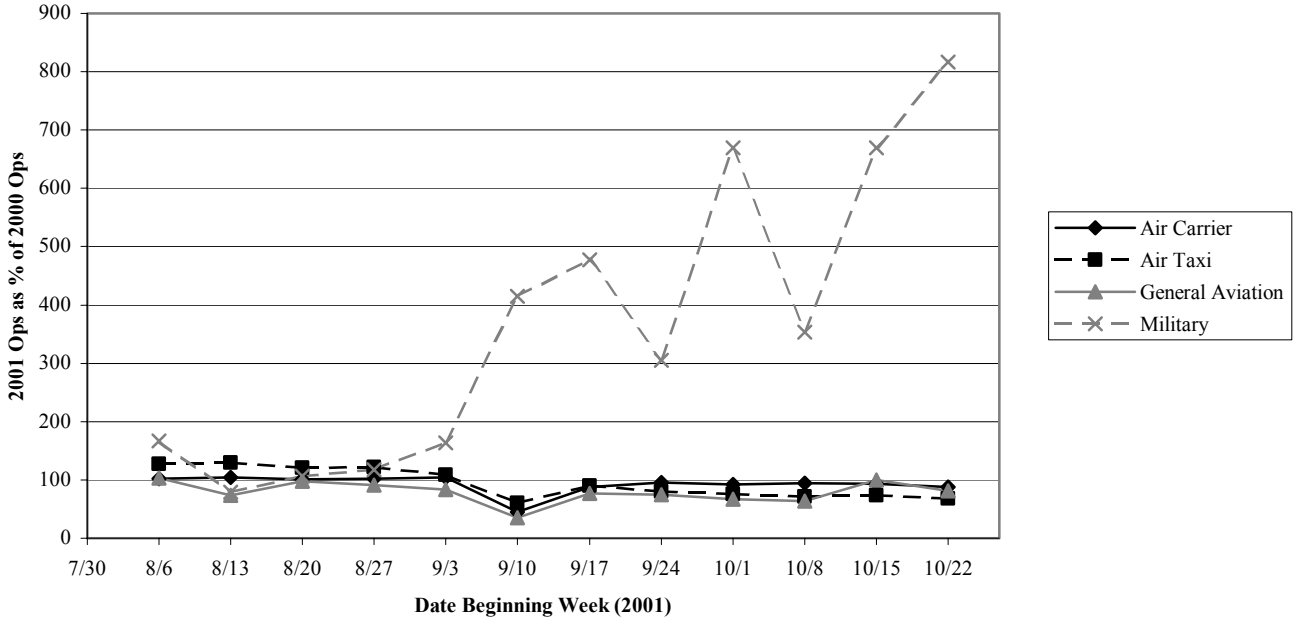


Figure 8-39
Weekly Operations at SFO

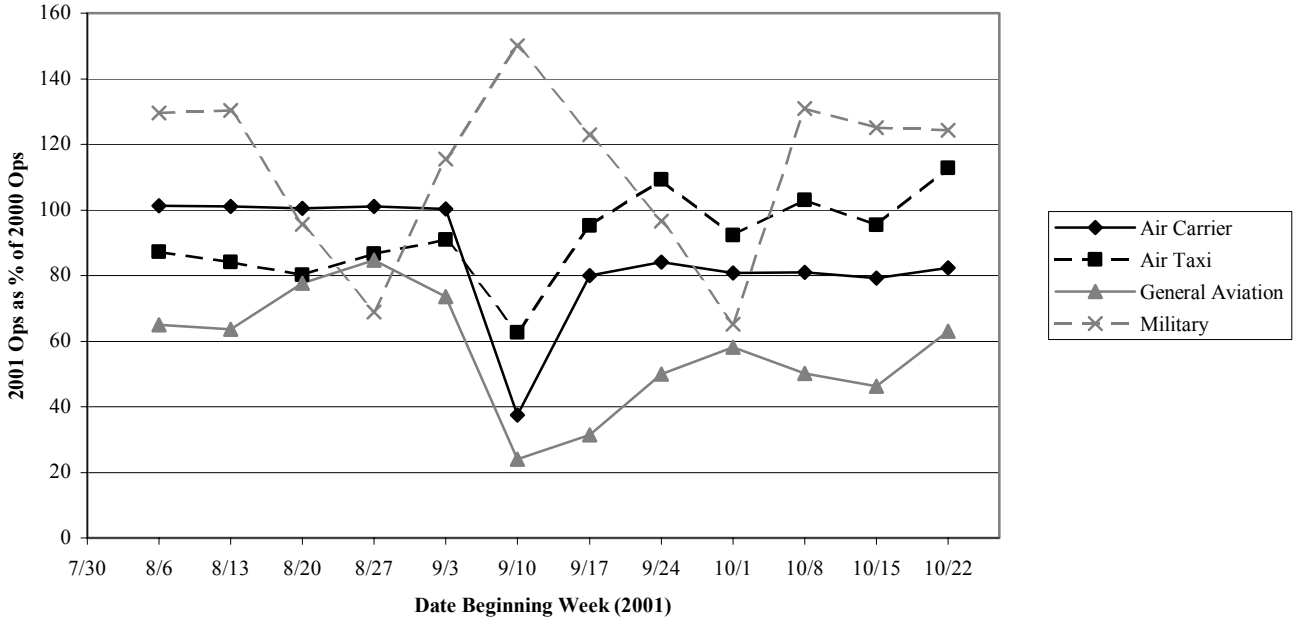


Figure 8-40
Weekly Operations at SJC

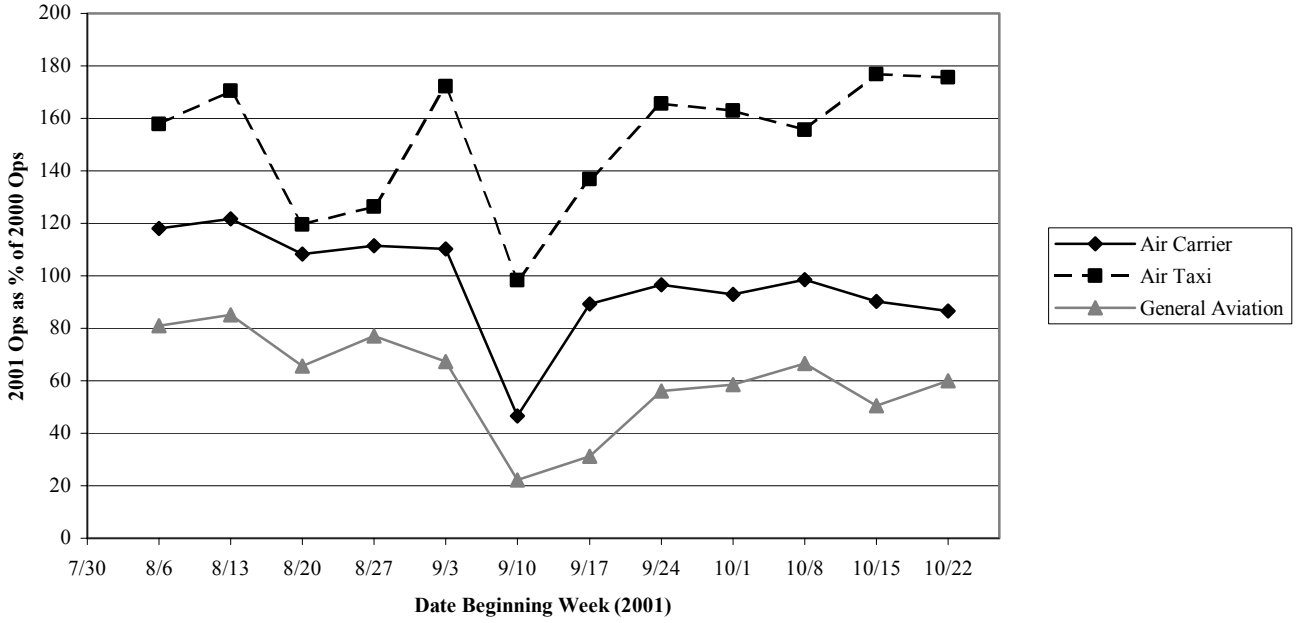


Figure 8-41
Arrival Delay, 2000 and 2001

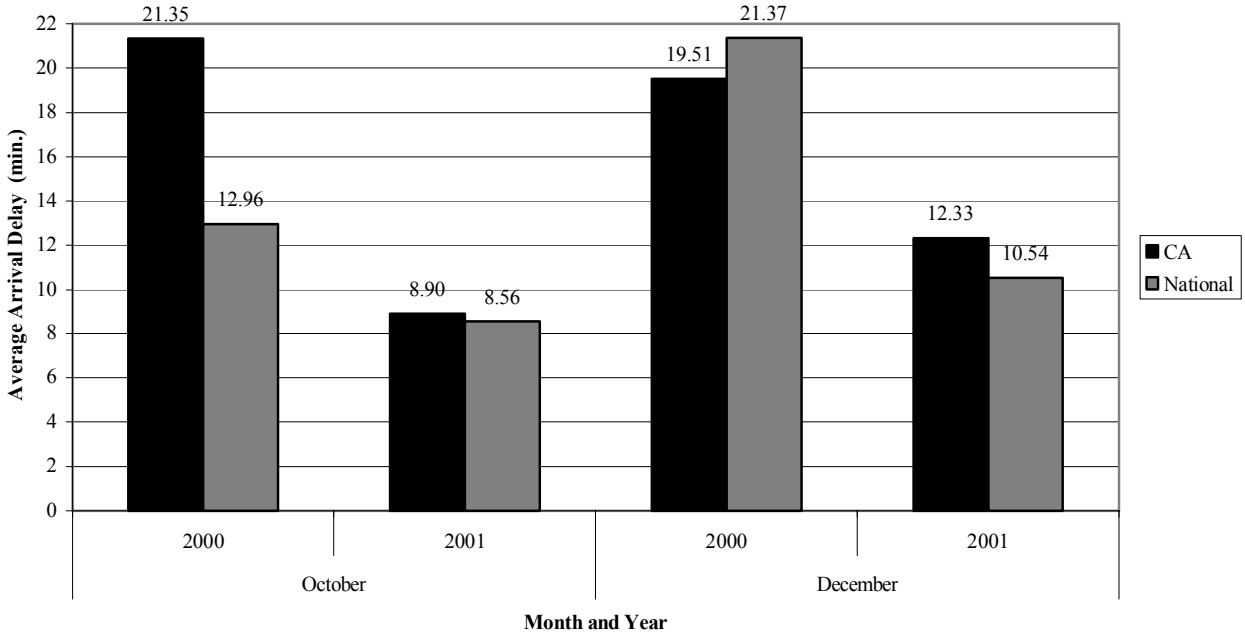


Figure 8-42
Average Arrival Rates to LAX in December (Friday)

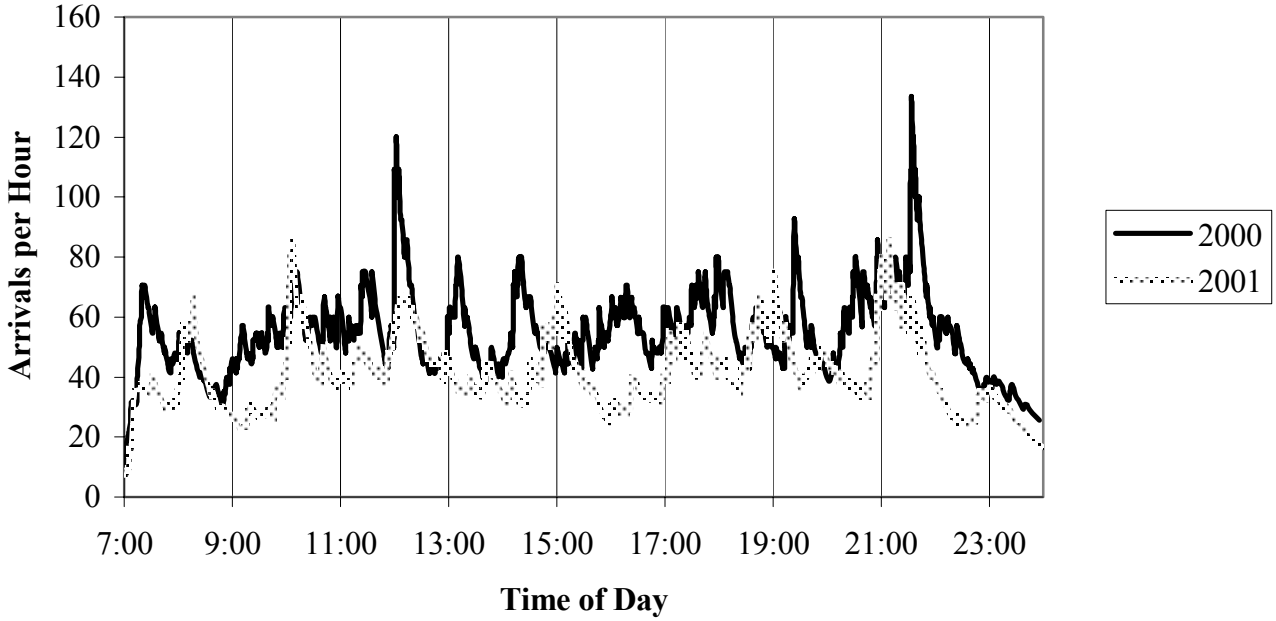


Figure 8-43
Average Arrival Rates to SFO in December (Friday)

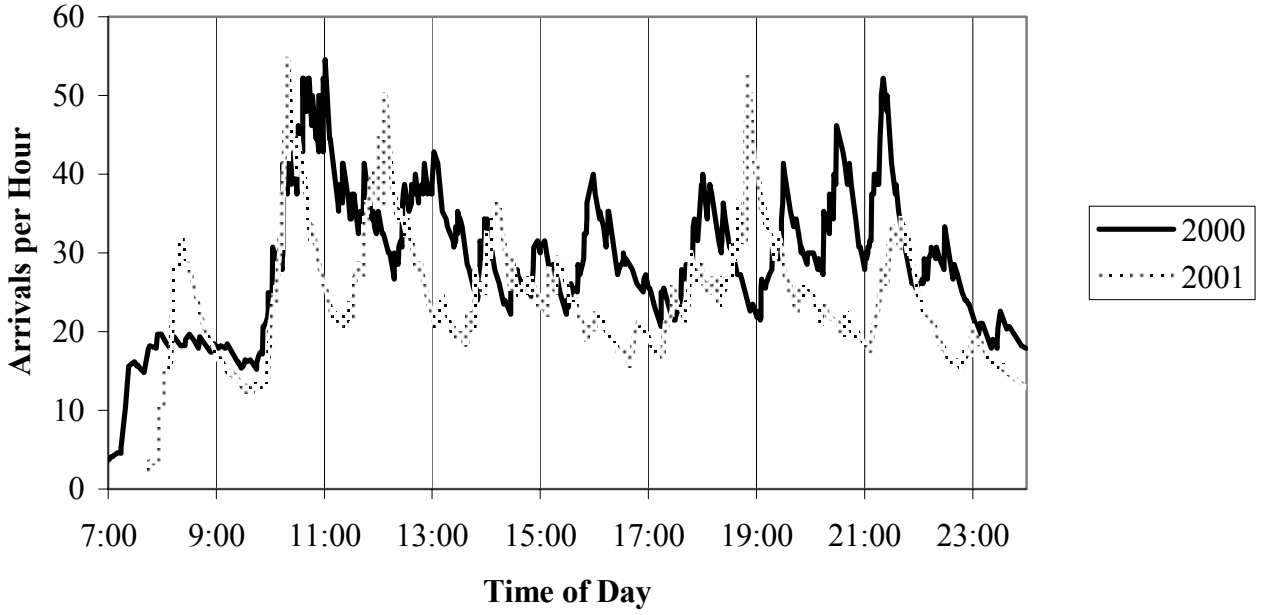


Figure 8-44
Monthly Revenues at California Airports

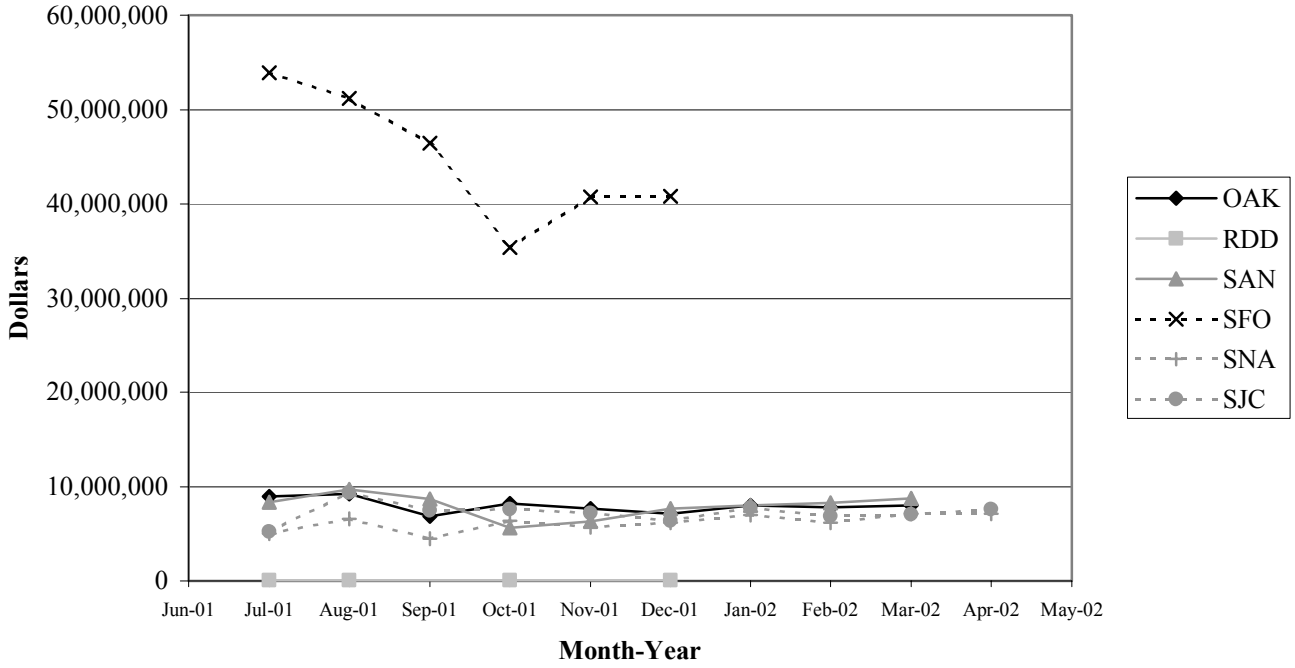


Figure 8-45
Monthly Expenses at California Airports

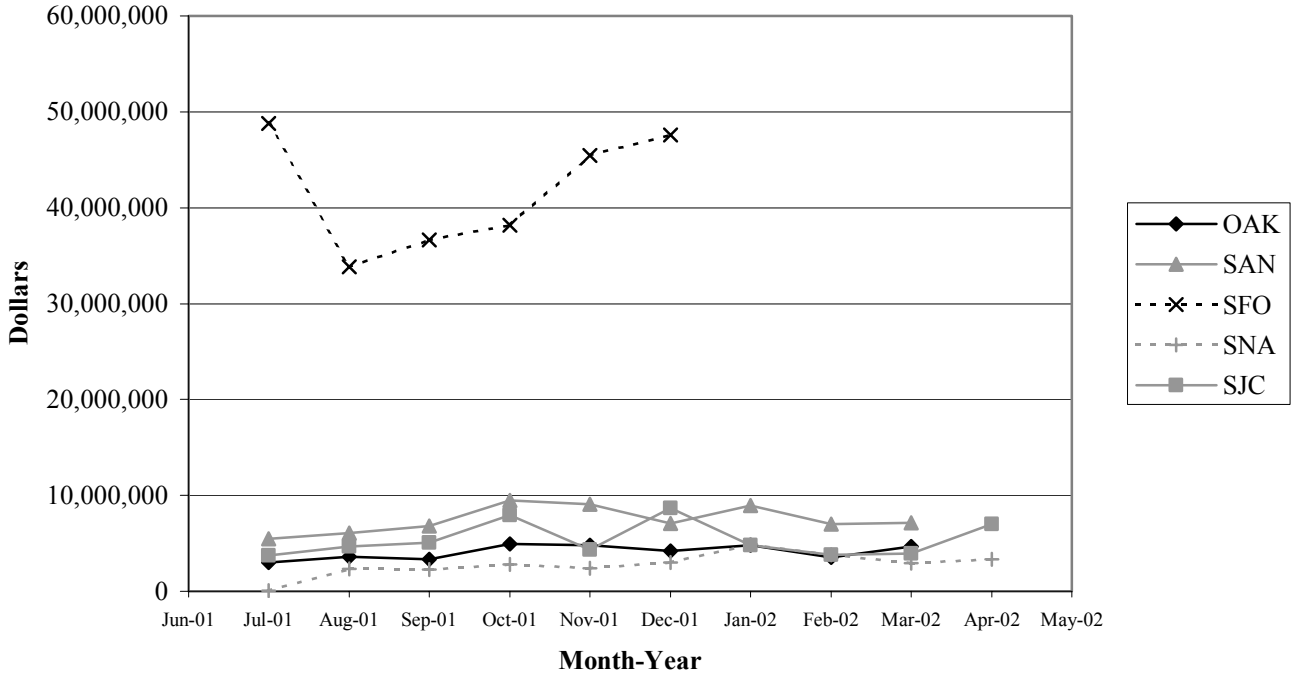


Figure 8-46
Monthly Revenues and Expenses, OAK

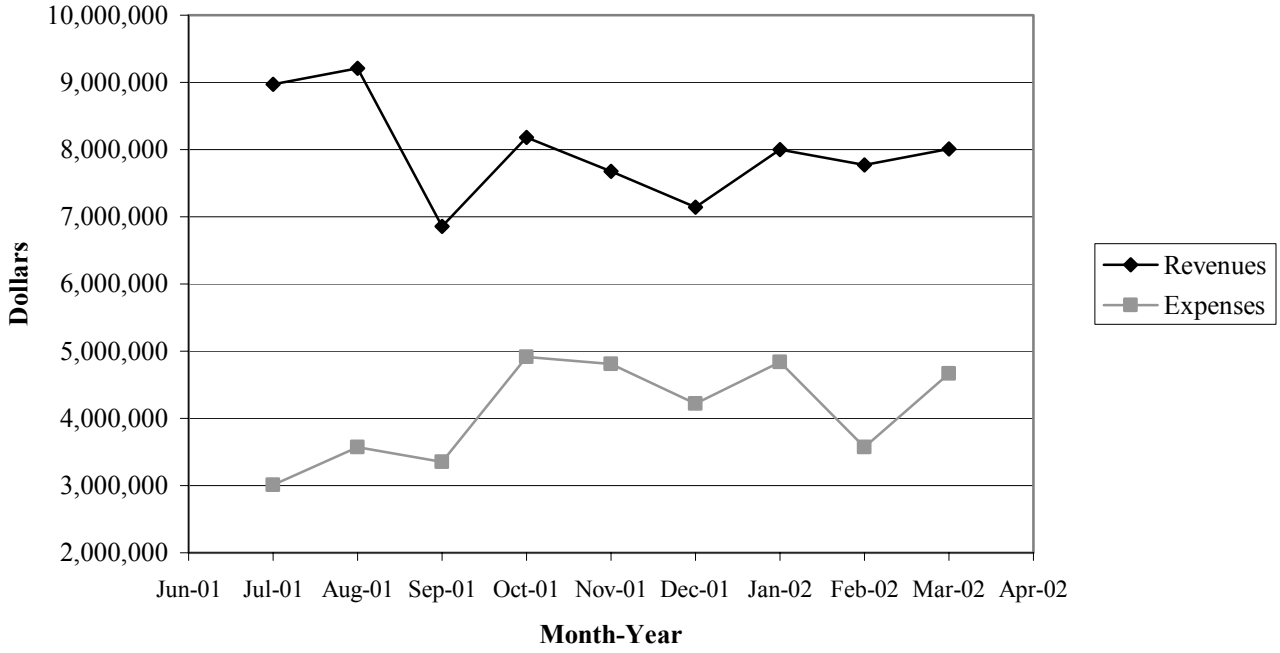


Figure 8-47
Monthly Revenues, RDD

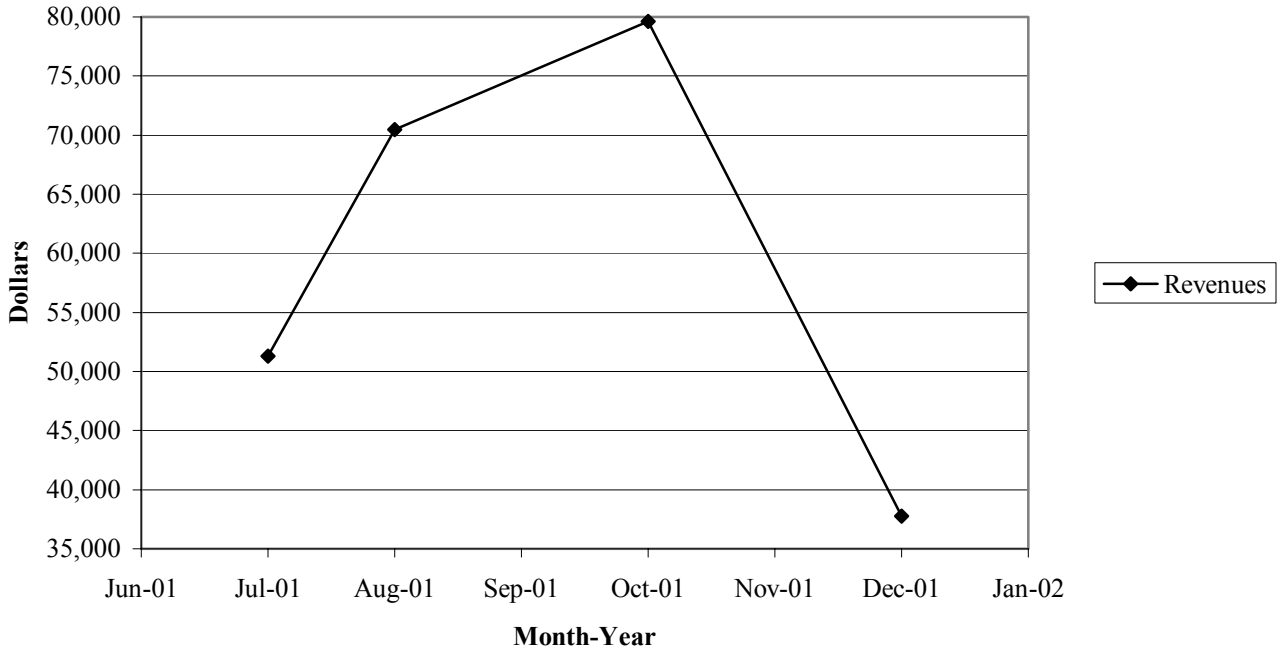


Figure 8-48
Monthly Revenues and Expenses, SAN

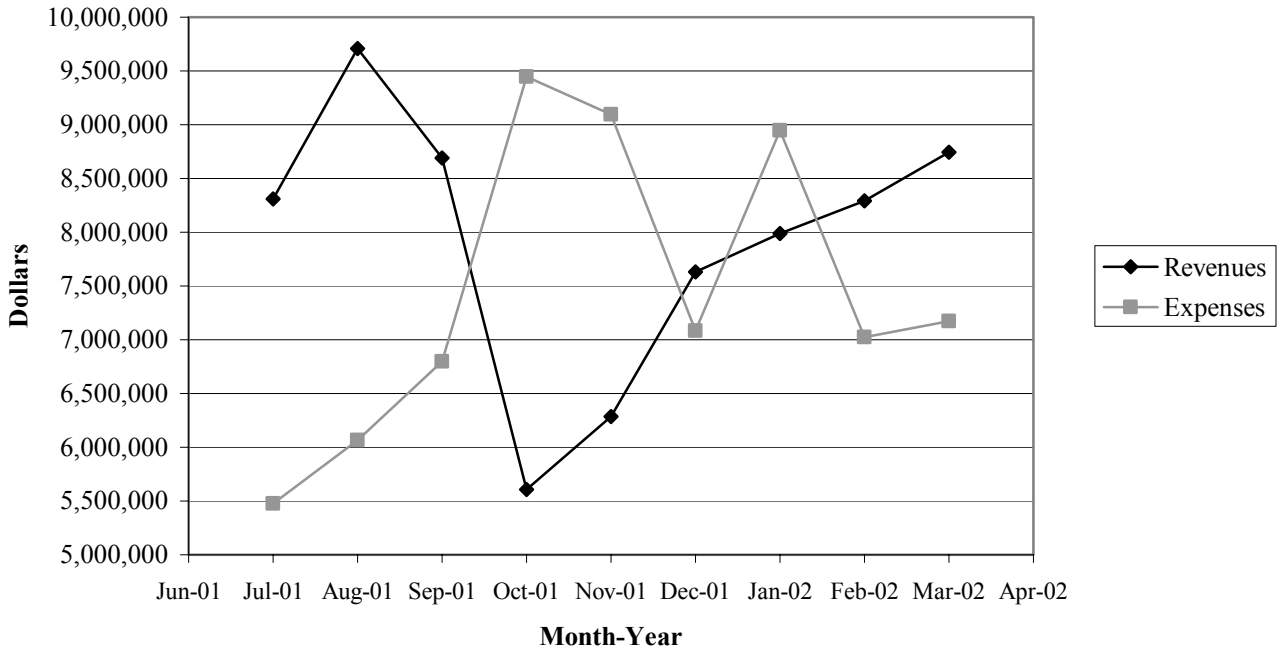


Figure 8-49
Monthly Revenues and Expenses, SFO

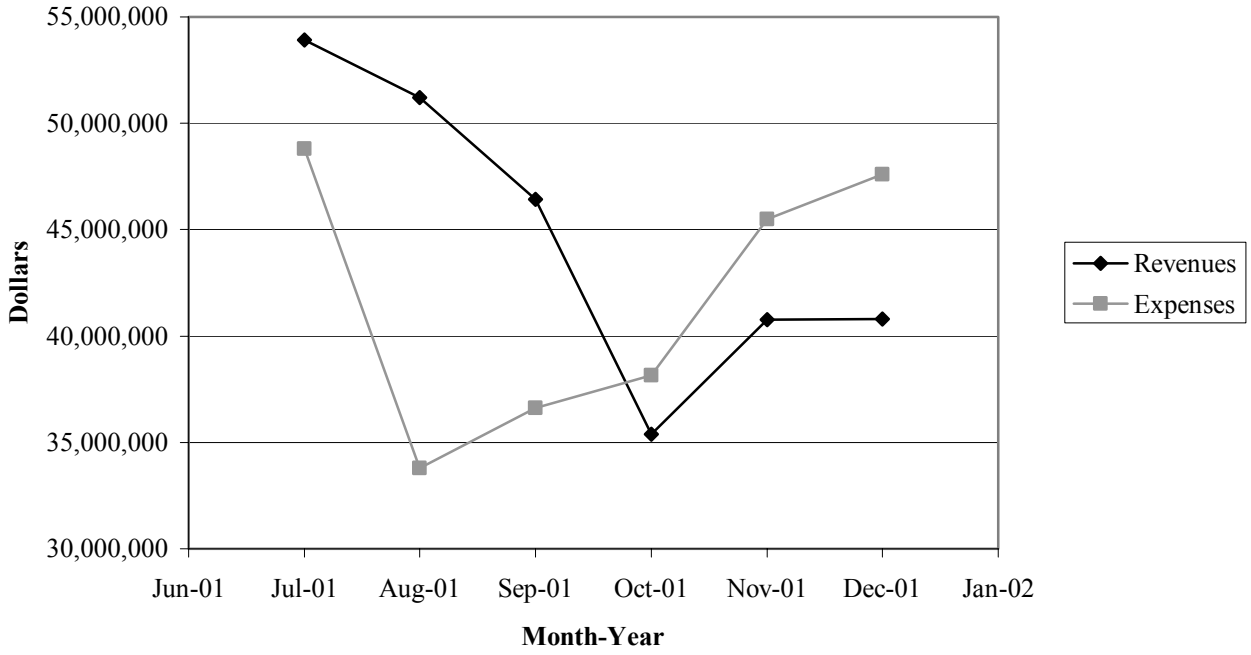


Figure 8-50
Monthly Revenues and Expenses, SJC

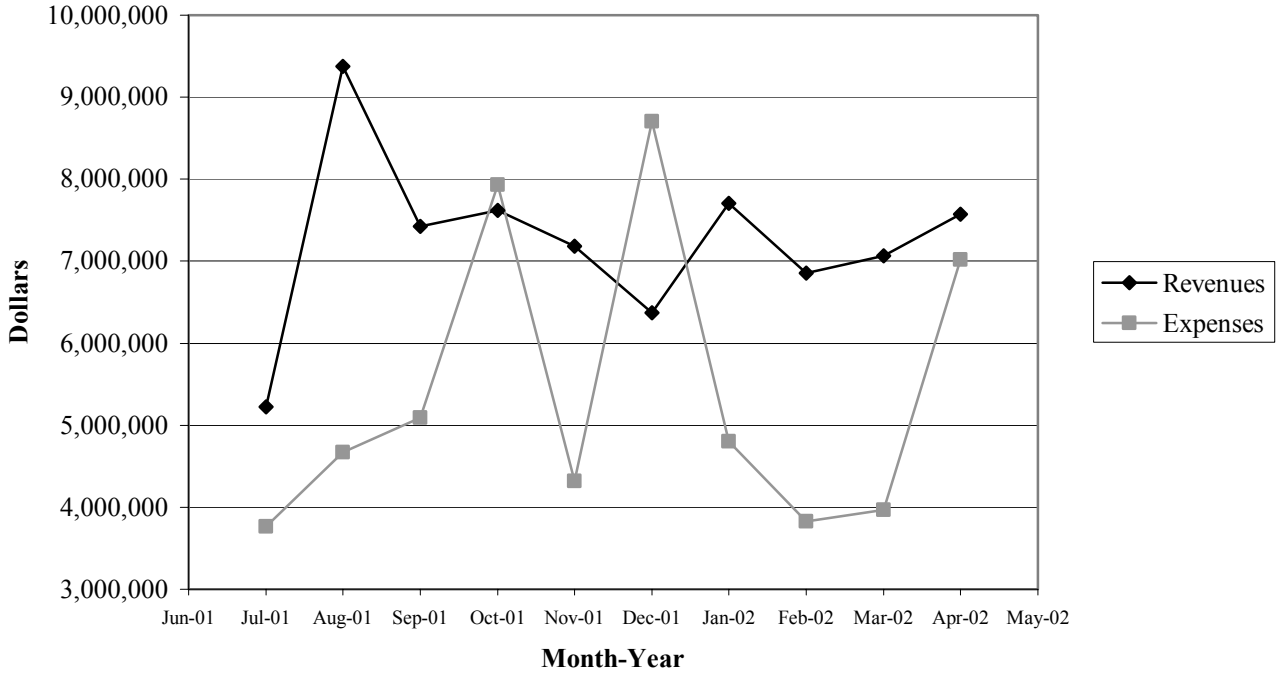
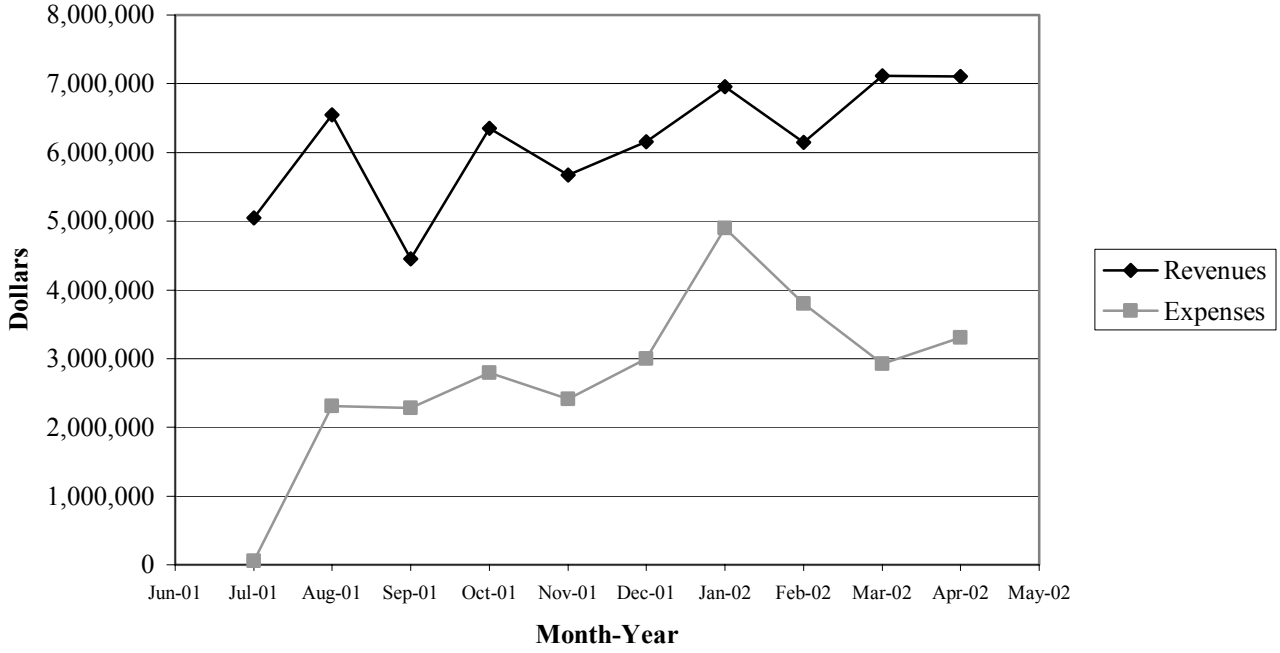


Figure 8-51
Monthly Revenues and Expenses, SNA



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