

FINAL REPORT

Air Cargo Mode Choice and Demand Study



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1 Executive Summary

1.1 Study Purpose

Air cargo significantly contributes to the State and national economies. The intent of this study is to obtain updated, quantifiable and descriptive information about air cargo in California for the purpose of improving mobility of goods by supporting industry infrastructure needs. This comprehensive overview covers historical trends, dynamics of air cargo as a transportation mode choice, industry landside infrastructure capacities and insight into future air cargo demand. Essential information from this study will be incorporated into the forthcoming Goods Movement Action Plan update.

1.2 Background

Recognizing that the air cargo industry has experienced many changes in the past ten years, Caltrans sponsored this study to develop a more current understanding of past, present and anticipated future air cargo trends and to determine how these trends affect the California economy and infrastructure planning. Information from this study will provide background and support for needed air cargo infrastructure projects.

To accomplish the above objectives, it is important to begin with a review of the previous information that has been published and how things have changed, particularly in the last decade. This sets the stage for the subsequent sections, with Section two providing insight into how the air cargo industry has changed and how this will affect infrastructure planning as the state moves forward. Section three then looks at the air cargo industry as a whole, pointing out the differences between the integrator's¹ business model [primarily Federal Express Corporation (FedEx) and United Parcel Service (UPS) in California] and the model followed by traditional air cargo operators. This is followed in Section four by a review of the specific airports in California and air cargo operators at these airports (specifics from a survey of market participants appear in this section as well as in Appendix B). Finally, Section five provides a forecast of air cargo tonnage and related truck traffic for the years 2015 and 2020. The forecast section provides an economic benchmark for the thirteen largest cargo handling airports in California, based on each attaining the domestic and international growth rates forecast by The Boeing Company. The Boeing Company's annual world air cargo forecast is well-recognized as a source for future market demand of air cargo services. This forecast was used to provide aggregate long-term growth rates at the national levels for both U.S. domestic and international trade flows. These forecasts are an aggregate composed of leading cargo airports nationwide, and assume that growth of air cargo at California airports will be the same as for the U.S. as a whole.

1.3 Literature Review Summary

In 2000, several published reports forecast rapid growth in air cargo traffic in California (as measured in tonnage of goods transported). These forecasts embraced the assumption that the future would mirror the recent past and that the run-up in air cargo volume that characterized the 1990's would continue unabated into the future, based on the continued expansion of California's population and economy.

These forecasts, in turn, shifted transportation planners' attention toward various under-utilized California airports to accommodate the growth in air cargo volume that the state's major airports, San Francisco International (SFO) and Los Angeles International (LAX) in particular, would not be able to handle due to this ever growing demand. The managers of these under-utilized airports, in turn, used this forecast information to provide the basis for considerable investment to position their airports (and surrounding communities) to welcome more air cargo operations. This reaction by the entire air cargo community in the state encouraged planning that was becoming increasingly at odds with a contraction in air cargo that was occurring throughout California during the past decade.

¹ The category of integrators covers the operations of companies such as FedEx, UPS, DHL, and TNT. As the name implies, these operators provide a door to door service for shippers or importers, usually providing their own road transport (local and trucking), handling, transit warehousing facilities, often through an airport terminal dedicated to their use, and aircraft (whether owned or chartered).

The optimistic forecasts of the early 2000's were not adequately "reset" to reflect the changes in the air cargo industry business models, as well as the overall California economy, both of which were undergoing significant, permanent changes, which altered the traditional models that had long linked growth in air cargo to economic growth. Instead, goods that were previously transported via air are now moved electronically (music, books, etc.). In addition, high-tech manufacturing, a source of air exports, has migrated out of California. Finally, due to longer-range aircraft, California airports function less often as gateways for air cargo traffic to/from interior U.S. cities.

As part of this changing environment, the integrators such as FedEx and UPS have been taking over more of the state's air cargo market and their business model dictates an early-delivery, late pick-up schedule, which is far more difficult to accommodate at airports located farther from California's metropolitan areas with higher population concentration.

1.4 Airports, Air Cargo Handlers and the Air Cargo Industry

A market survey was developed to elicit feedback and forecasts from key participants in California's air cargo industry. Survey questionnaires were sent to 158 air carriers, freight forwarders, truckers and developers operating at California airports, and 30 responses (approximately 19 percent) were received. Additionally, the in-depth knowledge of the air cargo industry provided by the consultant team was drawn upon to augment the information gathered by the survey. The survey responses from the air cargo operators indicated an average annual growth rate of 1 – 2 percent is anticipated over the next five years. On the question of additional on-airport warehouse requirements, 25 out of 30 respondents anticipated no additional capacity would be required for the next five years. Twenty-two of 29 respondents anticipate no additional aircraft ramp will be needed, while 7 operators responded there would be a requirement.

1.4.1 Air Cargo Business Models

The air cargo industry has evolved significantly over the last several decades, particularly with the increasing dominance by the integrators in the domestic air cargo segment. The integrator business model and the traditional "air cargo" model, either by air freighter or as "belly" cargo in passenger aircraft, operate in very different ways. Passenger (belly cargo) carriers, all-cargo airlines and combination carriers (operating both passenger and freight flights) all rely on networks and allied services typically only available at larger international gateways. Generally, the cargo industry operated off-peak and is therefore more likely to be the victim than the cause of roadway congestion. Passenger carriers have cut schedules and reduced aircraft size to such a degree that except for international gateways, they carry little more than mail and small packages. Combination carriers dominate Asia and Europe but only serve gateways. Freight forwarders control bookings of about 76 percent of international shipments but rather than influencing capacity offered by carriers, tend to follow it.

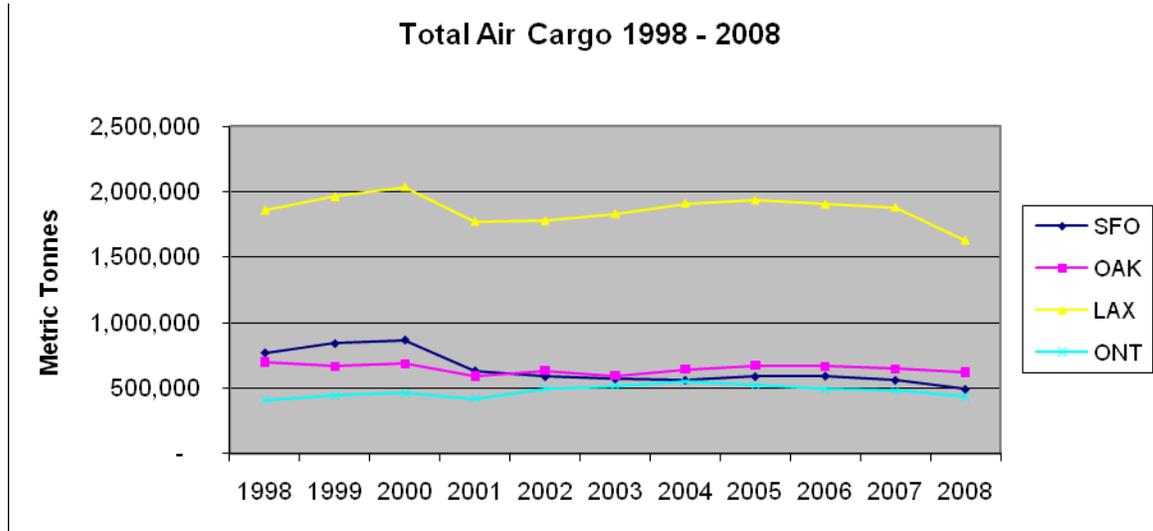
Integrated carriers, such as FedEx and UPS, operate via a hub and spoke system and prefer to locate at airports closer to the major population centers as they must offer late pick-ups and early deliveries. Additionally, the integrators are relevant to the vast majority of California airports as they have captured an increasing share of international air cargo and almost all of the U.S. domestic air cargo. Both FedEx and UPS have the volume and resources to operate independently. The concentration of cargo in the hands of the integrators has left large surplus capacity at most US airports.

1.4.2 California Airports

California airports represent a broad, diverse range with 4 of the top 16 U.S. cargo airports. There are two international gateways (LAX and SFO), two regional integrator hubs [Metropolitan Oakland International (OAK) for FedEx and Los Angeles Ontario International (ONT) for UPS] and numerous local service airports. From an airfreight perspective, FedEx and UPS dominate all of these airports except for LAX and SFO, based on their dominance in the domestic air freight market. California's top four airports, as shown in Figure 1-1, account for

approximately 88 percent of the state's total air cargo (4,027,321 U.S. Tons – total 2008 California air cargo). For reference purposes, the airport codes for twelve of California's top air cargo airports are shown in Table 1-1.

Figure 1-1: Major Air Cargo Airports in California



Source: Airports Council International – North America and Webber Air Cargo

Table 1-1: Top 12 California Cargo Airport Codes

Airport Name	Airport Code
San Francisco International	SFO
Metropolitan Oakland International	OAK
San Jose International	SJC
Sacramento Mather	MHR
Sacramento International	SMF
Fresno Air Terminal	FAT
Los Angeles International	LAX
LA Ontario International	ONT
Bob Hope (Burbank)	BUR
John Wayne	SNA
San Diego International	SAN
Long Beach	LGB

Source: TranSystems

- LAX is one of the major international gateways for international cargo coming from Asia, for the entire US and accounts for 45 percent of the state's total. Recently, due to the economic downturn and the subsequent decline in air cargo volumes, LAX has suffered significant losses and capacity is again at a surplus.
- SFO has an international carrier mix similar to LAX but suffered greater air cargo losses than LAX, in fact among the worst of any US airport over the last decade. SFO's air cargo is belly-dependent with very few freighters operating into the airport.

- OAK and ONT are both integrator hubs but otherwise operate like other spoke airports. Attempts to attract international carriers have been unsuccessful.
- Land-constrained San Diego will be unlikely to see any significant change in air cargo volume because of their proximity to the UPS hub at ONT and FedEx's large operation at LAX. They will likely contribute to truck traffic but only from a relatively small cargo base volume.
- San Jose shares a local market with SFO and OAK and is therefore little more than a reliever airport to the international gateway and integrator hub. It may contribute to some localized traffic for UPS but is unlikely to grow dramatically.
- Sacramento airports split cargo operations when exceptional growth was anticipated but the region's principal carrier, FedEx, stayed at SMF while DHL and UPS went to MHR. MHR enjoyed a very short (1999 – 2001) growth spurt when the US Postal Service established their western regional hub there. The Sacramento airports are not likely to attract carriers from the SF Bay airports.

Other California commercial airports have nominal cargo volumes and generally have either little opportunity or even interest in nurturing air cargo growth. There is still interest among former military bases in Southern California to establish operations but with contractions at LAX and ONT, this is not likely to occur in the near-term.

1.5 Air Cargo and Related Truck Traffic Forecasts

Forecasts of air cargo volumes at California airports must account for an unusual growth history of cargo at these airports over the past two decades. California air cargo tonnage grew in line with economic expansion during the 1990s, and reached a peak in 2000 at 4.57 million tons. For the year 2000, this cargo was valued at \$77.9 billion. Since 2000, however, despite continued economic growth, tonnage declined steadily, down to 3.55 million tons in 2008, valued at \$67 billion, an overall decline of 22.5 percent, and a further sharp decline in 2009 as recession took hold. The decline in air cargo was particularly steep at SFO, where volume declined by 47.5 percent between 2000 and 2008. Elsewhere in the U.S. air cargo volume continued to grow, and California's share of total U.S. air cargo fell from 36 percent in 2000 down to 23 percent in 2008², a significant drop in percentage terms. The factors responsible for this decline from the 2000 peak are somewhat unique to California, and the outlook for the growth of California air cargo over the next decade depends on to what extent they have run their course.

The primary factors responsible for California airports' loss of volume and declining share of U.S. air cargo since the 2000 peak include:

- Bypassing of California by longer-range aircraft, connecting interior U.S. cities directly with overseas origins and destinations, particularly in Asia – The role of major California airports, LAX and SFO, as gateways for export and import cargo to/from Asia has been permanently diminished.
- Declining volume of California-based high-tech exports, particularly from Northern California – Following the sharp downturn in the technology sector after 2000, California, which had by far the highest concentration of high-tech exports, saw these decline over 15 percent in the first year (2001) alone, and continued to decline through 2009, particularly in Silicon Valley's main airport for international trade, SFO.
- Substitution of surface modes (ocean and truck) for air freight transport, due to rising fuel costs and increasingly stringent security requirements, which disproportionately increased the unit cost of air relative to other modes

² UPS and FedEx domestic cargo volumes were not included in either the year 2000 or 2008 share as they did not begin to report this information until 2001 and 2002 respectively.

The latter factor negatively affected air cargo to/from all U.S. airports, but had a disproportionate effect on California, as the principal gateway for trade with Asia, where a massive substitution of containership for air occurred.

The outlook for air cargo at California airports depends on (1) the outlook for the growth of the California economy and U.S. international trade by trade-lane; and (2) continuation of trends identified above that had a disproportionate negative effect on California.

Regarding economic growth and international trade patterns, California airports should be favored, mainly because of the expected continuation of Asia growing its share of U.S. imports and exports by air. The California economy declined relatively rapidly during the recent recession, but its growth out of the recession should be at about the national average. Regarding the special factors that have led to California's decline in air cargo, these do not appear to be sources of further decline. One possible exception is a sharp lasting increase in fuel prices that drives up the relative cost of air even further and leads to a further shift away from air to surface in international and domestic transportation.

On balance, for the purpose of developing initial high-level forecasts of California air cargo, it is reasonable to assume that the positive and negative factors balance out and the growth rate of California air cargo is equal to that projected for the U.S. as a whole. Forecasts of air cargo growth at the national level are developed by The Boeing Company, and these projections, which tend to be somewhat optimistic, are widely used in air industry planning in both the public and private sector. These Boeing air cargo growth rates to 2015 and 2020 are applied to 2008 actual volumes by trade-lane for each of the major California airports and for the state as a whole, with results presented in Table 1-2, below. Also, for reference, Table 1-2 presents peak year 2000 volumes. In addition, Table 1-2 converts annual tonnage forecasts into weekly air cargo truck volumes moving to and from the airports.

Table 1-2: Optimistic Air Cargo Forecasts for Top California Airports (2008-2020)

	Cargo Traffic (1,000 Metric Tons)				Weekly Truck Trips			
	2000*	2008	2015	2020	2000	2008	2015	2020
Los Angeles	2,039	1,615	2,196	2,757		4,747	6,278	7,727
LA Ontario	464	455	550	631		1,719	2,067	2,365
March ARB		20	25	29		73	90	105
San Diego	139	124	146	164		1,191	1,404	1,578
Long Beach		40	47	53		385	454	510
Bob Hope		34	39	44		322	380	427
John Wayne		21	24	27		199	235	264
Sub Total	2,642	2,308	3,028	3,706		8,637	10,906	12,976
San Francisco	870	457	622	781		1,072	1,376	1,658
Oakland	685	563	681	783		2,079	2,490	2,838
San Jose	148	77	91	102		739	871	979
Sub Total	1,703	1,097	1,394	1,666		3,890	4,737	5,475
Sacramento Mather	167	72	85	95		691	814	915
Sacramento International	61	60	71	80		581	685	770
Fresno		9	11	12		86	101	114
Sub Total	228	141	167	187		1,358	1,600	1,799

Totals	4,573	3,546	4,589	5,559		13,885	17,243	20,250
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Source: Exhibit 11, Appendix C

*Note – 2000 volumes only represent major California Airports.

As shown, using the Boeing projected growth rates, total California air cargo increases from 3.55 million tons (13,855 weekly truck trips) in 2008 to 5.56 million tons (20,250 weekly truck trips) in 2020, an annual growth rate of 3.8 percent. This positive growth rate is a sharp contrast to the 3.1 percent annual decline between 2000 and 2008. It should also be noted that this Boeing-derived forecast of 3.8 percent annually is significantly higher than the typical forecast by respondents in the survey of industry participants of 1-2 percent per year (Section 1.4). However, according to these relatively optimistic projections, for California as a whole, annual air cargo volumes (and related truck trips) do not return to peak year 2000 levels until 2015. For SFO, which experienced the biggest drop, it appears that volumes will not return to 2000 levels until well after 2020. By contrast, LAX returns to 2000 air cargo volume levels by about 2013, somewhat faster than the California average.

1.6 Conclusion

In summary, air cargo is an extremely important part of the overall California economy, both in terms of tonnage and dollar value. The last decade has proven to be a reversal of the forecast outlook that was previously used, with the year 2000 being a pivotal year. Additionally, major players in the air cargo industry have undergone significant changes, particularly the integrators (primarily FedEx and UPS with respect to their dominance in the domestic air cargo trade). The airports in California have undergone similar changes in terms of their cargo mix and volumes with the forecast for some airports, such as SFO, not reaching their 2000 volumes anytime in the forecast horizon analyzed. These and many more themes will be explored more fully in the sections that follow.

2 Air Cargo in California: A Literature Review

2.1 Introduction

In a 1998 report published by the Institute of Transportation Studies (ITS) at the University of California (UC) at Berkeley, the author, H.-S. Jacob Tsao, lamented that: "Little is known about the role of air cargo in California's goods movement."³ Although there had actually been a fair number of studies published on the topic of air cargo operations in California by the time of Tsao's report,⁴ there is no question that the ensuing years have seen a substantial expansion in the body of relevant literature. This is especially true as state and local transportation planning agencies, regional economic development organizations, airport management, university research groups, and private consulting firms have come to appreciate the economic significance of air cargo services in California and have identified the policies needed to ensure that California continues to enjoy efficient airborne access to the rest of the country as well as to the global economy.

Yet, despite these previous studies and other efforts to publicize air cargo's importance to California's economy,⁵ the business of transporting goods by air both domestically and internationally is widely under-appreciated and misunderstood by elected officials and other policymakers. As an item on the public policy agenda, aviation matters are viewed almost entirely through the prism of complaints lodged by either airline passengers or homeowners distressed by the noise and traffic generated by nearby airports.⁶ At the federal level, air cargo is generally accorded priority attention only in the context of national security or global warming.⁷ The failure to fully

³ H.-S. Jacob Tsao, "The Role of Air Cargo in California's Goods Movement," (U.C. Berkeley: Institute of Transportation Studies, September 1998), p. 11. While many of his findings are now dated, Tsao's work constituted a valuable contribution to publicly available information about air cargo's significance to the state's economy.

⁴ In 1992, for example, aviation planners with SCAG (SCAG) completed a comprehensive regional air cargo study, which documented evolving trends in the air cargo industry, such as the counties in the region that produced the most air cargo and the potential of airports to serve only cargo and few or no passengers. The cargo estimation methodologies developed for that study, along with the RADAM technology, were applied to a military/civilian joint use study of March Air Force Base joint use study completed by SCAG in 1997 and have been refined and updated periodically ever since. Even earlier, a 1988 California World Trade Commission report entitled *California's Export Statistics* was the first to cite U.S. trade data showing that more than half of California's merchandise export trade (when measured by dollar value) was shipped by air.

⁵ For a sampling of op-ed articles that have pleaded for more awareness of air cargo's significance to the California economy, see a series of articles by Jock O'Connell: "A 'fly-by-night' state" in the *Sacramento Bee*, May 14, 2000; "To Fly High, California's Economy Must First Get Airborne," *Los Angeles Times*, March 25, 2001; "The Sacramento Region's Future Is Literally Up In The Air," *Comstock's Business Magazine*, May 2001; "Flying in the face of reality" *San Francisco Chronicle*, May 16, 2001; "Missed connection on air cargo," *San Francisco Chronicle*, August 3, 2004; "Sacramento: A no-fly zone for international trade," *Sacramento Bee*, September 18, 2005; "San Diego's Need for a True International Airport," *San Diego Daily Transcript*, September 22, 2005; "Goods don't just move by sea," *San Diego Union-Tribune*, October 6, 2005; "Infrastructure plan doesn't fly," *San Francisco Chronicle*, February 27, 2006; "America's Dependence on Flight-by-Night Operators: The Underappreciated Role of Air Cargo in the U.S. Economy," *Economic Development America*, the magazine of the U.S. Economic Development Administration, Spring 2006.

⁶ For example, Congress has been considering enactment of an Airline Passengers Bill of Rights in response to incidents in which passengers were kept aboard aircraft for several hours in increasingly uncomfortable circumstances while the flight awaited take-off clearance. In California, noise complaints from residents of adjacent communities have led to the imposition of late evening and early morning flights curfews at airports such as Mineta San Jose International and Burbank's Bob Hope Airport, where the curfew hours at 10 p.m. to 7 a.m. Such curfews have a disproportionate effect on air express carriers whose delivery commitments generally require arrivals and departures during those hours when curfews are in effect.

⁷ Congressional action on this front has been driven primarily by Rep. Edward Markey (D-Mass.), who has requested a number of reports from the U.S. Government Accountability Office regarding Transportation Security Administration's effort to meet air cargo screening requirements. See, for example, "Review of the Transportation Security Administration's Air Cargo Screening Exemptions Report" (GAO-08-1055), August 15, 2008. See also the GAO's report, "Aviation Safety: Better Data and Targeted FAA Efforts Needed to Identify and Address Safety Issues of Small Air Cargo Carriers" (GAO-09-614), June 24, 2009. More typical of the attention directed at air cargo's role in the nation's goods transport system, however, is a 59-page GAO report of January 7, 2008, "Freight Transportation: National Policy and Strategies Can Help Improve Freight Mobility" (GAO-08-287), which contains only one reference to air cargo by alluding to a project

acknowledge just how vital air cargo operations are to California's economic well-being and to the international competitiveness of its industries is often reflected in goods movement analyses which lavish considerable attention on the state's seaports and its border-crossings while treating its airports almost parenthetically -- even though a greater share by value of California's merchandise export trade has historically travelled by air than by all other modes of transportation combined.⁸

The overall purpose of our report is to provide a detailed description of air cargo⁹ operations in California as they are conducted today, how the various parts of the air cargo industry interact, how air cargo operations in this state have changed in response to various developments over the past twenty years, how California's air cargo system relates to air cargo operations nationally and internationally, and how vital an efficient and economical air cargo industry is to California's economy. Our analysis will offer statistical data on the volume of air cargo handled at California airports in dollars as well as in tons. Moreover, as air cargo is inherently an intermodal enterprise, we will also address issues associated with ground access, including not only the problems of road congestion and intersections that create bottlenecks in the immediate vicinity of airports, but also the hurdles faced by shippers in one region of the state seeking to transport time-sensitive and often perishable cargos to airports in another region of the state.

In this Literature Review chapter, we will examine a variety of reports, whitepapers, and academic studies addressing air cargo operations in California that have been published over the past decade. Several of the analyzes issued since Tsao's 1998 report have contributed valuable descriptive detail and provided helpful context to the public's understanding of air cargo's economic significance to California. However, we do identify a tendency in many reports to recite out-of-date information and, more particularly, obsolete forecasts, thus helping to perpetuate certain outmoded impressions and expectations about the operations of the air cargo industry at California airports. Indeed, given the considerable restructuring the air cargo industry has gone through in response to the extreme turbulence it has encountered since 2000, much of the California-specific literature that was produced in this first half of the current decade is of little practical use to the state's transportation policymakers and planners.

In general, three dominant themes emerge in the relevant literature:

- (a) Air cargo operations play a significant but generally unappreciated role in supporting California's economy and especially its export trade;
- (b) The volume of air cargo at California's airports was expected to double or even triple between 2000 and 2020; and
- (c) The capacity of California's air transport system would have to be greatly expanded and extended to additional airports to prevent air cargo capacity from falling short of projected demand.

being "considered" by the New York State Department of Transportation to configure a series of road ramps along the Van Wyck corridor near JFK International Airport that "would ease the flow of operations moving air cargo to the airport" (p. 25).

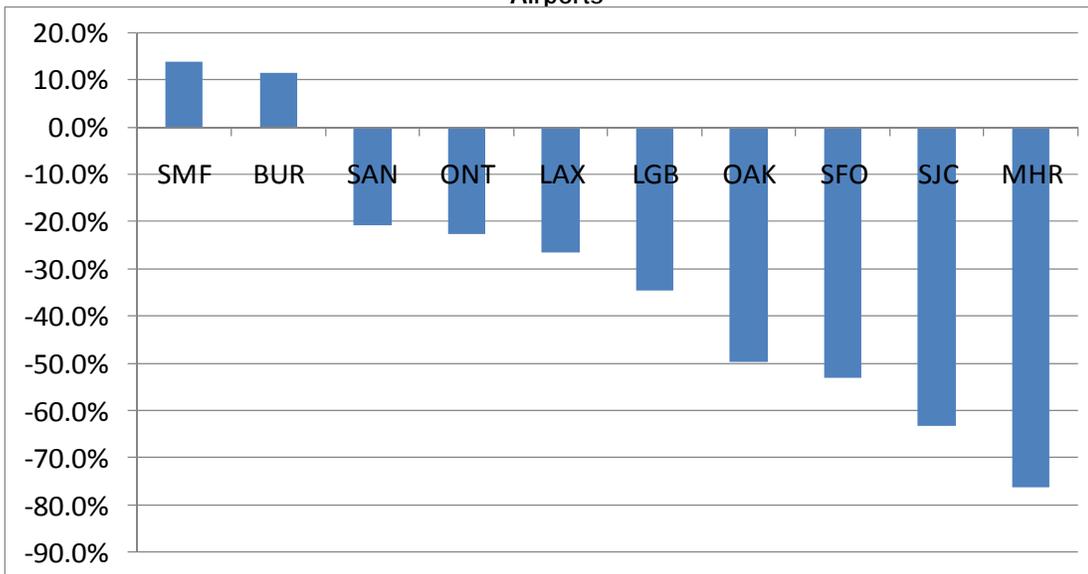
⁸ To be sure, an emphasis on relieving congestion along the transportation corridors serving the state's principal seaports and its border-crossings with Mexico is fully understandable given the huge volumes of truck and rail movements these gateways generate -- not to mention the adverse environmental consequences of such traffic. Still, it is useful to bear in mind that, in the period from 1998 through 2008, airborne shipments accounted for \$697.4 billion of the state's \$1.240 trillion in merchandise exports, a 56.2 percent share, according to data compiled by the Foreign Trade Division of the U.S. Census Bureau and processed by WISERTrade.

⁹ Although in common parlance air cargo is often used synonymously with air freight, the preferred industry definition of air cargo (at least in North America) encompasses freight as well as mail. This is the definition used by Airport Council International as well as other industry groups. Air freight is defined as anything carried aboard an aircraft, except mail or passenger baggage. Freight may, however, include passenger baggage moving under an air waybill or shipment record (See: IATA RP 1601 -- Conditions of Carriage for Cargo). Distinguishing mail as a separate category has grown increasingly difficult in recent years because FedEx, which transports mail under contract with the U.S. Postal Service, reports everything it carries as cargo. Given the large volumes of U.S. mail routinely carried aboard FedEx planes, it has become practically impossible to differentiate freight from mail at most airports.

We wholly concur with the first theme. Even though air cargo's overall economic importance to California arguably reached its high-water mark some ten years ago, it will remain the primary mode of transport for a wide range of goods ranging from hi-tech electronic and pharmaceutical products to highly perishable fruits and vegetables.

We adamantly disagree with the second theme. As Figure 2-1 demonstrates, the past several years have clearly not seen the growth rates anticipated by turn-of-the-century air cargo forecasts which almost uniformly foresaw the doubling or tripling of air cargo tonnage by 2020. Instead, cargo volumes at most of the state's major airports experienced a dramatic decline during a decade which began with uniformly optimistic forecasts of brisk growth in air cargo operations in this state. Indeed, the volume of cargo handled at California's airports in 2009 was some 34 percent lower than the tonnage peak achieved in 2000, and the prospects for a return to the rapid growth rates seen in the 1990s are far from encouraging. The domestic U.S. air cargo market has matured, ground transportation alternatives have become more efficient, and the percentage of America's airborne foreign trade passing through California airports has been steadily declining as more air carriers now routinely bypass California by flying polar or Great Circle routes between the Far East and cities throughout North America.

Figure 2-1: 2000 to 2009 Percentage Change in Air Cargo Tonnage at California's Top Ten Cargo Airports



Source: Caltrans Aeronautics Division and Individual Airport Operations Reports

As for the third theme, we argue that the extension of air cargo service to additional California airports – particularly those located in the Central Valley and Inland Empire where population growth has been especially fast-paced in recent years – will occur only when the sundry elements comprising the air cargo industry determine that the provision of air cargo service to those regions will be profitable.¹⁰ Transportation planning

¹⁰ As a December 2009 report from the U.S. General Accountability Office (GAO) observed: "Airlines act independently of both airports and communities, and their independence may complicate efforts to plan regionally. Airlines make decisions about which airports to serve and the level of services they will offer according to their business and network plans, and such decisions may not align with airport and MPO [Metropolitan Planning Organization] plans. Most notably, in a congested region, planning officials might suggest that traffic migrate to lesser-used alternate airports, as they have in Los Angeles. However, this suggestion may conflict with the business plans of airlines that already serve primary airports in a region. Such airlines generally want to focus their traffic in a city at one major airport, both for cost and revenue reasons.⁵⁷ In addition, while MPOs may want to develop capacity in the system, this development may not align with the objectives of airlines. Individual airlines may prefer to sell limited capacity at a premium price or limit the ability of other airlines to provide competing service." See the GAO's report "National Airspace System: Regional Airport Planning Could Help Address Congestion If Plans Were Integrated with FAA and Airport Decision Making" (GAO-10-120, December 2009), p. 40.

updates are important exercises for identifying options and drawing attention to the importance of preserving alternatives to the current air transport system. Yet, regardless of how elegantly designed a transportation strategy may be, it cannot dictate the choices of the various profit-driven businesses involved in providing air cargo services. Nor have well-crafted transportation plans been sufficient to overcome public opposition to efforts to expand the capacity of California's airport system. The political consensus for engineering even a modest restructuring of the state's air transport system has been conspicuously absent. A result of the fall-off in air cargo volumes in the past decade, the recession-induced reduction in commercial passenger and general aviation operations, and the likelihood of modest air cargo growth over the next twenty years is that the aviation system capacity crisis that once seemed so imminent has at least been temporarily delayed.

2.2 *The Early 2000s: Optimism and Anxiety about the Pace of Growth*

The turn of the millennium saw a surge in research into air cargo operations in the state. Many of the studies in the early years of the current decade were undertaken in conjunction with the updating of the master plans at several of the state's airports. At the same time, though, the rapid growth in air cargo volumes through the 1990s and the mounting evidence that air transport represented an indispensable link to the global economy gave regional planners – especially at the Southern California Association of Governments (SCAG) and the San Francisco Bay Area's Metropolitan Transportation Commission (MTC) -- added impetus to explore the subject of air cargo's importance to the local economy. Additionally, economic development strategies that focused on logistical services, or more particularly, which saw cargo airports as a centerpiece for industrial attraction purposes became increasingly more popular.¹¹

In Southern California, the issue of devising a governance structure for better managing the region's diverse aviation assets also added a major stimulus to research into air cargo's role in the economy.¹² Meanwhile, the state's second most populous city, San Diego, wrestled with the prospect that its single-runway airport would reach capacity well before steps could be taken to expand that capacity or develop an alternate airport.¹³ Elsewhere, the new civilian authorities who had taken over a string of recently decommissioned military airfields in the state's interior saw great opportunity to prosper not only from the rapid movement of people and businesses into the surrounding areas but also in forecasts indicating that the state's principal air cargo airports along the coast would presently be unable to handle projected growth in air cargo tonnage.¹⁴ In general, alarms were being raised nearly everywhere about an impending capacity crisis involving rising levels of commercial passenger and general aviation volumes that would ultimately affect the viability of time-sensitive air cargo

¹¹ Airports as the centerpieces of industrial development has been an especially seductive concept for public officials seeking ways to make profitable use of military airfields decommissioned since the end of the Cold War. The idea has been extensively promoted by John Kasarda of the University of North Carolina's Kenan-Flagler Business School. At the same time, the belief that the logistics sector could replace manufacturing as a primary source of blue-collar jobs paying middle-class wages took hold in Southern California's Inland Empire and influenced policymaking at the Southern California Association of Governments. Underpinning this belief was research conducted by John Husing, a private economist. Husing's work has lately been criticized for exaggerating actual take-home pay in an industry characterized by seasonal fluctuations in labor demand and high turnover. See Susan Christopherson and Michael Belzer, "The Next Move: Metropolitan Regions and the Transformation of the Freight Transport and Distribution System" in Nancy Pindus *et al.* (editors), *Urban and Regional Policy and Its Effects* (Washington D.C., Brookings Institution Press, 2009). Likewise, Kasarda's "aerotropolis" concept has been sharply critiqued by experts within the air cargo industry who argue that the concept is economically and logistically unrealistic. See *Air Cargo World*.

¹² One outcome of this particular interest was the publication in September 2005 of a "Regional Air Management Study," a report prepared for SCAG by Stephen P. Erie, Andrew Mckenzie, Scott MacKenzie, and Susan Shaler.

¹³ For background on San Diego International capacity issues, see Steven P. Erie. *Globalizing L.A.: Trade, Infrastructure, and Regional Development*. Stanford University Press: Stanford, California. pp. 175, 217-218. For a somewhat different perspective, see Richard Carson, Shannon Brown, and Tolga Cenesizoglu, "Forecasting Issues Related to San Diego Airport," University of California, San Diego, Department of Economics, February 2006.

¹⁴ March GlobalPort, situated on a portion of the partially demilitarized March Air Reserve Base in Riverside County, was successful in persuading the integrated air cargo carrier DHL to establish its western hub there in 2004. Unhappily, DHL's departure from the U.S. domestic express delivery market in early 2009 deprived the airport of its primary tenant. In the Sacramento area, Mather Air Force Base transitioned to the Sacramento County Airport System in 1995 and has since served as the region's designated air cargo terminal.

operations in California and elsewhere.¹⁵ That widely anticipated outcome, in turn, promised to have a serious dampening impact on the state's economy, which had grown unusually reliant on air cargo.

2.2.1 Air Cargo and the California Economy

A conclusion uniformly shared by air cargo studies published in the early part of the current decade was that air cargo operations, by linking California businesses and consumers to national and international markets, play a uniquely important role in maintaining the competitiveness of the state's economy. In the words of one 2002 report from the Institute of Transportation Studies at the UC Berkeley, "...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 other industries in the state, and the state's ability to capitalize on the forecasted growth of air cargo routes between the Pacific Rim countries in Asia and North America, are essential to the prosperity of California."¹⁶

The availability of frequent air cargo service to foreign as well as domestic destinations has long been seen to be a particularly important asset to California's high-technology companies, who had come to rely extensively on air transport in managing the movement of raw material, components, subassemblies, and finished products through far-flung supply-chains and distribution networks. According to a January 2003 Bay Area Economic Forum report, "More than half of the exports passing through SFO were high technology, coming primarily from Silicon Valley. Low-volume, high-value, and time-sensitive products (such as computer and electronic equipment and parts, telecommunications equipment, medical equipment and pharmaceuticals) are more often shipped by air than by sea, making the region's international airports a critical commercial link to the world for both goods and services."¹⁷

In January 2002, the California Department of Transportation released its *Global Gateways Development Program* (GGDP) report which offered "an outline of policy options and technical background for further discussion of actions to enhance the capacity and improve the efficiency of California's global goods movement system."¹⁸ That report stressed: "Airport access is critical to California remaining a major player in moving air cargo. According to the U.S. Customs, \$173 billion worth of air cargo moved through California's airports in 2000. Many of these shipments are related to the high-tech industry such as computers, electronic equipment and perishables that demand just-in-time delivery and distribution. Ground access and airport improvements are needed at all of these airports now."¹⁹

In June 2003, Caltrans published *Aviation in California: Benefits to Our Economy and Way of Life*, a comprehensive assessment of the vital role aviation plays in the state.²⁰ The report calculated that aviation in general accounted for nearly nine (9) percent of the state's job rolls and its economic output. In 2001 aviation was responsible for an estimated \$111 billion of California's \$1.3 trillion Gross State Product as well as

¹⁵ See U.S. General Accounting Office, "National Airspace System: Long-Term Capacity Planning Needed Despite Recent Reduction in Flight Delays, (GAO-02-185, December 2001), which pointed out: "Many of the most delay-prone airports, such as La Guardia, Newark, Kennedy, Los Angeles, San Francisco, and Philadelphia, would find it difficult to build an additional runway either because they are out of room or they would face intense local opposition." See also U.S. Department of Transportation, Federal Aviation Administration, "Capacity Needs in the National Airspace System: An Analysis of Airport and Metropolitan Area Demand and Operational Capacity in the Future," June 2004. The latter report was updated in May 2007 with an outlook to 2025. Among the sobering conclusions of the latter report, "four metropolitan areas did not have sufficient capacity to meet the anticipated demand in 2015: Los Angeles, New York, Philadelphia, and San Francisco." U.S. Department of Transportation, Federal Aviation Administration, "Capacity Needs in the National Airspace System 2007-2025: An Analysis of Airport and Metropolitan Area Demand and Operational Capacity in the Future," May 2007, p. 12.

¹⁶ Mark Hansen, Geoffrey Gosling, and Colin Rice, "The California Aviation System: Current Status and Recent Trends," (University of California at Berkeley, Institute of Transportation Studies, December 2002), p. 43.

¹⁷ Bay Area Economic Forum, "International Trade and the Bay Area Economy: Regional Interest and Global Outlook," January 2003, pp. 33-34.

¹⁸ California Department of Transportation, "Global Gateways Development Program," (January 2002), p. 1.

¹⁹ *Ibid.*, p. 19.

²⁰ California Department of Transportation, "Aviation in California: Benefits to our Economy and Way of Life" (June 2003). The report was prepared by Economics Research Associates (ERA) and JD Franz Research, Incorporated.

approximately 1.7 million of the state's 19.5 million jobs. The Caltrans report also pointed out that almost half of all domestic visitors from outside California traveled by air in 2001, generating some \$14.5 billion in tourist spending. The report further noted that aviation also generates revenue for the state through a variety of taxes, including personal property taxes, taxable aviation gasoline revenues, taxable aircraft jet fuel, excise tax revenues, possessory interest tax, and sales tax on general aviation aircraft. According to the report, total tax revenue generated as a result of aviation in FY 2002 was slightly over \$250.2 million.²¹

The report observed that the value of air cargo that moved through California's airports in 2000 was \$173 billion. It went on to describe the significance of air cargo operations to the state's economy:

Movement of cargo through California's airports, particularly international activity, plays a significant role in the vitality of the state's economy, and the national economy as well. How air transportation of goods and services impacts everyday lives can be overlooked and taken for granted. Most air cargo consists of high-value, time-sensitive documents and goods, such as electronics equipment, computer parts, and perishables that require just-in-time delivery. Speedy delivery of goods and services is essential to many manufacturing and service businesses involving items like fresh produce, equipment repair and auto parts, and business and banking documents. For transportation of medical supplies, vaccines and transplant organs, the speed in delivery by air is critical.

Air cargo serves the state and its residents in several forms. The world's governmental postal services depend on air transportation for timely delivery of mail and small packages. Dedicated air cargo carriers such as Federal Express (FedEx), Airborne Express, DHL, and United Parcel Service (UPS) provide air express service, for small packages (typically under 100 pounds), often with overnight delivery. Modern commerce involving catalog sales and online shopping is possible only with air express service and has grown to 60 percent of the U.S. air cargo market. Bulkier items, from elephants to machinery, are often carried in chartered or contract aircraft as airfreight. Other carriers such as Polar Air Cargo and BAX Global also carry larger cargo items. Airfreight is vital to the transport of large size, heavy weight or special purpose items across long distances in a short time. Equipment and supplies are shipped any place in the world in a matter of hours, which is vital for disaster relief.

The impact of the 2002 California seaport dock strike was lessened by the increased use of airfreight. Although the weight of air cargo is much less in proportion to all goods moved by ship, rail or truck, the value of air cargo is substantial. U.S. Customs reports the value of air cargo moved through California's airports in 2000 was \$173 billion. The Los Angeles Customs District reports the value of goods flown through their airports was \$41.8 billion while the value of goods shipped through ports was \$34 billion. The San Francisco Customs District reports \$46.2 billion by air verses \$12 billion through ports. West Coast locations of California airports provide direct links to vast Asian markets.²²

Air cargo's role in the San Francisco Bay Area has been the subject of several reports in this decade, prominently including those undertaken by the Bay Area Economic Forum.²³ The first report, issued in January 2000, provided a baseline economic impact survey, including the importance of the region's international airports in direct and indirect job-creation as well as to maintaining the global competitiveness of Bay Area industry. ²⁴ This was followed later in the same year by a second report which contained an economic analysis of projected demand for air service in the region and addressed the question of whether Bay Area's airport infrastructure could meet the expected tide of rising traffic.²⁵ In January 2002, the Bay Area Economic Forum revisited the issues in the aftermath of both the collapse of the electronics/computer industry boom in Silicon Valley and the

²¹ *Ibid.*, p. ii.

²² *Ibid.*, pp. 28-29.

²³ The Forum has since been rechristened as the Bay Area Council Economic Institute.

²⁴ Bay Area Forum Economic Forum, "Air Transport and the Bay Area Economy – Phase One," January 2000.

²⁵ "Air Transport and the Bay Area Economy – Phase Two," November 2000.

terrorist attacks of September 2001.²⁶ A fourth report that focused on San Francisco International was issued in 2004.²⁷

The two Bay Area Economic Forum reports issued in 2000 anticipated that cargo tonnage through the Bay Area's three major international airports – San Francisco International (SFO), Oakland International (OAK), and San Jose International (SJC) – would double from 1.75 million tons in 2000 to 3.2 million tons by 2005 and triple to 5.5 million tons by 2020 – reflecting an average annual growth rate of 6.2 percent. Despite the daunting challenge of accommodating that much growth in the volume of air cargo, regional transportation planners and public officials seemed content to leave the problem's resolution to competition among Bay Area airports and those in adjacent areas of Northern California.²⁸

The Bay Area Economic Forum's reports were consistent with a 2000 air cargo forecast produced by the San Francisco Bay Area's Metropolitan Transportation Commission. According to that forecast, "Each airport has developed a historic air cargo niche, and...we believe we can forecast how air cargo will develop within each airport's defined role. We do this by observing and assessing industry projections from a variety of sources. All of the forecasts for worldwide cargo growth are remarkably similar, averaging about 6.2 percent per year into the foreseeable future. Thus, in contrast to the air passenger forecasts above, the air cargo industry is still in a growth and development stage in most sectors (domestic mail being the anomaly)."²⁹

The importance of air cargo to California's agricultural economy was examined in considerable detail in a 2005 study published by the Center for Agricultural Business at California State University - Fresno.³⁰ That initial study was later updated in 2007.³¹ Both studies used state-of-origin export data sorted by mode of transport and foreign destination to establish the size, composition and geographical pattern of the state's airborne agricultural export trade.³² As an added feature, the 2005 report provided an extensive examination of the steadily evolving nature of the air cargo industry, both within California and internationally.

The Census Bureau's state-of-origin data indicate that California's airborne food export trade edged above the half-billion dollar mark in 2003 and has since remained consistently above that level. The state's airborne food exports rose in nominal terms from \$396 million in 1996 to a high of \$669 million in 2004, before falling back to \$644 million in 2005 and to \$579 in 2006. On an inflation-adjusted basis, California's airborne food exports rose by 48.0 percent between 1996 and 2004, before falling off the two succeeding years. Even so, California's

²⁶ "Air Transport and the Bay Area Economy – Crisis in Air Travel: Weathering the Downturn, January 2002.

²⁷ "Economic Impacts of Competitive Air Service at San Francisco International Airport," November 2004.

²⁸ Regional airport planning in the Bay Area at the time was constrained by political considerations. San Francisco International Airport was pushing to gain approval for construction of a new major runway needed to avoid delays in inclement weather. Airport management and officials of the City and County of San Francisco as well as San Mateo County were therefore reluctant to concede that the Bay Area's aviation needs might be better served by distributing the load of traffic to other regional airports.

²⁹ Metropolitan Transportation Commission, "Aviation Demand Forecasts (February 2000): Executive Summary." Since 1972, the Association of Bay Area Governments and MTC have periodically updated the Regional Airport System Plan (RASP) to provide analysis and policy level guidance on aviation requirements for commercial and general aviation airports in the region. The RASP is considered by the airports and FAA during the course of preparing airport master plans and environmental documents for proposed airport improvements. The Metropolitan Transportation Commission uses the RASP to guide decisions about surface transportation investments that provide access to airports. The San Francisco Bay Conservation and Development Commission's Bay Plan airport policies refer to the RASP for guidance when evaluating proposals for airport improvements that would require Bay fill. The Bay Area Air Quality Management District also considers aviation emission estimates in preparing federal and state air quality plans for meeting adopted air quality standards.

³⁰ Jock O'Connell, Bert Mason and John Hagen, "The Role of Air Cargo in California's Agricultural Export Trade" (California State University, Fresno, Center for Agricultural Business and the California Agricultural Technology Institute, May 2005).

³¹ Jock O'Connell and Bert Mason, "California's Agricultural Export Trade: The Role of Air Cargo -- A 2007 Update (California State University, Fresno, Center for Agricultural Business and the California Agricultural Technology Institute, May 2007).

³² In response to questions from state governors and legislatures, the U.S. Census Bureau began in 1987 to publish state-level export figures based on information provided on Shippers Export Declarations. A 1988 California State World Trade Commission study ("California's Export Statistics") compared various sources of data purporting to describe the Golden State's foreign trade. That study was the first to observe that most of California's merchandise export trade – when measured by dollar value – was airborne.

airborne food export trade in 2006 was still -- in real terms -- 24.5 percent higher than it had been ten years earlier.³³

The principal conclusions of the original study remain unaltered in the updated report. California continued to export over one half-billion dollars in agricultural and other food products by air each year, primarily to destinations in the Far East. Even though this represents a relatively modest share of the state's overall food export trade, the ability to ship products by air has been vital to shippers of such perishables as fresh cherries, asparagus, table grapes, strawberries, salad ingredients, and a wide range of organic fruits and vegetables. Air freight remains a valuable mode of transport for a vast array of processed food products, food preparations, and seeds for sowing horticultural plants and trees.

Looking down the road, both reports contended that worldwide demand for high value-added food products of the sort produced in California should expand dramatically, especially in such fast-growing economies as China and India, where the ranks of upper middle-class consumers have been rapidly expanding and where multinational food retailers are rapidly establishing a major market presence.

In 2007, the California Department of Food and Agriculture commissioned a study that specifically examined the feasibility and desirability of making more extensive use of air-freight services to supply fresh California-grown fruits and vegetables to a geographically dispersed array of urban markets in the People's Republic of China.³⁴ These included not only such mega-markets as Shanghai, Beijing, and Guangzhou but also an increasing number of second-tier cities, especially those that U.S. Foreign Agricultural Service officials have identified as China's most promising Emerging City Markets (ECMs). These ECMs, fifteen in number, are scattered throughout a country which covers an area approximately 20 percent larger than the territory occupied by the 48 contiguous U.S. states. They stretch from Harbin in the far northeast to Kunming in the south. While most are congregated along China's coastline, the roster of ECMs also includes Xi'an, Wuhan, Chongqing, and Chengdu in China's interior provinces. All are industrial centers which have attracted considerable foreign direct investment and have sizable expatriate business communities. Many are also major tourist destinations featuring luxury-class hotels and restaurants. Most importantly, all are home to a growing indigenous class of affluent consumers concerned with the quality and safety of domestic food supplies. However, the study found that access to these ECMs was severely impeded by grave deficiencies in China's cold-chain systems.³⁵ This has had the effect of restricting imports of perishable food items to regions immediately adjacent to China's principal international gateways. However, with an increasing number of direct and indirect flight connections available between California and China, and with the rapid development of China's domestic air transport networks, the

³³ The decline of airborne agricultural exports in 2006 was in large part the result of lower than normal cherry harvest and a sizeable drop in airborne exports of a category of food preparations involving fortified, concentrated fruit juices. The state's cherry orchards were hit by a late season freeze in 2006. According to the California Cherry Advisory Board, this resulted in a harvest that was down about 60 percent from a normal season. The category known as Foods Preparations NESOI (USDA HTS-Code 210690) principally includes fortified fruit juices in concentrated form. (NESOI is a bureaucratic acronym for "not elsewhere specified or identified.") Exports of these food products appear to have settled back to a historic level after a brisk rise in the preceding three years. Vagaries in weather (not to mention longer-term changes in climate) will always result in sometimes sharp fluctuations in trade in agricultural goods. In addition, many elements of the state's food processing sector are known to be aggressively pursuing offshore outsourcing strategies. In this case, the data show that overall California exports of Food Preparations NESOI increased in 2006, thus indicating that more of this category of goods is being shipped overland to Mexico and Canada and by sea to other destinations.

³⁴ Jock O'Connell, "Taking the Fast Plane to China: An Expanded Role for Air Freight in Increasing California's Fresh Fruit and Vegetable Exports" (California State University, Fresno, Center for Agricultural Business, April 2008).

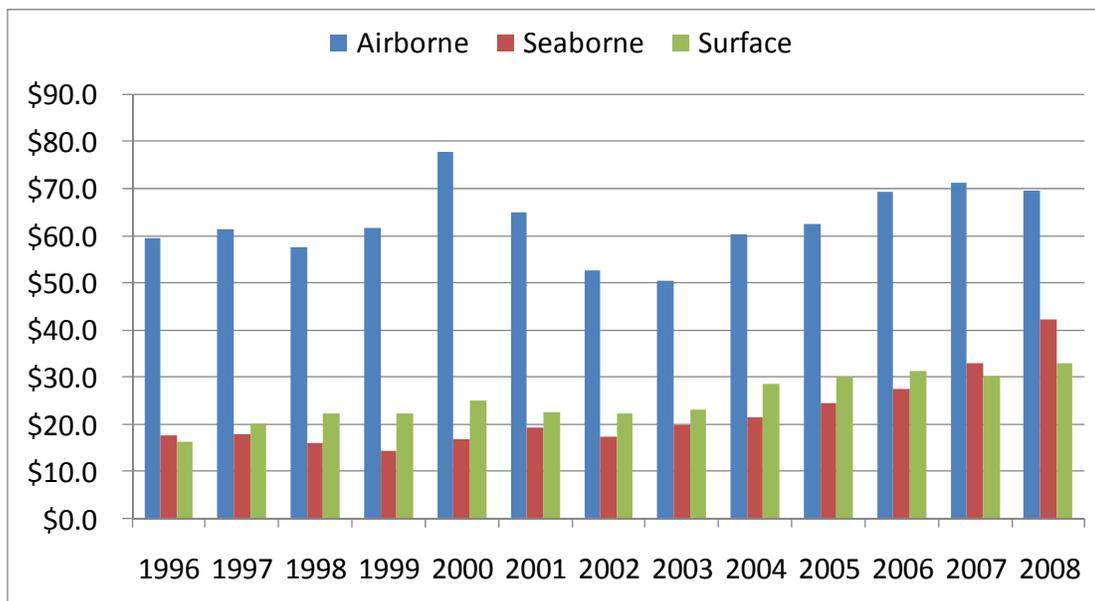
³⁵ A cold-chain is essentially a temperature (and sometimes humidity) controlled supply chain. Perishable commodities -- whether fresh fruit and vegetables or pharmaceutical products -- must be maintained within certain temperature ranges throughout the journey from the point of production to the point of consumption. California growers of fresh and vegetables have pioneered in the development of efficient cold-chains which involve the use of refrigerated trucks to convey produce from the point of harvest to packing houses where the produce is prepared for shipment to market in specified conditions to prevent crop deterioration. The stateside cold-chain is subsequently maintained through the use of refrigerated trucks, rail cars or shipping containers used by maritime and airborne freight carriers. Ideally, the cold-chain is similarly maintained by importers. While that is generally true in most developed nations, cold-chains frequently break down in developing countries where the availability of refrigerated trucking or storage facilities is inadequate.

report recommended that California exporters of perishable fruits and vegetables take a new look at air freight's potential for overcoming surface transport barriers. Moreover, the report noted that substantial imbalances in transpacific trade flows worked to the benefit of California shippers, who generally enjoyed favorable "back-haul" air-freight rates that were in recent years as low as one-fifth of the rates charged Asian exporters of air-freighted goods to the U.S. At the same time, the report noted that any appreciation of the Yuan against the dollar would make California products more price-competitive in Chinese markets.

2.2.2 An Unappreciated Mode of Transport

Despite numerous reports attesting to air cargo's value to California's international trade, lack of appreciation among many public officials and the media is not entirely surprising, considering certain widespread misconceptions about the logistics of goods movement. Take, for example, the nation's merchandise export-import trade. Given the frequency with which news reports about world trade seem to invariably feature photographs of busy seaports or heavy-loaded container ships, most of us can be forgiven for instinctively regarding international trade as an activity confined to the waterfronts of coastal cities or perhaps to fixed border-crossings with Canada and Mexico.

Figure 2-2: California's Exports by Mode of Transport, 1996-2008
(In Billions of Current Dollars)



Source: U.S. Census Bureau's Foreign Trade Division, WISERTrade

To be sure, the heavy-lifting in foreign trade is done by steamships and by trucks, railroads and pipelines. In 2007, 77.7 percent of the 1.95 billion tons of merchandise transported across U.S. borders travelled by water, while 21.7 percent was surface trade.³⁶ By contrast, a mere 0.4 percent of the nation's trade tonnage was airborne. But weight is not the metric by which economic activity is typically measured, and when trade is denominated in its dollar value a far different picture emerges. Waterborne trade accounted for 44.9 percent of

³⁶ 2007 is the latest year for which comparable statistics by mode of transport are available. See the Bureau of Transportation Statistics, *Pocket Guide to Transportation 2009* (January 2009), Tables 5-5 and 5-6.

the nation's \$3.12 trillion in international trade in 2007, and surface modes of transport carried a 24.1 percent share. But 25.1 percent was airborne. The burden of transporting the nation's merchandise export trade is even more equitably shared, with waterborne trade handling 32.3 percent in 2007, while airborne movements accounted for 31.5 percent and surface modes handled a 27.3 percent share.

Here in California, discussions of California's international trade infrastructure almost invariably revolve around the condition of our major seaports or our border-crossings with Mexico. There is no question that seaports handle the vast majority of cargo tonnage. Yet, as the data in Figure 2-2 above attest, *when measured by dollar value, more of California's merchandise exports have historically been transported by air than by sea and land combined.* Indeed, for the entire thirteen year period, the airborne share of the state's export trade averaged 52.8 percent.³⁷ One 2002 study found that 16 percent of the nation's international airborne trade passed through LAX.³⁸

Air cargo typically consists predominantly of high-value or time-sensitive goods, most notably telecommunications hardware, electronic equipment, perishable commodities, pharmaceutical products, emergency shipments, overnight packages, and business documents. By one University of California estimate, air cargo is, on average, at least 37 times as valuable as goods transported by truck.³⁹ The timely delivery of such cargos has become an increasingly critical requirement for many of California's most competitive industries. Indeed, according to a study by the Institute of Transportation Studies at UC Berkeley, the ability to move goods via air cargo is more important to California than to the nation as a whole.⁴⁰

During the 1990s, air transport grew to become an essential facilitator in the management of global supply chains as well as in the implementation of just-in-time delivery and inventory control strategies. Not surprisingly, the kinds of high value-added products associated with California's advanced technology industries have been routinely exported by air. During the 1990s, air cargo tonnage at the Bay Area's three principal airports grew at an average annual rate of 7.0 percent.⁴¹ By 2000, air freight accounted for 65.1 percent of California's \$119.6 billion merchandise export trade.⁴² By comparison, just \$16.8 billion or 14.1 percent of the state's exports that year went by sea. By way of further comparison, 36.4 percent of total U.S. export trade in 2000 was airborne.⁴³ In other words, California was nearly twice as dependent on air cargo for its export trade as the country as a whole at the peak of the dot.com boom.

That dependence was even more manifest for industry in Northern California, the home of Silicon Valley. In 2000, the value of international trade handled by San Francisco International was two and one-half times greater than the value of trade handled across the Bay at the Port of Oakland. In that year, some \$41.8 billion in exports and \$46.9 billion in imports passed through SFO. Meanwhile, just \$9.6 billion in exports and \$15.5 billion in imports crossed the wharfs at Oakland.⁴⁴

³⁷ State of origin export data used in this report are derived from information gleaned from Shippers Export Declarations which, by law, must be submitted in conjunction with any export shipment whose value exceeds \$2500. The raw data are compiled by the U.S. Census Bureau's Foreign Trade Division. Detailed state-of-origin export data used in this report were obtained from WISERTrade, a private firm which provides trade data services.

³⁸ Steven P. Erie and Henry Kim, "Southern California Infrastructure: Growth and Governance Challenges." September 2002, p. 8 (Cited in Grant Boyken, "Growing Pains: Airport Expansion and Land Use Compatibility Planning in California," California Research Bureau, September 2006, p. 33.)

³⁹ H.-S. Jacob Tsao, "The Role of Air Cargo in California's Goods Movement." University of California at Berkeley Institute of Transportation Studies Research Report UCB-ITS-RR-98-7, September 1998, p. 43.

⁴⁰ Mark M. Hansen, Geoffrey D. Gosling, and Colin Rice, "The California Aviation System: Current Status and Recent Trends." University of California at Berkeley Institute of Transportation Studies Research Report UCB-ITS-RR-98-12, December 1998, pp. 43-45.

⁴¹ Airports Council International data cited in "Long-Term Forecasts of Bay Area Aviation Demand," a March 27, 2009 report prepared for the Regional Airport Planning Committee by SH&E

⁴² Based on export data collected by the U.S. Census Bureau's Foreign Trade Division and sorted by state-of-origin and mode-of-transport by WISERTrade.

⁴³ Bureau of Transportation Statistics, *Pocket Guide to Transportation 2000*, Table 16.

⁴⁴ Ibid. Table 18.

The Caltrans GGDP report pointed out that, from 1990 to 2000, the value of air cargo exports through the Los Angeles and San Francisco Customs Districts alone increased over 170 percent to \$88 billion dollars. "This was driven by California's top two exports on a dollar basis: Electronic equipment and industrial machinery (54 percent of all exports). From a tonnage basis, enplaned California air cargo is expected to increase by at least 150 percent, from 4.4 million tons in 2000, to 11.2 million tons by 2020. Transportation infrastructure must expand to accommodate the increasing role of international trade, e-commerce, the shift to just-in-time production and inventory techniques, and the growth in research, manufacturing and retailing industries."⁴⁵

Although there can be no doubt that air cargo operations continue to make a significant contribution to California's economy, it is possible to overstate matters, especially if the air cargo industry maintains a fairly tepid growth rate over the next few years. The sixteen percent share of the nation's international airborne trade that LAX reportedly handled in 2002 had diminished by 2008 to 9.8 percent.⁴⁶ Similarly, SFO saw its share of the nation's international air cargo trade decline from 9.0 percent in 2005 to 6.6 percent in 2008.⁴⁷ Nonetheless, reports continue to be circulated which refer to air cargo as the fastest-growing segment of the transport sector or which reflexively recycle forecasts from earlier years. These, regrettably, perpetuate outdated notions that give rise to expectations that are seldom tenable. As we shall discuss in the next section of this Literature Review, the air cargo industry in California has come through an exceedingly turbulent era which has seen fundamental changes in operational practices both by shippers and by air carriers. The consequences of those changes and how they have affected air cargo's role in serving the interests of California's economy are generally not well-understood.

2.3 A Looming Aviation System Capacity Crisis?

A feature common to virtually all of the air cargo studies and forecasts produced during the early years of the current decade was the expectation that air cargo volumes would continue to expand dramatically over the appropriate planning horizon, which typically looked out to 2020 and beyond. That expectation, reinforced by the industry-wide forecasts issued by Boeing Aircraft, Airbus Industries, and the Federal Aviation Administration,⁴⁸ greatly influenced the conclusions and recommendations reached by the California studies. Eventually, these uniformly robust forecasts for air cargo growth found their way into a wide range of formal documents such as airport master plans, environmental impact studies, and airport financial statements. If any concerns were voiced in these studies, they took the shape of alarms that the state's existing air transport infrastructure would soon be swamped by the expected waves of added cargo.

With a tone of urgency, the 2002 Global Gateways Development Program (GGDP) report from Caltrans concluded that California's international gateways and the freight transportation infrastructure serving them were in danger of being overwhelmed by the pace of growth in the state's economy and by the steadily swelling volume of foreign trade passing through it. "The California goods movement challenge is both substantial and immediate. The development of the State's global gateway facilities and transportation infrastructure has not kept pace with California's economic and trade growth."⁴⁹

⁴⁵ California Department of Transportation, "Global Gateways Development Program," (January 2002), p. 9.

⁴⁶ U.S. Census Bureau, Foreign Trade Division, FT 920 U.S. Merchandise Trade – Selected Highlights.

⁴⁷ Ibid.

⁴⁸ See Federal Aviation Administration, FAA Aerospace Forecast FY 2000-2011, Table 16 "U.S. Commercial Air Carriers Total Air Cargo Revenue Ton Miles." That forecast projected total RTMs of air cargo to increase from 25,520 million to 38,682 million by 2006. In actuality, total RTMs in 2006 were 27,956 million. While that represented a gain of 9.5 percent over 1998's level, it fell short of the forecast by 27.7 percent. The year 2006 represents a useful benchmark yet because it preceded both the sharp run-up in fuel costs in 2007-08 and the onset of the current recession. The FAA cargo forecast for 2000-11 was in line with similar forecasts found in Boeing's World Air Cargo Forecast 2000-01 and in Airbus Industries.

⁴⁹ Op. cit., p. 8.

In addition to focusing on California's major seaports, its border crossings with Mexico, and its rail and highways networks, the GGDP report also drew attention to the plight of five of the state's international airports -- Los Angeles, San Francisco, Oakland, Ontario, and San Diego. However, as the GGDP report stressed, California's ability to capitalize on this growing demand for air travel in international business services and goods movement was being constrained by inadequate airport capacity and crippling ground access congestion at its major commercial airports. "These capacity problems are most acute in the greater Los Angeles, San Francisco Bay, and San Diego regions, and include airspace, runway and terminal operating constraints, and significant land-use limitations. Major airports, which have focused mainly on passenger traffic in the past, are having particular difficulty accommodating the increased demands for air cargo. Truck access, for example, is a critical problem at Los Angeles, Oakland, and Ontario Airports. In general, multimodal airport ground access improvements need to be pursued."⁵⁰

The purpose of the GGDP was to determine how best to ensure that the state's goods movement transportation system would be able to accommodate the expected surge in international trade. To address the challenges facing the state's air cargo airports, the report concluded that several difficult steps -- some fairly modest, some controversial -- would need to be taken:

In the "Ground Access to Airport Study" (August 2001), the Department found that signage and ground access are the two most needed improvements at California's airports. Los Angeles International Airport, which handles 2.1 million tons of air cargo per year and generates \$60 billion in annual economic activity, has proposed a "Ring Road Expressway" to facilitate ground access, along with the realignment and other improvements to SR 1. Improvements to the I-405/I-05 HOV connectors are also required. The Oakland International Airport has proposed the Air Cargo (Infield) Access Road project that will provide improved access to a new air cargo complex. Ontario International airport has proposed the Airport Drive West-End Improvements Program to improve truck access. The Oakland Airport has proposed a runway extension and San Francisco Airport has proposed an additional runway, both of which stakeholders believe need to be completed within the next ten to fifteen years. The San Diego International Airport has proposed the Air Cargo Relocation and Enhancement Project to address its operating, runway, and land use concerns.

International airports are developing master plans that include additional capacity for ground access. The Southern California Association of Governments (SCAG) has recommended in the updated 2001 Regional Transportation Plan the dispersal of cargo delivery and pick up to outlying airports. Lessening the major access problems for overtaxed airports will in turn improve the environment surrounding those airports, though it may adversely affect the environment at airports where the traffic will be increased. Expansion plans cannot move forward without a political consensus.⁵¹

The GGDP report echoed the widely held expectation that air cargo volumes at California airports would continue to grow at rates comparable to those achieved during the 1990s. "Air cargo grew very rapidly in the past decade. The factors that contributed to this growth included the decade of rapid global economic expansion and the increasing popularity of on-line purchases by consumers necessitating air shipments. From 1990 to 2000, average annual growth at the major air cargo airports was seven percent. Six of the top 12 air cargo airports in the country more than doubled their air cargo volumes during the preceding 10-year period."⁵²

As did most other analyses at the time, the Caltrans report discounted the impact of the terrorist attacks on air cargo operations statewide: "...air cargo was not as dramatically affected as passenger travel by the events of

⁵⁰ Ibid., p. 19.

⁵¹ Ibid., p. 23. The "Ground Access to Airport Study" was prepared for Caltrans by the Landrum & Brown Team and was submitted on August 24, 2001. It is discussed elsewhere in this report in the chapter dealing with surface access issues for air cargo service providers.

⁵² Ibid., p. 13.

September 11th.⁵³ The Southern California Association of Governments (SCAG) *Regional Aviation Economic Analysis* discussion paper on the effects of September 11th similarly indicated that passenger air travel in Southern California had dropped 47 percent since September 11th as compared to a decline of just 10 percent for air cargo tonnage.⁵⁴ So, too, did a December 2002 study issued by the Institute of Transportation Studies at the University of California at Berkeley.⁵⁵

The Caltrans report on aviation's economic impact reiterated a warning much on the mind of transportation planners at the time: "As passenger and air cargo volumes grow and decentralize, many airports need to expand in order to accommodate the capacity needs of California's aviation system. While aviation planning has taken place on the state and regional levels, local airports commonly face challenges when trying to expand. The inevitable need for increased airport capacity due to the rapid growth in air travel is an issue that affects policy makers, planners, and airport administrators throughout California."⁵⁶

That view had gained traction in the 1990s, especially with a series of studies by the six-county Southern California Association of Governments. One forecast issued at the time by SCAG expected that, while passenger traffic would double at Southern California airports, air cargo would grow at a much faster pace – increasing from 1.5 million tons in 1995 to 4.8 million by 2010.⁵⁷ Subsequent projections to 2025 forecast even more explosive growth – to 9.5 million cargo tons.⁵⁸ Confidence in those growth rates was reaffirmed in a 2004 SCAG report, which Air cargo will more than triple, to 8.7 million tons in 2030.⁵⁹

As University of California at San Diego Professor Steven P. Erie described the challenge that appeared to be facing aviation officials and regional transportation planners in Southern California during the 1990s:

Absent new runways, by the early twenty-first century the region's five metropolitan commercial airports (LAX, Ontario, John Wayne, Burbank, and Long Beach) would experience a serious physical-capacity shortfall (exacerbated by noise and air-quality policy constraints) relative to the burgeoning demand... Failure to resolve this looming shortfall, particularly in international service, threatened the city's and region's future as a global export center. In 1995, well over half of regionally produced exports (by value) were shipped by air. Airborne exports added more in value to the local economy than did waterborne exports.⁶⁰

In 2002, the Southern California Association of Government's Regional Transportation Plan (RTP) forecast that 9.5 million tons of air cargo would be handled by the region's airports in the year 2025.⁶¹ That represented a 265 percent increase in volume over the 2.6 million tons of cargo handled by the region's airports in 1997. To meet that anticipated future demand, the RTP called for both an expansion of existing commercial service airports and

⁵³ *Ibid.*, p. 13.

⁵⁴ See Technical Appendix B of the SCAG Regional Transportation Plan (2002) for more detail on air cargo operations in Southern California.

⁵⁵ In addition to the SCAG study referenced, the authors of a December 2002 study issued by the Institute of Transportation Studies at the University of California at Berkeley reached a similar conclusion. See Mark Hansen, and Geoffrey Gosling, and Colin Rice, "The California Aviation System: Current Status and Recent Trends," (University of California at Berkeley, Institute of Transportation Studies, December 2002), p. 43. However, the ITS study did point out that cargo volumes had been falling at most California airports in the months prior to September 2001, a development the study attributed to a nationwide economic slowdown. In that context of steadily declining cargo tonnage, the immediate effects on air cargo operations appeared less dramatic.

⁵⁶ *Ibid.*, p. 13.

⁵⁷ SCAG, "Regional Mobility Element: The Long Range Transportation Plan for the SCAG Region," Vol. 2, (June 1994), pp. 8-1 to 8-13.

⁵⁸ SCAG, "2001 Regional Transportation Plan (April 2001), pp. 98-99.

⁵⁹ SCAG, "Regional Aviation Plan for the 2004 Regional Transportation Plan" (April 2004), pp. 1-2. In retrospect, that plan's expectation that four airports which handled almost no air cargo in 2004 – San Bernardino, March, Palmdale, and the Southern California Logistics Airport at the former George AFB – would be handling 42.9 percent of the region's air cargo load in 2030 seems especially hopeful.

⁶⁰ Steven P. Erie, *Globalizing L.A.: Trade, Infrastructure, and Regional Development* (Stanford University Press, 2004), p.173.

⁶¹ Southern California Association of Governments, "Goods Movement Program Whitepaper: A Survey of Regional Initiatives and a Discussion of Program Objectives" (January 2002), p. 9.

the development of several new facilities at former military air base sites, including Norton Air Force Base (now San Bernardino International Airport), George Air Force Base (now Southern California Logistics Airport), March Air Reserves Base (which includes March Global Port), and Palmdale Regional Airport. SCAG's regional aviation strategy aimed to disperse passenger and cargo capacities throughout the region. Not only would this relieve operational pressures at LAX, it would ensure the development of air services nearer to some of the Southland's fastest-growing areas.

The prospect of seeing airports overwhelmed by growth – which admittedly would result much more from expanded commercial passenger service and general aviation activity than from air cargo operations⁶² -- sparked a renewed emphasis on regional airport planning in Southern California. The effort was led largely by SCAG but also involved a separate entity, the Southern California Regional Airport Authority (SCRAA).⁶³ In theory, SCRAA would act to build the broad-based political consensus necessary for forcing major changes in the structure of Southern California's airport system. In practice, it succumbed to a lack of consensus among the political jurisdictions comprising it.⁶⁴

Unlike in Southern California, there has been much less effort in Northern California to devise a comprehensive strategy for dealing with the region's air transport needs. Indeed, the Bay Area's Metropolitan Transportation Commission frankly conceded that neither it nor any other transportation planning agency in the region had the authority to coordinate the operations of the Bay Area's three major airports.⁶⁵ If anything, regional planning was further inhibited by officials at SFO, who resisted efforts to coordinate operations with other Bay Area airports. In 2001, SFO officials argued that coordination of Bay Area airports would result in: (a) more than 9 million passengers per year being unable to use the airport of their choice; (b) almost immediate capacity issues at both Oakland and San Jose International if enough flights are shifted to reduce SFO's delays, and (c) virtual elimination of freighter cargo at SFO.⁶⁶ Rather than consider proposals for a more cooperative strategy, SFO management and San Francisco City and County leaders in the early 2000's banked heavily on securing clearance to build a new runway that would have extended well into the bay. When that runway option was finally defeated in 2003, the Bay Area was left with a gaping need for air transport services but no coherent plan to cope with it.⁶⁷ (With runway expansion effectively off the table, SFO officials have apparently warmed to the idea of regional planning. According to the U.S. General Accounting Office: "An airport official told us that such

⁶² For a discussion of expected increases in general aviation and air-taxi traffic, see "Airports and the Newest Generation of General Aviation Aircraft, Volume 1: Forecast and Volume 2: Guidebook (Transportation Research Board, Airport Cooperative Research Program, 2009).

⁶³ For an extensive discussion of SCRAA, see Stephen P. Erie *et al.* "Regional Airport Management Study," a report prepared for SCAG in September 2005. Because participating jurisdictions have diverging agendas on aviation issues, Erie and his colleagues persuasively argue that SCRAA was not an effective mechanism for coordinating the operations of the region's airports, much less the air carriers serving them.

⁶⁴ In April 2009, the SCRAA Board formally voted to terminate the joint powers agreement that created the organization. "One problem, as noted by a Government Accounting Office report in December 2009 was an evident lack of trust among airport authorities throughout the region. It was specifically alleged by officials with Los Angeles World Airports and SCAG that Long Beach, Burbank, and Orange County Airports "have viewed regional airport planning suspiciously, notably the planning undertaken by the now-defunct Southern California Regional Airport Authority." See "National Airspace System: Regional Airport Planning Could Help Address Congestion If Plans Were Integrated with FAA and Airport Decision Making" (GAO-10-120), p. 39.

⁶⁵ Metropolitan Transportation Commission, "Regional Airport System Plan, 2000 Update: Final Report," (September 2000), Executive Summary (not paginated). As the RASP specifically noted, "Absent Congressional action to change federal laws, there are no regulatory mechanisms that can be used to shift flights from one airport to another- nor would a new regional body have such authority."

⁶⁶ SFO press release dated April 21, 2001 and titled. "SFO Officials React to Independent Report on Alternatives to Reduce Delays without Runway Separation." The press release alludes to the findings of a Charles River Associates study of the impact of alternatives to building a new runway at SFO.

⁶⁷ SFO has not been the only major airport to prioritize the protection of its prerogatives. As a December 2009 report from the U.S. Government Accountability Office observed, "Philadelphia International does not support planning efforts that may divert traffic from its airport to alternate regional airports." See "National Airspace System: Regional Airport Planning Could Help Address Congestion If Plans Were Integrated with FAA and Airport Decision Making" (GAO-10-120), p. 39. More generally, the GAO report usefully calls attention to how regional transportation planning goals often differ from the more specific agendas being pursued by airport authorities and airlines.

an effort might allow SFO to focus on a more-targeted segment of the aviation market, notably long-haul and international flights, while allowing alternate airports to expand shorter-haul domestic flights.”⁶⁸)

One refrain common to air transport studies in California was spelled out in a 2001 report from the Southern California Association of Governments: “Failure to adequately address and plan for significant growth in airport demand will not only result in major air and ground congestion; it will also seriously jeopardize Southern California’s position as a national and international trade center.”⁶⁹ A subsequent review of the air transport situation in Southern California concluded that the region’s airports “threatened to become the Achilles’ heel of L.A.’s trade future.”⁷⁰

As the new millennium began, the region appeared to face a growing airport capacity crisis threatening its trade future, with few institutional mechanisms to help resolve it. The combined land size for the Los Angeles area’s five major commercial airports (7,900 acres) was only slightly larger than Chicago-O’Hare Airport (7,700 acres), and was dwarfed by Dallas-Fort Worth (18,000 acres) and Denver International (34,000 acres). Without new runways, it was thought that the region would experience a 50 percent capacity shortfall by 2025 — the greatest among the nation’s major metropolitan areas.

Although development of new airport capacity, especially in the fast-growing periphery of the region, seemed an obvious solution, it was far from a practical one. The few institutional mechanisms that were in place to provide coordination of the region’s air transport assets lacked statutory authority to implement regional airport system plans. Los Angeles World Airports (LAWA) could only make decisions for its own airport system, which included LAX, Ontario, Palmdale, and Van Nuys. Constraints on LAX and ground access challenges for Palmdale left Ontario as the only airport where near-term expansion seemed feasible. Yet the efforts of LAWA and other local officials to persuade air carriers to relocate some or all of their air freight operations from LAX to Ontario have not been successful. Elsewhere in the region, airport officials at John Wayne Airport in Orange County recently told officials of the U.S. Government Accountability Office that, while they may consider the regional airport system plan devised by SCAG when making decisions about airport improvements, “it is not the primary driver for these decisions because, in their view, regional and airport priorities necessarily differ.”⁷¹

Although SCAG has been the lead agency for regional transportation planning (including aviation), it lacked the land-use and financial authority required to develop and operate airports. And the promise of the Southern California Regional Airport Authority (SCRAA) created in 1983 and revived in 1999 and again in 2006, largely remained illusory. While it may have enjoyed the appearance of real authority, it functioned primarily as a voluntary association comprised of the City of Los Angeles and the counties of Los Angeles, Orange, San Bernardino, and Riverside, with SCAG participating as a nonvoting member. When Orange County finally joined SCRAA in 1992, it did so on the condition that each member had veto power over the authority’s decisions. That veto power severely limited the agency’s regional airport development authority.⁷²

The 2002 Global Gateways Development Program report from Caltrans identified five of the state’s international airports (LAX, SFO, Ontario, Oakland, and San Diego) among California’s high-priority gateways to the world.⁷³ Unlike other studies at the time, the GGDP report did not emphasize the issue of airport capacity but rather identified truck access as a critical problem, especially at Los Angeles, Oakland, and Ontario airports. The report

⁶⁸ *Ibid.*, p. 45.

⁶⁹ SCAG, *Draft Regional Transportation Plan: Task Forces – Aviation* (February 2001), p. 1.

⁷⁰ Steven P. Erie, *Globalizing L.A.: Trade, Infrastructure and Regional Development* (Palo Alto: Stanford University Press, 2004), p. 172.

⁷¹ “National Airspace System: Regional Airport Planning Could Help Address Congestion If Plans Were Integrated with FAA and Airport Decision Making” (GAO-10-120), p. 29-30.

⁷² Steven P. Erie, “Enhancing Southern California’s Global Gateways: Challenges and Opportunities for Trade Infrastructure Development” (Los Angeles: Pacific Council on International Policy, June 2003), p. 24.

⁷³ Caltrans, “Global Gateways Development Program,” (January 2002), p. 2. The other high priority gateways identified in the report were six maritime ports (Long Beach, Los Angeles, Oakland, Hueneme, Sacramento, and Stockton) as well as two border crossings (Otay Mesa and Calexico).

also noted that San Diego had operating constraints along with runway and land-use limitations. More generally, the report observed that: "Expansion of California's largest airports is hindered by urbanization, ground access limitations, air quality restrictions and local opposition. Sufficient air transport capacity needs must be addressed, which balances mobility needs, security concerns, and community impacts in providing an integrated system of airports in California."⁷⁴

But in Southern California, regional transportation planners face a frustrating paradox. Although demand for passenger and air cargo service could reach critical levels sometime in the future, there has been a long-standing inability to reach a regional consensus regarding where to shift the aviation burden. The airline industry has favored expansion of LAX and, in the 1990s, expressed interest in an El Toro airport. Both sites were attractive to the airlines because they were near housing and job centers. Yet, plans for LAX and El Toro were thwarted by opposition from nearby residents, who argued that new airport capacity should be located on the fast-growing periphery of the region. While communities around Palmdale, March, Norton, and George welcomed airports as potent development tools, the airlines were opposed to these remote sites, where demand had not yet reached critical mass. As Neil Bennett, Western Regional Director of the Air Transport Association, observed, "It's a Catch-22. In order to have demand, you have to have population density. And when you have population density, you have conflict."⁷⁵

A similar challenge was simultaneously emerging in Northern California. Several studies had argued that SFO was not adequately equipped to provide the extensive global connections that Northern California businesses would require in the years ahead. One report by the Public Policy Institute of California (PPIC) echoed complaints about SFO's air cargo operations that had been voiced by freight-forwarders, customs brokers, airline officials, and others involved in goods movement.⁷⁶ In a January 2003 study for the Pacific Council on International Policy, author Sarah Bachman pulled no punches: "Inefficient Oakland and San Francisco airports and marine ports are losing business to their rivals, particularly those in Southern California. Some freight forwarders truck shipments to Los Angeles to avoid congestion and delays in the Bay Area."⁷⁷ Similarly, a September 2004 commentary in *Air Cargo World* by the executive director of the Airforwarders Association chastised SFO management for its neglect of air cargo: "San Francisco International Airport in particular is critical to Northern California's economic success. But the management of SFO has fallen short in ensuring that the airport's cargo infrastructure is as accessible for users as its passenger facilities."⁷⁸

The San Francisco Bay Area's Metropolitan Transportation Commission's Regional Airport System Plan (RASP), issued in 2000, foresaw a 400 percent increase in international air cargo tonnage at SFO between 1998 and 2020. (The RASP forecast also expected tonnage through OAK and SJC to grow by 188 percent over the same period.) To realize that forecast volume, international tonnage at SFO would have to increase at an average annual rate of 5.1 percent over the forecast period.⁷⁹ Not surprisingly, the RASP questioned whether the Bay Area's three major airports as then configured would be able to contend with the anticipated increases in both passenger and cargo loads those airports would see over the next two decades. Handling additional volumes of air cargo was seen to be especially problematic at SFO given its limited and antiquated on-airport cargo facilities

⁷⁴ *Ibid.*, p. 3.

⁷⁵ Quoted in Stephen P. Erie, "Enhancing Southern California's Global Gateways," p. 24.

⁷⁶ For example, see "Airports keep their terminals simple" by Ian Putzger, *Journal of Commerce*, February 23, 2004. Putzger observes that: "Tight space for cargo activities has long been a problem at San Francisco International Airport. Some airlines use off-airport terminals, and there is off-and-on talk about moving freighter operators to a less-congested nearby airport." For an earlier expression of the same concerns, see "What about air cargo? Air cargo carriers complain that San Francisco International Airport is a difficult place to do business" by Chris Barnett, *Journal of Commerce*, March 12, 2001.

⁷⁷ Sarah Bachman, *Globalization In The San Francisco Bay Area: Trying to Stay at the Head of the Class* (Los Angeles: Pacific Council on International Policy, The Western Partner of the Council on Foreign Relations, January 2003), p. 1.

⁷⁸ David E. Wirsing, "San Francisco is a too-familiar example of airports that neglect the needs of air cargo." *Air Cargo World*, September 2004.

⁷⁹ Metropolitan Transportation Commission, "Regional Airport System Plan, 2000 Update: Final Report," (September 2000), Executive Summary (not paginated).

as well as its notorious ground access issues faced by the Northern California shippers, freight-forwarders, and customs brokers.

The 2000 RASP was not sanguine about the ability of area airports to meet projected increases in traffic. It found that demand would exceed capacity at both SFO and OAK in all weather conditions by 2010. Absent the construction of additional runways, the RASP concluded that the Bay Area would have to consider other alternatives, including the use of Travis Air Force Base in Fairfield (Solano County) or Moffett Field in Sunnyvale (Santa Clara County) should those facilities become available for civilian use.⁸⁰ It rejected a new North Bay airport, arguing that such a facility “would not provide significant air traffic relief and would not be feasible given the lack of an identified location and airport sponsor, costs, potential environmental impacts and uncertain public support.”⁸¹ The RASP conceded that construction of new runways and other infrastructure enhancements at SFO and OAK would be aggressively opposed by environmentalists and residents of nearby communities.⁸² It likewise acknowledged that neither Travis nor Moffett would likely be opened to commercial air service within any reasonable planning horizon.⁸³

Complicating aviation planning in the San Francisco Bay Area is that a state agency, the San Francisco Bay Conservation and Development Commission (BCDC), controls the permitting process for all development within 100 feet of the bay’s shoreline. Both SFO and OAK occupy waterfront property, and expansion plans at the two airports envision intrusion into the bay. The BCDC has repeatedly stated that it would oppose projects, including the construction of new runways that would affect the bay, unless the airports had exhausted all other reasonable alternatives to capacity expansion.⁸⁴

In light of such expectations, it was probably only natural that airport officials in the Central Valley cities of Sacramento and Stockton would seek to position their airports to absorb the eventual overflow of air cargo traffic from the three Bay Area airports. With the establishment of the Farmington Fresh packing house adjacent to an airport taxiway in the late 1980s, Stockton Municipal Airport (SCK) management sought to promote the airport as a hub for airborne shipments of perishable agricultural produce grown throughout the San Joaquin Valley. SCK also aspired to serve the air cargo needs of Silicon Valley via the Interstate 580 corridor, which links Stockton with the southern part of the San Francisco Bay area and, more specifically, to the high-tech industries of Silicon Valley.⁸⁵

While SCK might enjoy a closer highway link to Silicon Valley, Sacramento could boast of two large airports, one of which (Mather) had been designated an air cargo facility. Mather Air Force Base, which had housed a Strategic Air Command squadron until its decommissioning in 1993, was turned over to Sacramento County in 1995, and was officially reopened as a civilian airport on May 5 of that year.⁸⁶ Unlike Southern California and the Bay Area, the fact that both Mather and Sacramento International were both part of the Sacramento County Airport System meant that regional airport planning could be facilitated while governance issues could be averted.

⁸⁰ Ibid. The RASP was much more optimistic about San Jose International’s ability to manage projected growth.

⁸¹ Ibid.

⁸² That expectation proved accurate. For a description of the end of SFO’s hopes of building new runways into the Bay, see Philip Matier and Andrew Ross, “Money dries up for SFO plan to build 2 new runways in bay,” *The San Francisco Chronicle*, May 21, 2003. See also, Jane Kay, “Study sees threat to bay from more SFO runways: Planned expansion would disrupt sea life, stir up chemicals,” *The San Francisco Chronicle*, June 26, 2003.

⁸³ As the long-time home of the 60th Air Mobility Wing, the U.S. Air Force’s largest airborne logistics unit, Travis AFB appeared to be perfectly situated to relieve the growing air cargo burden on Bay Area airports. However, any hopes of Travis AFB joining the ranks of decommissioned military airfields in California were dashed by the events of 9/11/01 and the subsequent deployment of American forces to Afghanistan and Iraq.

⁸⁴ For the BCDC’s policies with reference to regional airport development, go to http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan#22.

⁸⁵ October 7, 2009 interview conducted for this report with Barry Rondinella, former airport director at SCK. Even though Farmington Fresh continues to bill itself as “the only produce shipper in the world to be located on the grounds of an airport facility,” Rondinella recalled that Farmington Fresh had generated only two air-freight flights carrying agricultural produce.

⁸⁶ Sacramento County Airport System, Mather Airport Master Plan Revised Draft (February 2004), p. 1-1.

Air cargo tonnage had increased sharply at Sacramento's airports, especially following the awarding of a U.S. mail contract in 1999 to Kitty Hawk, a carrier which then established its western regional distribution hub for first-class and express mail at Mather (MHR). In its first years of operation as a civilian airport, the volume of cargo handled at MHR soared, rising nearly eight-fold from 21,568 tons in 1996 to 167,526 tons in 2000.⁸⁷ Even with Kitty Hawk's operation in full swing, MHR still had ample capacity to expand its role as a cargo airport, noise complaints from neighboring communities notwithstanding. Indeed, the base range forecast contained in the 2001 iteration of MHR's Draft Master Plan expected to see cargo tonnage at the airport increase at a 5.0 percent average annual growth rate between 2000 and 2020.⁸⁸

A more muted but nonetheless optimistic forecast for air cargo growth was developed for Sacramento International (SMF) in early 2001. As a version of the Draft Master Plan for SMF published that year observed: "Cargo on U.S. air carriers, as measured by revenue ton miles, grew 5.7 percent annually in the 1990s. This growth occurred despite a downturn in cargo revenue ton miles in 1999, which were 1.4 percent below 1998. In addition to strength in the economy, other factors that drove air cargo growth, domestically and worldwide, were changes in supply chain mechanisms over that time. Moves by manufacturers to just-in-time methods to reduce inventory and growth in Internet sales contributed to the strong cargo growth."⁸⁹

Freight tonnage at SMF had increased at an average annual rate of some 23 percent from 1990 through 1995, when a number of the cargo carriers serving SMF departed for MHR when the latter airport opened. While that caused a 15 percent fall off in total freight volume at SMF between 1995 to 1999, those carriers that had stayed at SMF (Fed Ex, DHL, and West Air Industries) saw average growth of 9 percent per year during the last half of the 1990s.⁹⁰ The March 2001 Draft Master Plan for SMF forecast total freight growth averaging 8.2 percent annually through 2010, and 3.8 percent annually thereafter.⁹¹ On-again, off-again plans to build an industrial park on land immediately east of the airport further nourished expectations that air cargo would remain a vital part of operations at SMF.

In San Diego, civic leaders and airport planners faced a perplexing challenge. San Diego International (SAN) is the nation's busiest single-runway airport and one of its most constrained by growth barriers that are both a physical and political character. The airport has long been regarded as inadequate to the needs of California's second largest city with its large concentration of advanced technology industries.⁹² Recognizing the need to head off an eventual capacity crisis at the airport (which was then governed by the same authority that ran the city's maritime facilities), the California Legislature in 2001 enacted a measure establishing the San Diego Regional Airport Authority (SDRAA).⁹³

Depending on which growth scenario was employed, it was generally anticipated that the airport (popularly known as Lindbergh Field) would reach overall capacity somewhere between 2015 and 2022.⁹⁴ In a June 2004 update of its master plan, SDRAA issued a revised forecast projecting air cargo tonnage to increase steeply through 2030. Specifically, in the high growth scenario, cargo tons were projected to grow by 4.8 percent per year and reach 622,000 tons in 2030. A somewhat slower growth rate of 3.9 percent per year was projected in the low growth scenario. Cargo tons in the low growth scenario were expected to increase to 487,000 tons in

⁸⁷ *Ibid.*, p. 3-5.

⁸⁸ *Ibid.*, p. 3-9. The 2001 forecast was developed by the consulting firm Leigh Fisher Associates in August of that year. In May 2002, the consulting firm submitted a revised base range forecast for MHR to 3.7 percent average annual growth rate through 2021. That forecast appeared in the February 2004 edition of MHR's Draft Master Plan, see p. 3-22.

⁸⁹ Sacramento County Airport System, Draft Master Plan for Sacramento International Airport, March 8, 2001, pp. 3-3 – 3-4.

⁹⁰ *Ibid.*, p. 3-29 – 3-30.

⁹¹ *Ibid.*, p. 3-31.

⁹² SAN can handle only one-third of San Diego's air cargo shipments; the balance must be trucked to LAX or Ontario International, according to Steven P. Erie, *Globalizing L.A. Trade, Infrastructure, and Regional Development* (Stanford University Press, 2004), p. 175.

⁹³ Assembly Bill 93 (2001).

⁹⁴ San Diego International Airport, "Aviation Activity Forecast," (June 7, 2004).

2030.⁹⁵ Along with other factors, such forecasts prompted the SDRAA to explore various alternatives to continued use of SAN as the region's primary airport.⁹⁶

By contrast, the website of March Global Port in the fast-growing Inland Empire proclaimed: "Updated forecasts project a quadrupling of total regional cargo volumes over the next 20 years, to 8.89 million tons by 2016, compared to 2.15 million tons handled in 1994. The air cargo handling capacity of the region's airports in 1994 was estimated at 2.96 million tons. Without major new handling capacity added to the southern California region, the region is expected to run out of capacity by the turn of the century. Based upon an air cargo allocation methodology, 1,245,000 tons of cargo or 20 percent of the total regional cargo in the year 2016 is projected for March, of which 66percent anticipated being international. Additionally, as much as 80 percent of San Diego's air cargo or about 250 tons is 'leaded' to other airports, primarily LAX and Ontario. March is a superior alternative to serving San Diego's spillover cargo needs."⁹⁷ With the departure of DHL from the U.S. domestic express delivery business, air cargo traffic at March has abruptly ceased. Airport officials report that the airport handled zero air cargo tonnage in 2009, with the last reported tonnage moving through March in December of 2008.

2.4 The Perils of Prophecy

Air cargo forecasts tend to be extensions of the existing narrative, and the story of California during the latter part of the 1990s was one of brisk growth. Between the end of the post-Cold War recession in 1993 and 2000, California's Gross State Product surged by 41.0 percent in real terms.⁹⁸ That growth was spurred in no small way by a remarkable 82.4 percent expansion of the state's manufacturing sector.⁹⁹ Historical data on air cargo operations at California's airports tend to be sketchy, but one 1998 report observed that "growth of air cargo at the top ten airports in California has been very fast. Seven out of the ten airports experienced a growth rate higher than 50percent in the five years between 1991 and 1996; four out of the seven experienced more than doubling of the total air cargo tonnage. The ten airports had a combined growth rate of higher than 50percent in those 5 years."¹⁰⁰

Not surprisingly, virtually all of the forecasts and analytical studies dealing with air cargo in California as the new millennium arrived were highly optimistic about growth but deeply pessimistic about the ability of airports such as Los Angeles International (LAX) and San Francisco International (SFO) to handle the anticipated surge in air cargo. As the California Business, Transportation and Housing Agency's January 2002 *Global Gateways Development Program* report, observed: "For the international airports, truck access is a critical problem, especially at Los Angeles, Oakland, and Ontario airports. San Diego also has operating constraints, and runway and land-use limitations. Expansion of California's largest airports is hindered by urbanization, ground access limitations, air quality restrictions and local opposition. Sufficient air transport capacity needs must be addressed, which balances mobility needs, security concerns, and community impacts in providing an integrated system of airports in California." If anything, such conclusions nourished the aspirations of airport managers elsewhere in the state and led many of them to promote their facilities as potential alternatives or back-stops to the state's primary air cargo hubs.

⁹⁵ Ibid. p. 51.

⁹⁶ In June 2006, SDRAA board members selected the U.S. Marine Corps Air Station at Miramar as its preferred site for a replacement airport. The location of Miramar near the geographical center of San Diego County made it almost ideally suited to serve both the region's population but also its industry. However, the choice was strenuously opposed by the Marine Corps and the U.S. Navy, both of which have long historical ties to the San Diego area and sizable political constituencies in the community. On November 7, 2006, San Diego County residents voted down a plan which would have provided for joint use of Miramar.

⁹⁷ See <http://www.marchjpa.com/airport.html>.

⁹⁸ Source: California Department of Finance, *California Statistical Abstract* (December 2002), Table D-3.

⁹⁹ According to the California Department of Finance calculations, manufacturing's contribution to Gross State Product increased from \$112.1 billion in 1993 to \$204.4 billion in 2000, measured in constant 1996 dollars.

¹⁰⁰ H.-S. Jacob Tsao, "The Role of Air Cargo in California's Goods Movement," (U.C. Berkeley: Institute of Transportation Studies, September 1998), p. 9.

The 2002 Institute of Transportation Studies (ITS) report went on to observe that: “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.”¹⁰¹ The report disaggregated cargo data according to region: San Diego, Southern California, the Bay Area, and Sacramento. 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.

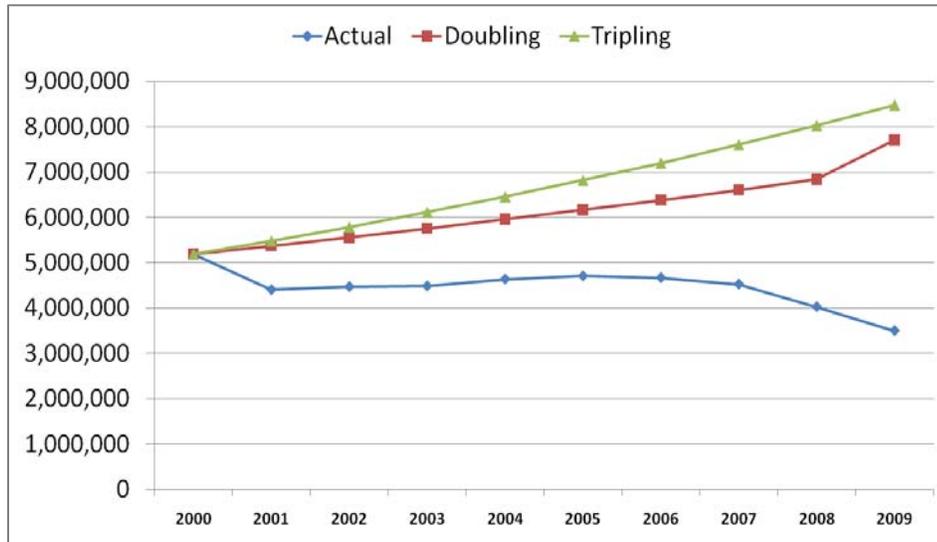
The ITS report's predictive value was undermined by a serious methodological flaw. Noting that “airports generally report air freight traffic levels separately from air mail and include air express in the air freight statistics,” the authors limited consideration of air cargo trends to air freight only. Unfortunately, this approach ignores the fact that FedEx does not distinguish mail from freight. The simple fact that the United States Postal Service (USPS) shifted massive quantities of air mail from passenger aircraft to air-freighters operated by FedEx immediately following the terrorist attacks artificially inflated air freight totals. Additionally, when the USPS transferred a mail contract from Kitty Hawk to FedEx in August 2001, the result was a sharp drop in air mail tonnage, especially at Mather Airport in Sacramento County (which then served as Kitty Hawk's western regional mail hub).¹⁰²

We know now, as Figure 2-1 (found on page 10 of the report) graphically illustrates, that the remarkable growth rates in air cargo tonnage that characterized the 1990s did not persist through the first decade of the new millennium. The consensus forecasts issued around the beginning of the decade – forecasts that generally anticipated cargo tonnage statewide to double or triple by 2020 – quickly parted with reality, as Figure 2-3 below illustrates.

¹⁰¹ Mark Hansen et al., “The California Aviation System: Current Status and Recent Trends” (Institute of Transportation Studies, University of California, Berkeley, 2002), p. 28.

¹⁰² Following the loss of the USPS contract by Kitty Hawk in August 2001, air cargo tonnage at Mather fell by 55.1 percent, from 172,766 tons in FY2001 to 77,613 in FY2002, according to Sacramento County Airport System activity statistics contained in the System's Comprehensive Annual Financial Report for the Fiscal Year Ending June 30, 2008, p. 69.

Figure 2-3: California Air Cargo Volumes
 Consensus Forecasts vs. Actual
 2000-2009 - In U.S. Tons



Source: Caltrans Aeronautics Division (1997-2008 Data), Individual Airports (2009 Data)

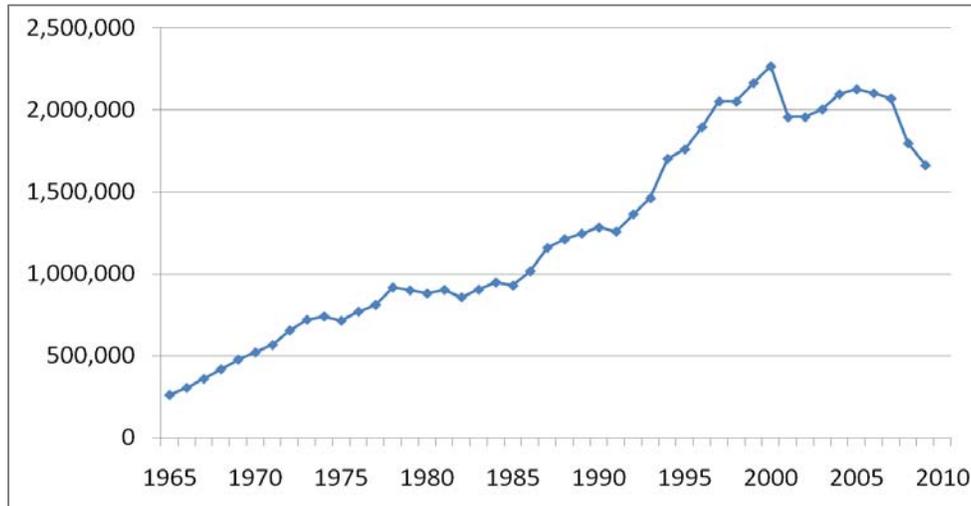
Yet, it was not that the buoyant expectations of continued growth found in most early-decade forecasts were not without some empirical foundation. As a December 1998 study from the University of California at Berkeley's Institute of Transportation Studies observed:

The growth of air cargo at the ten top cargo airports in California has been very fast. The combined growth rate of the ten airports during the six years from 1991 to 1996 is 57.6 percent, with an average annual growth rate of almost 10 percent. Seven out of the ten airports experienced a growth rate higher than 50 percent during the period. In particular, air cargo at Orange County, Oakland and Sacramento Metro airports grew 952 percent, 189 percent, and 121 percent, respectively. The average annual growth rate for Orange County Airport during the period was over 150 percent. At the regional level, the air cargo traffic in all four major regions of the state grew over 50 percent in the six years, while that in the two smaller of those regions grew faster than that in the two largest.¹⁰³

As Figure 2-4 below illustrates, air cargo tonnage handled at LAX rose precipitously from 1965 through 2000. Under the circumstances, it would be difficult to be anything less than optimistic about the prospects of continued growth.

¹⁰³ Mark Hansen, Geoffrey Gosling and Colin Rice, "The California Aviation System: Current Status and Recent Trends," (Institute of Transportation Studies, University of California at Berkeley, Research Report UCB-ITS-RR-98-12, December 1998), p. vii.

Figure 2-4: Air Cargo Tonnage at LAX, 1965-2009
(U.S. Tons)



Source: Southern California Association of Governments, Caltrans Aeronautics Division

However, almost from the outset of the new decade, a sequence of developments roiled the air cargo industry worldwide and in California. These developments prompted significant structural changes in the air cargo industry. According to the Federal Aviation Administration (FAA), these changes included more rigorous air cargo security regulations by the FAA and Transportation Security Administration; maturation of the domestic express market; a modal shift from air to other modes (especially truck); increases in air fuel surcharges; growth in international trade from open skies agreements; use of all-cargo carriers (e.g., FedEx) by the U.S. Postal Service to transport mail; and increased use of mail substitutes (e.g., e-mail).¹⁰⁴

Moreover, as the Southern California Association of Governments recognized nearly a decade ago, “much of what is ‘sold’ as 2nd- or 3rd-day air cargo never sees the inside of an airplane and is transported by truck or train in a tightly-coordinated “time-definite” fashion.¹⁰⁵ Less widely recognized has been the increase in cargo throughput rates at most major airports as the result of both the growing role of integrated carriers such as UPS and FedEx and the emergence of contract ground-handlers who now manage the cargo operations of most major carriers at airports such as LAX and SFO.

Still, the expectation that growth rates recorded during the 1990s would persist well into the future proved to be remarkably resilient in California, even in the face of major setbacks whose true impact at the time tended to be minimized. For example, the 2002 ITS study noted: “While air freight traffic in the last half of 2001 is significantly lower than in 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.”¹⁰⁶

Yet that was no mere slowdown in the economy; it was the bursting of an asset bubble that had driven the expansion of the state’s high-technology sector. The so-called dot.com boom of the late 1990s had not only fueled a decade of rapid growth and innovation among electronics, software, and other technology firms

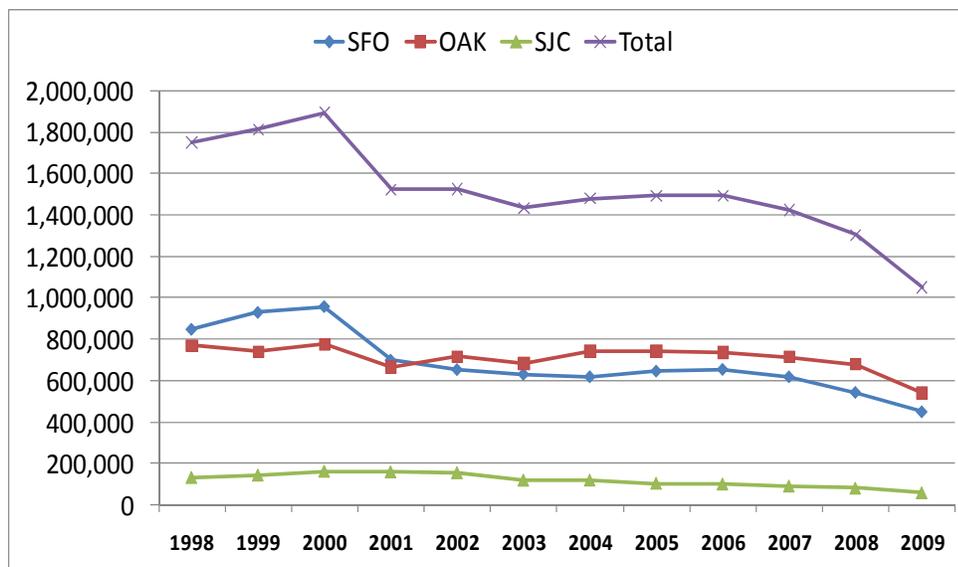
¹⁰⁴ Federal Aviation Administration Aerospace Forecast Fiscal Years 2009–2025, p. 56.

¹⁰⁵ Southern California Association of Governments, “2001 Regional Transportation Plan,” Technical Appendix B: Aviation, p. B-40.

¹⁰⁶ *Ibid.*, p. 56. The study goes on to note that air freight traffic in August 2001 was down 16 percent compared to 22.5 percent in September and 15 percent in October.

throughout California, it also created a surge in demand for air cargo services from those same industries.¹⁰⁷ Far from a “normal” recession that would see the overall economy bounce back once inventories had been depleted, the bursting of the dot.com bubble was an economic game-changer for California’s high-tech manufacturers. For example, statewide employment in the manufacturing of computers and related hardware fell from a peak of 437,000 jobs in December 2000 to 316,400 jobs within three years, a decline of 27.6 percent. Those companies that survived aggressively moved manufacturing operations to other states or nations. The overall economy might regain momentum, albeit on the back of an emerging housing bubble, but the collapse of the dot.com boom fundamentally altered the characteristics of goods production in California. And that had a lasting impact on air cargo, especially in the San Francisco Bay Area which was the epicenter of the crash. Not surprising, air cargo tonnage levels at San Francisco International, San Jose International, and Metropolitan Oakland reached peaks in 2000 that have not been replicated since (See Figure 2-5).

Figure 2-5: S.F. Bay Area Air Cargo Tonnage
1998-2009 - In U.S. Tons



Source: Caltrans Aeronautics Division

The collapse of the dot.com asset bubble during the winter of 2000-01 profoundly affected the Bay Area’s economy¹⁰⁸ but especially that of Silicon Valley. Between 2001 and 2006, manufacturing employment in the Bay Area counties fell by 23.3 percent. The drop off was even more precipitous in Silicon Valley (largely Santa Clara and San Mateo Counties), where manufacturing employment fell from 292,100 in 2000 to 194,400 in 2007 – before the full brunt of the Great Recession arrived.¹⁰⁹ A December 2006 study commissioned by the California Economic Strategy Panel spelled out the contraction in the Bay Area’s high-tech manufacturing industries: “Within Production, the Semiconductor & Other Electronic Component Manufacturing sub-sector reported the most jobs (almost 61,800), but experienced significant losses of 30percent from 2001 to 2004. Second, the

¹⁰⁷ According to Caltrans’ *Global Gateway Development Program* report, the 170 percent jump in the value of air cargo exports from 1990 to 2000 through the Los Angeles and San Francisco Customs Districts “was driven by California’s top two exports on a dollar basis: Electronic equipment and industrial machinery (54 percent of all exports),” p. 8.

¹⁰⁸ In the words of the November 7, 2003 *Economic Letter* from the Federal Reserve Bank of San Francisco, “As the IT bubble deflated, so did the Bay Area economy. Since hitting a peak in December 2000, total nonagricultural employment in the Bay Area has plummeted by 350,000 jobs, or 9.5 percent (data are through August), far exceeding the 2.0 percent decline in employment recorded nationally; about half of these lost jobs were in the IT sector.” As defined by the California Economic Strategy Panel, the Bay Area Region includes eleven counties: Alameda, Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma.

¹⁰⁹ Employment statistics are published by the Labor Market Information Division of the California Employment Development Department.

Computer & Peripheral Equipment Manufacturing sub-sector reported almost 38,600 jobs in 2004, but experienced significant job losses of 34percent for the period. The third largest Production sub-sector, Navigational, Measuring, Electro medical & Control Instruments provided over 34,100 jobs in 2004, but also experienced significant job losses (over 26percent).¹¹⁰

The end of the dot.com boom also led to a permanent restructuring of the high-tech sectors of the Bay Area's economy, one characterized by a growing emphasis on research and development and a rapidly diminishing emphasis on manufacturing products for world markets. As a whitepaper from the Bay Area Economic Forum explained, "companies in the Bay Area have lowered costs by employing local or domestic contract manufacturers, or developing alliances or joint ventures with overseas partners. As technological advances have now reduced interaction costs dramatically, companies are focusing more on their core capabilities and outsourcing activities that other companies can do better. This segmentation of the value chain, and the disaggregation of production into its modular components, is feeding the trend toward outsourcing. The semiconductor industry is a good example. Once made up of many vertically integrated companies, the industry is now made up of many companies that either focus on a small set of core activities and outsource the remainder, or perform a key function in the value chain, serving other companies up or down the production chain."¹¹¹

The end of the dot.com boom was less acutely felt in the more industrially diversified economy of Southern California. Ironically, the five-county area comprising Los Angeles, Orange, Ventura, Riverside, and San Bernardino Counties sustained a more glancing blow to its high-tech manufacturing cluster in the early 2000s than did the Bay Area principally because of much of Southern California's high-tech manufacturing had contracted sharply during the post-Cold War recession of the early 1990s, when federal spending on defense and especially aerospace was deeply slashed.¹¹² Still, despite very modest employment gains, high-technology manufacturing in the first decade of the 21st century was much less an economic force in Southern California than it had been just a decade earlier.¹¹³ As Figure 2-6 indicates, air cargo operations at Southern California's airports were accordingly less abruptly affected by the economic turndown that began during the winter of 2000-2001.

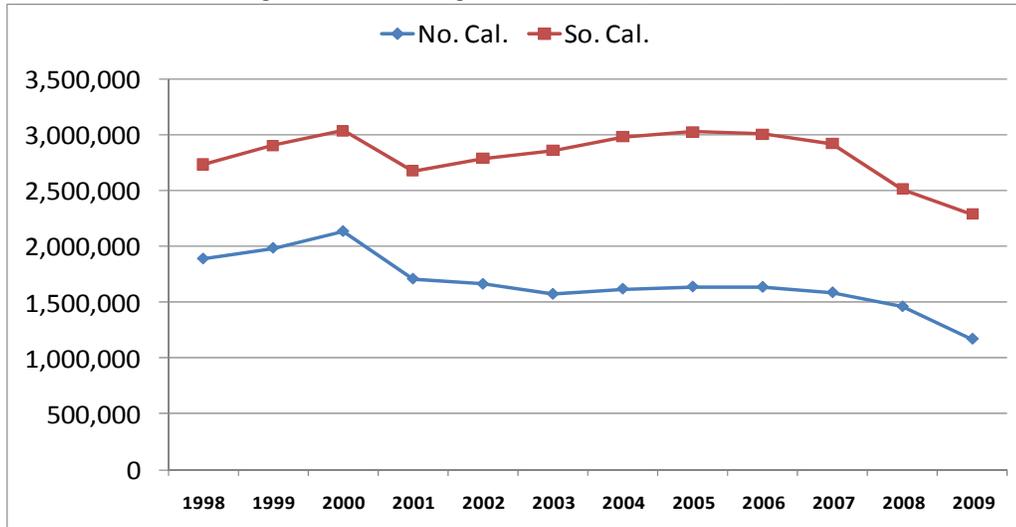
¹¹⁰ California Economic Strategy Panel, "California Economic Base Report: Bay Area Region" (December 2006), pp. 20-22.

¹¹¹ A.T. Kearney, "The Future of Bay Area Jobs: The Impact of Offshoring and Other Key Trends," a July 2004 report commissioned by Joint Venture Silicon Valley, the Bay Area Economic Forum, and the Stanford Project on Regions of Innovation and Entrepreneurship, pp. 6-7.

¹¹² California Economic Strategy Panel, "California Economic Base Report: Southern California Region" (December 2006), pp. 20-23.

¹¹³ Ibid., p. 22.

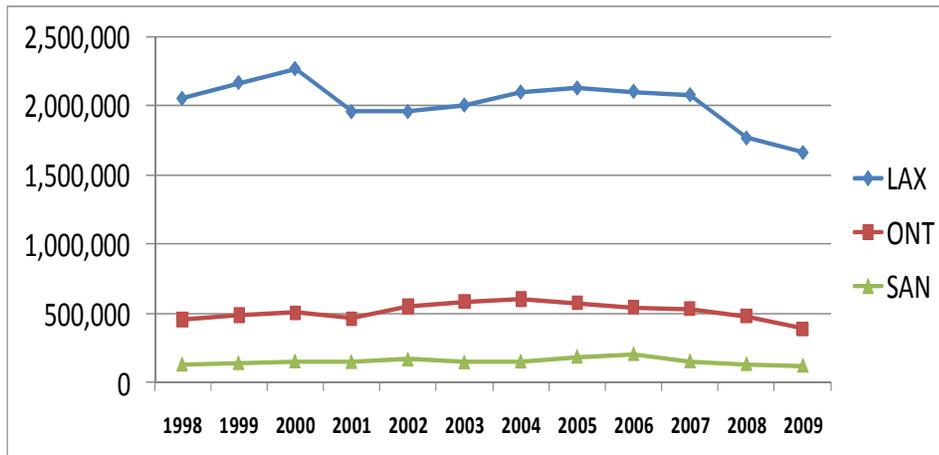
Figure 2-6: Air Cargo in California (In U.S. Tons)



Source: Caltrans Aeronautics (1998-2008); Individual Airports (2009)

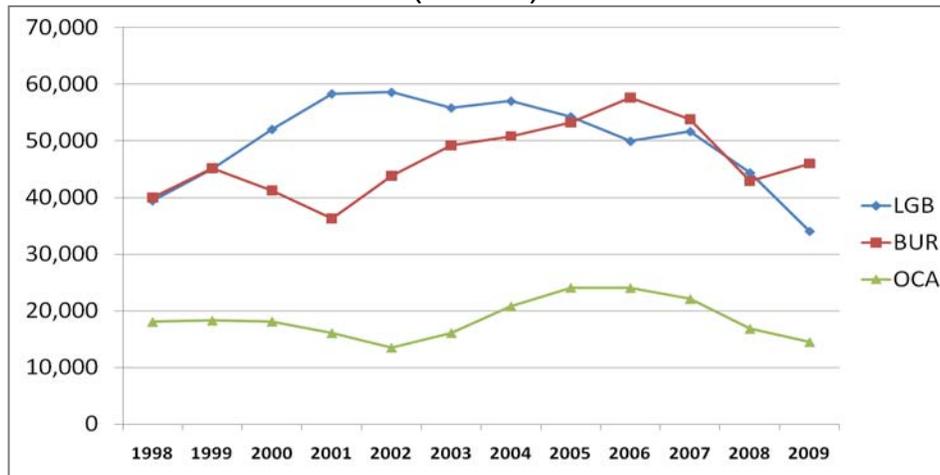
In general, (please refer to figures 2-6 through 2-8) air cargo operations in Southern California fared better than did cargo operations at Northern California's airports, although each region produced one outlier from the statewide trend (see Figure 2-1 on page 11 of this report) toward diminished cargo tonnage levels during the 2000's – those being Burbank's Bob Hope Airport and Sacramento International Airport.

Figure 2-7: Air Cargo Tonnage at Southern California's Three Largest Cargo Airports, 1998-2009 (U.S. Tons)



Source: Caltrans Aeronautics Division

Figure 2-8: Air Cargo Tonnage at Southern California's Three Next Largest Cargo Airports 1998-2009 (U.S. Tons)



Source: Caltrans Aeronautics Division

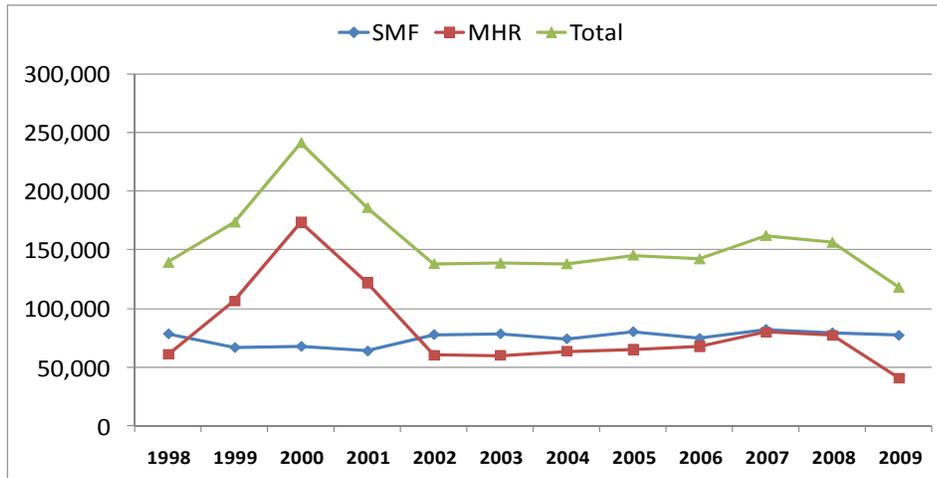
Unrealized expectations of rapid growth in air cargo volumes have similarly been true for both Sacramento International (SMF) and Mather Airport (MHR), both of which are operated by the Sacramento County Airport System. What is particularly intriguing about the Sacramento airports is the manner in which their experience in the past decade defied the basic tenets of air cargo forecasting. Following accepted practice, forecasters for the two airports placed considerable emphasis on regional economic and demographic factors which, theoretically, should have indicated the direction and extent of the region's demand for air cargo services. Yet that expectation has been frustrated by reality. While air cargo tonnage at SMF was fairly stagnant between 2002 and 2006 – years in which Mather was posting a relatively meager 0.75 percent annual growth rate -- one key economic indicator for the SACOG region -- taxable sales – was rising at a 6.25 percent annual rate. Likewise, the region's population had increased by a remarkable 9.7 percent during those same years. In theory, air cargo growth rates at SMF and Mather should have reflected these regional trends and been fairly brisk. Ironically, the much more appreciable increase in air cargo tonnage recorded over the next two years at both airports occurred against the backdrop of largely dreadful economic circumstances in a region especially hard hit by the nation's mortgage crisis. Perhaps nowhere else in the state was the emerging disparity between the predictive value of economic and demographic factors and air cargo growth more evident than in the Sacramento area.

In 2000, it was easy to be optimistic about Mather's prospects as a flourishing air cargo hub. Not only was the air cargo industry nationally enjoying remarkable expansion, the Sacramento region was itself experiencing a period of brisk economic development and population growth. Just from 1995 to 2001, air cargo tonnage handled at SMF and MHR rose by more than 250 percent. An airmail contract with Kitty Hawk furnished a beguiling example of what Mather could be. In addition, Mather's proponents found encouragement in widely-held expectations that America's surging airborne trade with the Far East would eventually overwhelm the capacity of already congested Bay Area airports, forcing carriers to shift increasing portions of their cargo operations to alternative airports in Northern California. Lending a measure of practical support to this expectation was a forecast published in 2000 by the San Francisco Bay Area's Metropolitan Transportation Commission. That report predicted that international air cargo at SFO would increase by no less than 400 percent by 2020. Under the circumstances, it was not at all unreasonable to anticipate that Mather – with one of the longest runways in the state and with convenient highway access -- would presently emerge as a major air cargo hub.

Things have not worked out that way. If anything, the story of air cargo in the Sacramento region over the past dozen years offers a cautionary tale of the perils of prophecy. Neither Mather nor Sacramento International has

achieved the levels of air cargo activity anticipated in their respective forecasts (See Figure 2-9). Hopes that Mather, in particular, would emerge as a busy air cargo hub featuring frequent air-freighter service to the Far East have yet to pan out. Even if an Asian carrier were to serve Mather on a regular basis, it remains unclear whether the additional activity would have an appreciable bearing on the airport's financial situation.

**Figure 2-9: Sacramento Area Air Cargo Tonnage
1998-2009 - In U.S. Tons**



Source: Caltrans Aeronautics (1998-2008); Sacramento County Airport System (2009)

The cargo forecast for Mather was initially prepared in May 2002, well after the collapse of the dot.com boom in Northern California and eight months after the events of 9/11 might have prompted forecasters to return to the drawing board. Still, the forecast remained embedded in the draft Master Plan submitted to and approved by the Sacramento County Board of Supervisors in December 2003. Even as recently as February 2006, this same forecast was presented without equivocation by airport officials at a meeting of the Sacramento Area Council of Governments Goods Movement Advisory Group.

Statewide by mid-decade, doubts were beginning to creep into the literature about whether all the fretting about cargo handling capacity at SFO and LAX being overwhelmed were not exaggerated. Both airports have a rich history in providing transoceanic air service to the Far East as well as to destinations in Europe. However, in recent years, their once paramount role as trading centers in the nation's transpacific trade has been eroded by the liberalization of international air transport agreements that have opened more routes to more carriers and by the advent of long-range aircraft able to ferry passengers and freight between the Far East and a growing number of cities throughout the United States. Primarily because they are the principal airports serving California's two largest metropolitan areas, LAX and SFO will continue to play a very substantial role in California's international trade. Still, an April 2004 study published by the San Francisco-based Public Policy Institute of California presented compelling evidence that SFO's competitiveness as an international air cargo hub had been waning since at least the mid-1990s.¹¹⁴

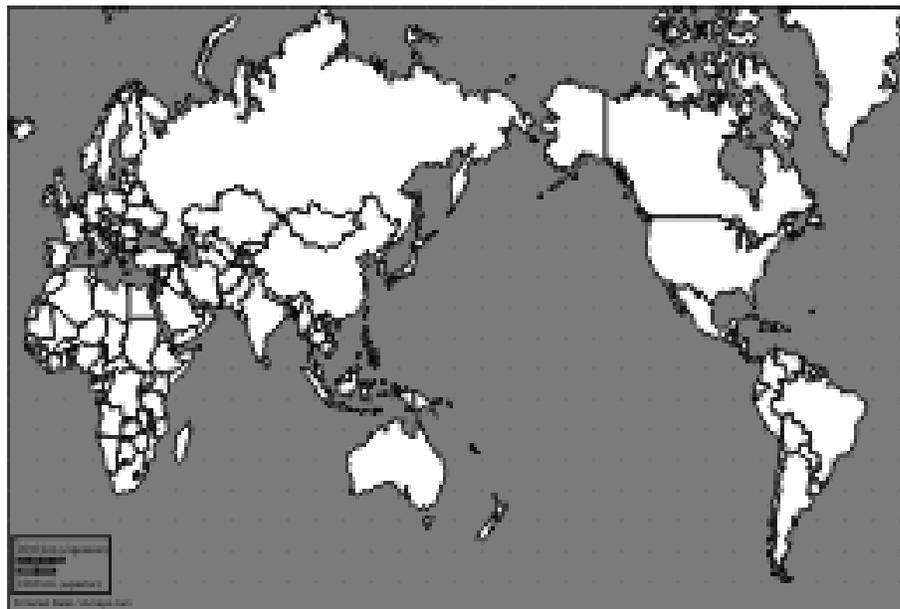
Complicating many discussions about the role of California's airports in the global trading system is a widespread misapprehension that California's airports, like its seaports, are ideally situated to serve as key trading centers or gateways for the nation's transpacific trade. Perhaps instinctively, many of us conceive of the globe in terms of the world maps that adorned the walls of grade school classrooms. Figure 2-10 presents one version of such maps, and, like them, it encourages us to conclude that the most direct route between the Far

¹¹⁴ Jon D. Haveman and David Hummels, *California's Global Gateways: Trends and Issues* (San Francisco: Public Policy Institute of California, April 2004). In particular, see pp. 47-57 for their discussion of "Are California's Gateways Keeping Up?"

East and the major markets of the American Midwest and East Coast runs directly through California. And historically, California airports did serve as the nation's aviation gateway on the Pacific, especially during the island-hopping era of the small, two seat propeller-driven aircraft. But as jet aircraft gradually extended the distances that could be safely covered and as improved navigation technology was introduced, the prevailing routes plied by aircraft flying between the Far East and North America shifted north, more closely reflecting the reality that the earth is a globe and that the most direct route from Tokyo and New York took planes not over San Francisco but over Anchorage. (See Figure 2-11.)

As Jon Haveman and David Hummels showed in a 2004 study for the Public Policy Institute of California, trade routes with California airports as gateways for Far East air cargo are rapidly ceasing to be the case.¹¹⁵ California's coast may be the principal North American landfall for the maritime trade, but Anchorage International has supplanted SFO and LAX as the foremost transshipment point for transpacific airborne cargos. The first map on the next page depicts the world as it is perhaps most broadly understood, but the second map reveals how the world actually looks. The latter representation makes clear that the most direct air routes between the Far East and most of North America lie well to the north of California. In 2008, more air cargo was routed through Anchorage International Airport than any other U.S. airport with the exception of Memphis, home to the main FedEx distribution center. Despite its own sparsely populated catchment area, Anchorage handled more cargo tonnage in 2008 that did LAX and SFO combined.¹¹⁶

Figure 2-10: Conventional Mercator-Projection Pacific-Centered Worldview



¹¹⁵ Ibid., especially pp. 51-54.

¹¹⁶ Airports Council International – North America. “Top World Airports – 2008 Final Rankings.” In 2008, 2,339,831 tons of cargo passed through Anchorage, some 10.2 percent more than the 2,122,153 tons handled at LAX and SFO that year.

Figure 2-11: Pacific-Centered Map Air Route Viewpoint



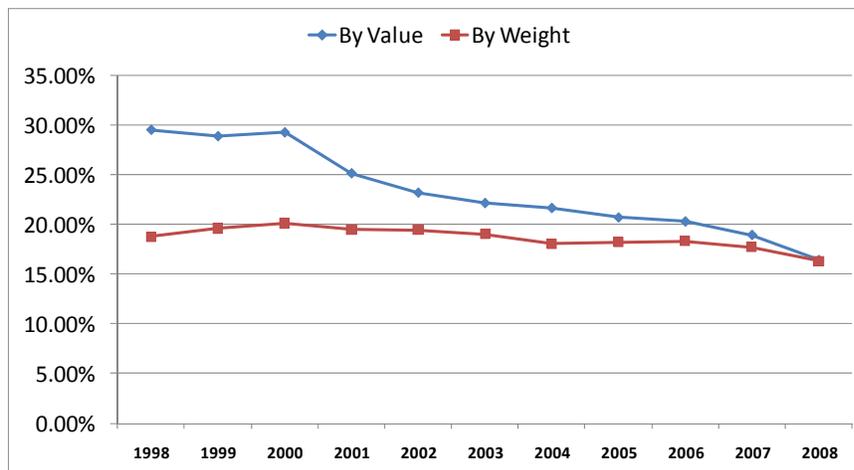
The latest generations of wide body jet aircraft increasingly feature long-range capabilities that enable air carriers to fly non-stop from the Midwest or the East Coast to their final destinations in Asia. The Boeing 777-200LR, for example, has a maximum range of 10,180 miles or more than 2,000 miles greater than the distance from New York to Hong Kong or from Shanghai to Miami. With aircraft able to convey passengers and cargo directly to markets throughout North America, the role of Anchorage, let alone airports in California providing transloading services for international cargos moving between the East Coast and the Midwest is rapidly receding into aviation history.

In their study, Haveman and Hummels employed a technique known as “shift-share decomposition” to clarify trade data indicating a steady decline since the mid-1990s of the percentage of airborne trade between the U.S. and the Far East that was directed through a California airport. They found that the decline in California’s value share comes from changes in the use of California’s airports, primarily resulting from reduced imports. They explain just under half the change in California’s air share of a significant decline in imports of electronic components and accessories from Japan through California. On the export side, the reduction in demand shares for California airport services largely reflects a change in the export origin point for integrated circuits bound for the Philippines, Malaysia, Singapore, and Japan. Many exports now originate in Dallas, Boston, New Orleans, and New York rather than California. Although the decline is common to California airports, the San Francisco district experienced the largest decline in share.¹¹⁷

¹¹⁷ Haveman has recently updated his shift-share analysis. See Beacon Economics’ website (www.beaconecon.com) for more information.

Forecasts that the volume of international cargo passing through SFO would increase by 400 percent between 2000 and 2020 were largely predicated on the assumption that SFO would be a transshipment point for a substantial amount of cargo moving between the Far East and other regions of the United States. That expectation, as we have seen, is no longer tenable. Far from continuing to expand at impressive rates, the volume of international air cargo moving through SFO has actually fallen off. One reason, clearly, was the devastating impact of the dot.com bust on the Bay Area's high-tech industries, by far the dominant customer for air cargo services on both domestic and international flights at SFO. Yet there have been other factors which would indicate that the demand for international air cargo in the Bay Area may not threaten to overtake the capacity of the Bay Area's airports as quickly as was once thought. And so the pressure to find alternative airports in Northern California to supplement existing Bay Area airports may not be as acute as some forecasts have suggested.

Figure 2-12: California Airport Share of U.S. Airborne International Trade 1998-2008



Source: U.S. Census Bureau Foreign Trade Division; WISERTrade

If anything, as illustrated in Figure 2-12, California's share of America's airborne international trade has been diminishing in recent years both in tonnage terms and, even more sharply, in dollar terms. Much of this has been due to the greater use of long-distance aircraft flying Great Circle or polar air routes between the Far East and cities throughout North America. Some of the decline is also attributable to a more general fall-off in California's share of the nation's merchandise export trade, from a peak of 15.4 percent in dollar terms in 2000 to 11.1 percent in 2008.¹¹⁸ The outlook for increased international air cargo traffic is not uniformly sobering. According to the World Trade Organization, trade between Asia and South America and Central America more than doubled between 2000 and 2006. As a result of the limited direct air service between the two continents, cities in North America such as Miami, Los Angeles, Dallas, New York, and Vancouver are serving as transit points between the two markets, making it difficult to determine the exact size of this air cargo market.¹¹⁹

Economic and demographic factors, which theoretically should be indicative of air cargo growth, have often behaved peculiarly in the case of California. Between 1976 and 1998, freight tonnage enplaned grew at an annual rate of 5.7 percent for the U.S. compared to 4.7 percent for California and 4.4 percent for Southern

¹¹⁸ Data obtained from WISERTrade based on state-of-origin data collected and processed by the U.S. Census Bureau's Foreign Trade Division.

¹¹⁹ Boeing World Air Cargo Forecast 2008-2009, p. 33.

California. As a July 2000 study commissioned by SCAG observed: "This is contrary to what was indicated by other statistical indicators, such as employment and population, which rose faster for Southern California and California than the rest of the nation."¹²⁰

There is little reason to expect a second-coming of the growth rates seen in the 1990s. In its latest air cargo forecast, Boeing observes that the U.S. domestic air cargo market "has matured, and since 2004, annual volume has been flat or slightly declining. In 2006, the domestic air cargo market increased 0.4percent and in 2007 declined 1.5percent."¹²¹ Consolidation in the industry has also affected the business. In 2003, FedEx and UPS held a 63.3 percent share of all enplaned tonnage reported flown on domestic routes by U.S. carriers. By 2008, that share had risen to 74.8 percent.¹²²

One seldom recognized factor in explaining diminishing levels of air cargo tonnage at California airports is the simple fact that many of the products customarily shipped by air are becoming smaller and lighter. Take, for example, the effect of R&D spending on semiconductors.¹²³ Research has shown that advances in the design and production of semiconductors have played an important role in the price declines of computers and communications equipment. One aspect of the technological advances in semiconductors is the size of individual chip components. Over time, these components (that is, individual transistors) have become smaller and smaller; the smaller the components, the more chips that can be etched onto a wafer, the greater the number of components per chip, and also the faster those chips are able to run. The International Technology Roadmap for Semiconductors (ITRS) (2004) noted that the shrinking of the size of the components on microprocessors and dynamic random access memory chips accelerated in the second half of the 1990s, the period when prices for IT goods also fell very rapidly. Using the terminology of the ITRS, the "technology node cycle"¹²⁴—a rough measure for the length of time it takes for components to shrink by 50 percent—shifted from three years to two years in the late 1990s and remained at two years through 2003. Looking ahead, the ITRS expects the technology node cycle to revert back to three years, a pace that is still very rapid. The continued shrinking of components should allow for further declines in the cost of producing chips and also allow new and better chips to be designed, both of which will result in falling prices. This helps to explain why the value of airborne shipments through SFO has been steadily rising, even though tonnage has been declining.

Concerns in the early years of this decade about the capacity of such key airports as SFO and LAX to absorb anticipated rapid growth in cargo tonnage were no doubt well-justified at the time. The fact that cargo tonnage statewide and at virtually every large airport in California currently equals tonnage levels seen in the early 1990s does not imply that air cargo has grown less significant to the state's economy. Nor does it suggest that transportation planners and airport authorities should cease efforts to persuade air carriers to extend air cargo operations to facilities elsewhere in the state where capacity is not at issue.

Long-term demographic trends are unambiguous in indicating that future population growth in California will occur largely in the interior regions of the state that are not ideally served by air cargo operations based at the existing primary hubs. With the continued rise of major populations centers in the Central Valley and in the

¹²⁰ CIC Research, Inc. (San Diego), Southern California Aviation Industry Impact Analysis," a study commissioned by SCAG and published on July 11, 2000. The study is reproduced in SCAG's 2002 Regional Transportation Plan: Aviation Appendix, pp. B-85 through B-183.

¹²¹ Boeing, "World Air Cargo Forecast 2008-2009," p. 23.

¹²² U.S. Bureau of Transportation Statistics, "Air Freight Summary Data (All U.S. Carriers) October 2002 - July 2009."

¹²³ This point was raised in a June 17, 2005 *Economic Letter* from the Federal Reserve Bank of San Francisco entitled, "IT Investment: Will the Glory Days Ever Return?"

¹²⁴For a more recent analysis of the impact of technology node cycles on product size and weight, see Kenneth Flamm, "Economic Impacts of International R&D Coordination: SEMATECH and the International Technology Roadmap," in *21st Century Innovation Systems for Japan and the United States: Lessons from a Decade of Change: Report of a Symposium* (Washington, D.C.: The National Research Council, The National Academies Press, 2009).

Inland Empire (primarily San Bernardino and Riverside Counties), commerce in these regions is also expected to expand at rates faster than businesses along the coast.

Still, it is necessary to raise doubts about the prospects for a resumption of fast-paced growth in air cargo operations at California airports. One matter that should be of particular concern is the reliance on forecasts which closely associate air cargo activity measured in tonnage with Gross Domestic Product (GDP). At least for the past few years, that has not been a correlation that has worked in the case of California, and one important reason for that is the relatively rapid pace with which California's economy has been shifting from goods-production to the provision of services. The sharp fall-off in cargo tonnage from 2000 to 2001 was largely the product of the collapse of the dot.com boom that had fueled much of the growth in air cargo tonnage in the late 1990s. The nation soon rebounded from the brief national recession which ensued, but manufacturing in California did not. Instead, the emphasis of high-tech industries in California shifted from production of goods for mass markets to research and development, to discovering the Next New Idea that would propel the economy forward.

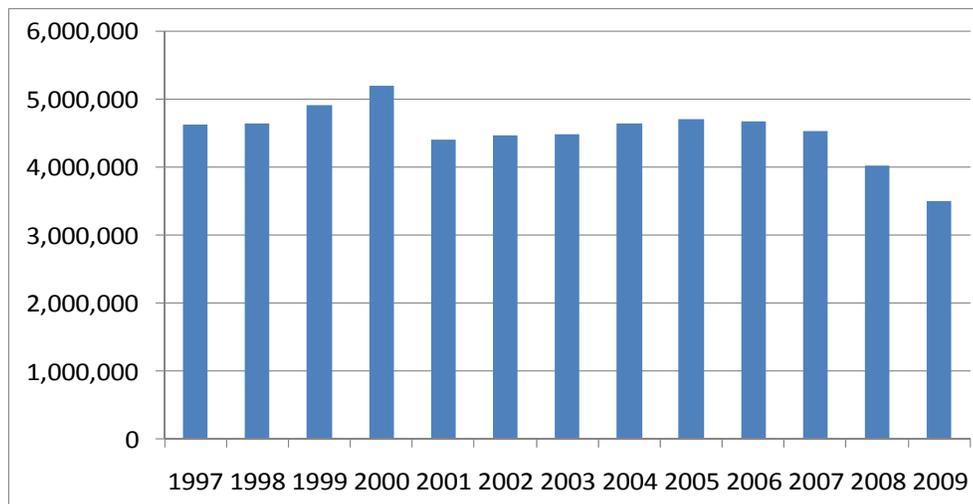
In the broad picture, whatever air cargo growth rates emerge in the future – whether measured by tonnage or landings/take-offs – is unlikely to be the decisive element in airport planning. Other factors, namely the proliferating use of smaller regional aircraft by passenger carriers and growth in business and general aviation, are much more likely to constrain the ability of airport managers to optimize the use of runways, taxiways, terminal space, and other on-airport facilities. Even the volume of truck traffic associated with air cargo operations at major airports is negligible in the context of all forms vehicular traffic.

The past two decades have been a tumultuous period for air cargo operations in California. The 1990s represented a period of rapid growth, both in California's economy and in the volume of air cargo handled at the state's airports. During that decade, California's Gross State Product increased by 34.7 percent, in real terms, while air cargo tonnage effectively doubled.¹²⁵ By contrast, the current decade has been an exceptionally turbulent one for the air cargo industry, internationally, domestically, and particularly within California. As shown in Figure 2-13, the amount of air cargo tonnage handled at California airports in 2008 was significantly lower – by 22.4 percent -- than in the peak year of 2000.¹²⁶ By the time 2009 was over and the economy was showing some signs of recovery, the amount of air cargo tonnage handled statewide had fallen even further – to a level not seen in nearly two decades.

¹²⁵ Gross state product data may be found in the California Finance Department's annual *California Statistical Abstract* series. Historical air cargo tonnage figures were provided by Caltrans Aeronautics Division. It should be noted that air cargo data for the years prior to 1998 are incomplete. However, the tonnage figures for the state's principal airports were available for both 1990 and 2000. State totals for those years were, respectively, 2.6 million tons and 5.2 million tons.

¹²⁶ According to the California Department of Finance, the state's gross domestic product increased by 20.1 percent between 2000 and 2008, rising in constant 2000 dollars to \$1.546 trillion from \$1.287 trillion.

**Figure 2-13: California Air Cargo Volume
1997-2009
(In U.S. Tons)**



Source: Caltrans Aeronautics Division (1997-2008 Data), Individual Airports (2009 Data)

Today, air cargo forecasts commissioned by California's leading airports tend to see only modest growth potential. For example, a new analysis and long-term forecast for the Bay Area's Regional Airport Planning Committee similarly concludes that the high rates of growth in air cargo tonnage once forecast for the region's airports will not materialize.¹²⁷ The analysis by consultants SH&E noted that, after advancing at an average annual growth rates of 7.0 percent from 1990 to 2000, air cargo volumes in the Bay Area had contracted by an average annual rate of -3.9 percent since 2000. Looking ahead, the consultants' Base Case forecast expects air cargo volumes in the Bay Area to increase at a slower pace than for the U.S. as a whole. More specifically, SH&E's Base Case cargo forecast for Bay Area airports expects tonnage to grow at a 2.4 percent average annual rate from 1,426,000 tons in 2007 to 2,740,000 tons in 2035. Tonnage at SFO, in particular, is expected to increase from 621,000 tons in 2007 to 1,411,000 by 2035. By way of comparison, the 2000 RASP forecast anticipated that SFO would have achieved that level of tonnage in 2008.

An ample portion of the market has been permanently ceded to surface modes of transport, which have historically enjoyed a substantial edge in pricing over air-freight but which have also grown more efficient in recent years in satisfying even the most demanding supply-chain managers.¹²⁸ That trucking firms, railroads, and steamship lines are less subject to the extensive security measures being imposed on air carriers merely adds to the marketing advantage enjoyed by surface transport modes.

While circumstances may have lowered the volume of air cargo handled at the state's airports, they have not much altered the rough contours of the air cargo system in California nor diminished the economic importance of air cargo operations. In 2000, ten airports accounted for 99.2 percent of the air cargo handled at California airports. Eight years later, those same ten airports continued to hold an estimated 98.0 percent share of the state's air cargo. (Figure 2-14 lists the rank order of California's cargo-handling airports in 2009. Although complete 2009 cargo tonnage figures for nine of the state's ten largest air cargo airports have been published, a

¹²⁷ SH&E, "Long-Term Forecasts of Bay Area Aviation Demand," a report for the Regional Airport Planning Committee (March 27, 2009).

¹²⁸ "The recent unprecedented rise in fuel price has led to increases in the cost of air cargo. The rising price of air cargo has caused some shippers to increase their use of maritime transportation. This practice is not new. Some commodities, particularly consumer goods, have historically migrated from air freight to containerships as they matured in their product life cycles and no longer warranted the speed and reliability of air cargo." Boeing's World Air Cargo Forecast 2008-2009, p. 7.

complete statewide total is not yet available. Note that Sacramento International has overtaken San Jose International, which long occupied the sixth spot in the ranking. Mather Airport, meanwhile, fell back following DHL's exit from the domestic express delivery business and a sharp reduction in ABX Air flights.)

Figure 2-14: California's Leading
Air Cargo Airports
CY 2009 – In U.S. Tons

2009 Ranking	Airport	Tonnage Handled
1	Los Angeles International	1,663,855
2	Oakland International	541,497
3	San Francisco International	449,728
4	Ontario International	390,932
5	San Diego International	121,538
6	Sacramento International	77,226
7	San Jose International	59,471
8	Bob Hope (Burbank)	46,595
9	Mather	40,862
10	Long Beach	34,000*

Source: Individual Airport Activity Reports – Asterisks Indicate Estimates Based on November YTD Data

The single most significant change during the '00s was at SFO, which saw a 51.6 percent drop in cargo tonnage between 2000 and 2009. That included a 50.1 percent decline in international cargo and a huge 83.7 percent fall-off in domestic mail. Although the raw numbers are smaller, Sacramento's Mather Airport and San Jose International saw larger percentage declines – 61.7 percent and 58.5 percent, respectively – during the 2000's.¹²⁹

Going forward, air cargo will continue to account for the lion's share of California's merchandise export trade, while providing timely links to domestic markets. However, growth rates are apt to remain comparatively sluggish and certainly well below the brisk pace predicted only a few years ago. Those earlier forecasts understandably gave rise to deep concerns over whether the capacities of the state's airports – especially its primary aviation gateways – would be overstretched before concrete steps could be taken to alleviate the growing burden by either expanding capacity at existing airports and/or dispersing air-freighter operations to other airports, most notably those located closest to the fastest growing municipalities in the state. On the positive side, the tumult of the past few years, by appreciably slowing growth in air cargo volumes at virtually every airport in California has bought airport officials and transportation planners added time to lay the groundwork for an aviation infrastructure better suited to meeting the evolving needs of the state.

¹²⁹ The data were obtained from the websites of the individual airports and from Caltrans Aeronautics Division.

2.5 General Comments and Conclusions

There is no question that managing California's aviation system to provide efficient and economical service to both passengers and shippers of air cargo remains a serious challenge. Of the 14 airports nationally that the FAA predicts will be "significantly capacity constrained" by 2025, five (SFO, OAK, SAN, LGB, and OCA) are in California. Regional airport planning can identify alternatives on how best to manage available capacity and address the problems posed by congestion.¹³⁰ A 2003 study for the Office of the Assistant Secretary for Transportation Policy at the Department of Transportation looked at the potential for alternative airports to meet regional capacity needs and found that the use of these airports can make more efficient use of existing resources and better use of limited funds for airport development.¹³¹ According to that report, regional airport planning should focus on both airport development and access issues. The study concluded that as metropolitan areas grow and become more congested and complex, FAA needs to promote regional airport planning. Likewise, according to ongoing research sponsored by the Airport Cooperative Research Program, there are important opportunities to improve aviation system capacity and airport operations by embracing more collaborative and cooperative regional airport planning.¹³²

Yet, according to a 2009 report from the U.S. Government Accountability Office, regional airport system planning efforts have had less influence on the FAA than might be imagined.

While regional airport planning has been undertaken in each of the regions forecast to have significantly congested airports, FAA has used the results of this planning selectively when working with airports or making funding decisions. In each of the five potentially congested regions we visited, FAA regional officials stated that they may look at RASPs or other regional airport plans when reviewing projects at individual airports. FAA regions, however, do not carry out a systematic review of RASPs to ensure that they meet the guidance for airport system planning, and none of the FAA regions we spoke with regularly used them in decision making when funding airport improvements, despite the potential identified by FAA and others for RASPs to identify potential options to alleviate congestion. For example, FAA officials in the Western-Pacific Region stated that capital investment decisions are made on the basis of airport master plans or airport layout plans. The officials noted that RASPs can serve as a tiebreaker among projects, but that funding decisions are made using national-level priorities.

Lack of tight coordination between regional and national agencies is only part of the problem. Because regional airport planning is advisory, competing interests can thwart plans to develop new capacity. Whether California is inherently more litigious or lacking in consensus than any other state, efforts to increase the capacity of the state's air transport system have routinely been derailed. In 2008, San Diego County voters rejected a plan to establish commercial air service at Miramar Naval Air Station even though San Diego International (Lindbergh Field) was fast approaching planned capacity. Regional or metropolitan planning organizations generally develop RASPs but have no authority over airport development. That authority rests with airports, which are not required to incorporate planning recommendations into their capital plans, and with FAA, which makes funding decisions on the basis of national priorities.

Much of what has been written on the topic of air cargo operations in California is of limited utility to today's transportation policymakers and planners. This is especially true of the various reports and studies issued during

¹³⁰ The FACT 2 report used measures of demand and capacity to identify those airports forecast to face significant capacity constraints by 2025 and 2015. For its analysis, FAA focused on 56 of the nation's 291 commercial service airports, including the 35 airports—primarily large-hub facilities—included in the FAA's OEP and an additional 21 airports identified for more detailed analysis on the basis of airport operation levels and assumptions about fleet mix at these facilities. It should be noted, however, that the demand forecasts included in FACT 2 were conducted before 2007 and do not take into account the reduction in demand resulting from the recent economic downturn.

¹³¹ GRA Incorporated, *Alternative Airports Study*, prepared for the Office of the Assistant Secretary for Transportation Policy, Office of the Assistant Secretary for Aviation and International Affairs, Department of Transportation (Washington, D.C.: Apr. 15, 2003).

¹³² See the ongoing research entitled *Innovative Approaches to Addressing Aviation Capacity Issues in Coastal Mega-Regions*, ACRP 3-10, is in the process of being finalized.

the first half of this decade. Because they often contain information, analyses, and forecasts which are severely out-of-date in light of the dramatic changes that have taken place within the air cargo industry and in California's economy, much of the existing literature on air cargo operations in California is inaccurate and misleading.

There has been a tendency in much of the literature to conflate statistics indicative of impending airport congestion in a way that suggests that air cargo operations are a primary cause of airport congestion or that the transfer of air-freighter operations from gateways such as LAX would significantly ease congestion at that airport. In fact, air-freighter operations represent a very small percentage of daily flight operations at LAX and other major airports. Moreover, the hours during which air-freighter landings and take-offs typically occur do not normally coincide with the periods in which passenger and general aviation aircraft operations are at their peak.

Also evident in much of the literature is a reluctance to address costs. Discussions of shifting aviation services from one airport to another sometimes assume the aura of the board game Risk™ in which players move armies over considerable distances without reference to the logistical problems and expenses that would impede real generals ordering similar troop movements. Preserving the option of transferring air-freighter operations from a congested airport on the coast to an under-utilized airport inland may seem like a sensible step to ensure that a future need can be managed when that need finally becomes acute. But such planning often ignores the costs involved in keeping surplus airports in operation against some future day when they may be required to absorb anticipated increases in airborne traffic.

Likewise overlooked in many aviation planning documents is the possibility that relocating a measure of air cargo operations from Airport A to Airport B may not necessarily be Airport B's best interest. The investment needed to prepare the infrastructure for handling an additional volume of cargo tonnage, for example, can exceed whatever net revenue gains would be generated by an added number of operations. For example, a proposal to build a cargo-handling facility at Mather Airport did not include any calculation of how much new air-freight business would be needed to generate the landing fees, ground rents, and other airport charges to recover even some portion of the approximately \$75 million construction cost.

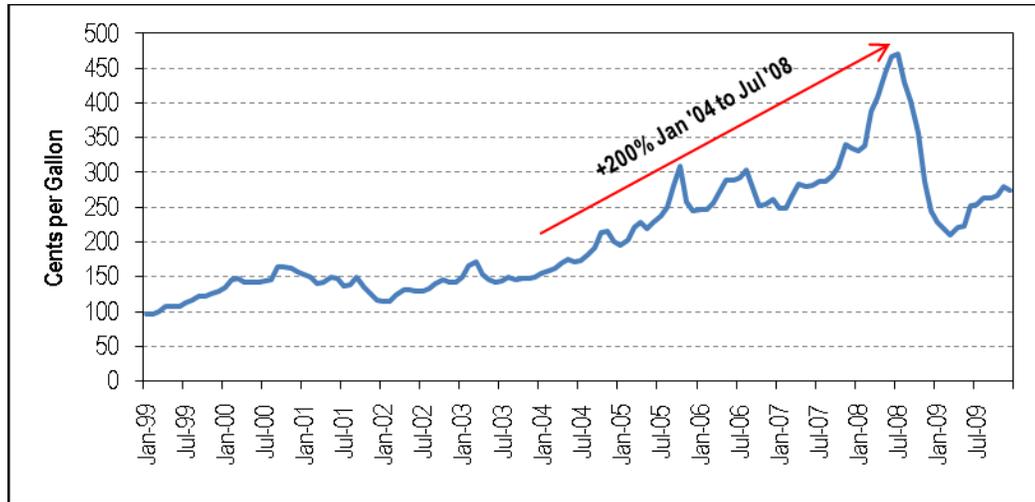
Of equal concern is the almost universal use of tonnage (or a variant such as Revenue-Ton-Miles) as the sole metric by which to measure air cargo activity. While air carriers, who generally charge by the pound, may be understandably focused on weights and volumes, sheer tonnage numbers shed almost no light on the economic value of the goods being shipped. Nor does tonnage alone provide a good indication of the importance of air cargo to a region's economy. Even from the perspective of airport managers, cargo tonnage does not necessarily correlate with the amount of revenue earned from landing fees or cargo terminal rents, because some carriers are more efficient than others in transporting goods. In the Sacramento County Airport System, for example, FedEx paid 30 percent less in landing fees during 2009 than did UPS even though FedEx handled 30 percent more cargo tonnage than its rival.¹³³

Consolidation within the air cargo industry and especially the increasingly dominant role of integrated carriers (specifically UPS and FedEx) along with the emergence of third-party ground handlers such as Swissport International, Menzies, and TRUX at several California airports has resulted in higher cargo through-put rates and better all-around utilization of limited on-airport cargo facilities. As a consequence, the physical impact of air cargo tonnage on airport operations (although not necessarily on related truck traffic) is significant less now than it had been in an age when a much larger number of competing air cargo carriers handled their own loading, unloading, and sorting.

¹³³ Calculated from landing reports submitted by the air carriers to the airport system. The large differences are due primarily to the different types of aircraft the three carriers use to service the Sacramento area airports. FedEx employs more capacious MD-11s as opposed to smaller aircraft. Landing fees are the same at SMF and MHR.

In ways described elsewhere in this report, the operations of the air cargo industry in California have changed dramatically in the years since much of the literature reviewed in this chapter were produced. Heightened security concerns, continued volatility in fuel prices (as shown in Figure 2-15 below), stiffer competition from surface transport modes, consolidation among air carriers, freight-forwarders and ground-handlers, and the steady rise of integrated carriers are among some of the developments that have transformed the way the industry operates.

Figure 2-15: U.S. Diesel (On-Highway) Prices



Source: U.S. Gasoline and Diesel Retail Prices, January 2010, Energy Information Agency

At the same time, California's economy has undergone significant changes in just the past decade that will have lasting consequences for future demand for air cargo services in this state. These changes have been so rapid that they have outpaced and rendered obsolete much of what constitutes today's conventional wisdom about the role of air cargo in California's aviation system.

3 The Air Cargo Industry

3.1 Introduction

To evaluate California’s air cargo future in terms of projected growth and challenges, it is essential to first understand the individual business models that encompass the industry, including not only a variety of air carriers but also allied services such as freight forwarding, ground-handling and trucking. The global air cargo industry relies upon a network of facilities and services, rather than being a collection of individual, wholly independent parts. The extent of that network and its interdependence makes it more difficult for individual airports/markets to unilaterally undertake extensive new development because while airports and communities can contribute bricks-and-mortar facilities, as well as incentives, the cargo operators must reconcile each station with regional, national and often international networks or systems.

3.2 Air Carriers

Air cargo may be transported on passenger aircraft (belly cargo) and on all-cargo aircraft (freighters). For broad organizational purposes, air cargo carriers may be stratified into additional categories that will be further detailed later. Freighters are operated by all-cargo airlines, as well as by *combination* carriers that operate both passenger and freighter aircraft. Integrated carriers (*integrators*) operate not only freighter aircraft but also proprietary trucking fleets to offer door-to-door service. The term all-cargo airline is used to describe non-integrators that operate only freighter aircraft without the significant trucking and other services characterizing integrators. ACMI (aircraft, crew, maintenance and insurance) carriers use their own aircraft to operate scheduled flights on behalf of other carriers and occasionally forwarders. Air cargo is also transported by airlines operating only passenger flights. Throughout this study, the emphasis will be on how carriers (and types of carriers) serve the California market. International carriers may operate far differently in their home markets or regions given both differences in market share and regulatory provisions.

Table 3-1: Air Carriers

All-Cargo Airlines	Combination	Passenger (Belly)
Cargolux	Lufthansa	American
Martinair	Korean	Continental
Nippon Cargo (NCA)	China Airlines	Delta/Northwest
Integrators	Asiana	Southwest
FedEx	Cathay Pacific	British Airways
UPS	EVA Airways	Japan Airlines
DHL/ABX ¹³⁴	Air China	Thai Airways
ACMI	Air France	Air Canada
Polar/Atlas	KLM	
Evergreen		

Source: Webber Air Cargo

¹³⁴ For much of the recent historical period of this analysis, DHL and its contract carriers operated in North America as a true integrator but have receded from the US domestic market in favor of international.

3.3 Integrated Carriers (Integrators)

In addition to aircraft, integrators operate door-to-door truck and van service for collection and delivery services under their own brand name. Their services are typically available not only to (and between) businesses but also to residential consumers and shippers. Their logistics chains are optimally structured to provide fast, time-guaranteed delivery at a premium, while slower (deferred delivery) options can be offered at lower rates to the consumer. While significant exceptions exist, integrators' air operations occur primarily during night when flights from different origins land at a hub airport where shipments are sorted and leave again by air thereafter to meet guaranteed delivery times.

As many as six carriers were routinely listed as integrators in the 1990's but this number has dwindled dramatically through acquisitions and other market developments. DHL absorbed elements of Airborne Express in 2003 and UPS acquired remnants of Emery Worldwide in 2004, eliminating two former integrators. DHL has since terminated much of its US domestic network in January 2009 to concentrate on international shipments, although it will continue to operate in major international gateways and select markets used to feed those gateways. BAX Global has also pulled aircraft from many secondary markets such as LA/Ontario International Airport to emphasize only major gateways.

Most California airports are now dominated by the two principal integrated carriers – FedEx¹³⁵ and UPS – with limited belly-hold capacity offered by narrow passenger aircraft. According to International Air Transport Association's (IATA) 2008 World Air Transport Statistics, FedEx and UPS also rank first and second, respectively, in international freight tons flown by scheduled carriers. Consequently, even at international gateways with far more carriers, FedEx is the single largest cargo carrier at LAX and ranks second at SFO to passenger hub carrier United. FedEx operates its western regional hub at Oakland International Airport and UPS does the same at LA/Ontario. Consequently, the two integrators account for around 95 percent of total annual cargo – almost all of it domestic - at the two airports.

Both integrators have large proprietary fleets operating international flights from their national and regional hubs, but are also major customers buying capacity from other carriers. Even with its international focus in North America, DHL relies far less on proprietary capacity, purchasing much more capacity from commercial carriers.

Apart from their air operations, FedEx and UPS are also large trucking companies and their near-term US expansions are far more likely to emphasize trucking with only modest air operations growth driven by changes in local origin and destination demand.

FedEx Express - the airfreight subsidiary of FedEx holding company – operates an all-cargo aircraft fleet of 671 aircraft, larger than UPS' proprietary fleet and charters combined. Conversely, truck operation FedEx Ground operates a fleet about half that of UPS. FedEx Express operates its global hub in Memphis

The world's largest package delivery company, **United Parcel Service (UPS)** operates 1,130 daily North American flight segments, utilizing 424 airports and 796 international segments. UPS' dominance in the package business derives from its trucking resources. Of its daily North American volume of 15.6 million packages and envelopes, only around 2.3 million (roughly 15 percent) are transported by air. In addition to providing transport in its proprietary trucks and aircraft, UPS also operates as a major freight forwarder (UPS Supply Chain Solutions) procuring space on common carriers operating aircraft (both passenger and freighters), trucks (both truckload and less-than-truckload), rail and maritime services.

Initially upon acquiring many assets of the former Airborne Express, **DHL** consolidated redundant Airborne and DHL stations in many secondary markets – contributing to a glut of on-airport cargo space at many North

¹³⁵ In some markets, FedEx uses small contract carriers operating on their behalf, rather than their own aircraft but the flights are operated exclusively to feed FedEx's system.

American airports. Effective January 30, 2009, DHL exited the U.S. domestic market altogether to limit its U.S. focus to international shipments of U.S. origin/destination.

3.4 Passenger (Belly Cargo) Carriers

While cargo at medium-sized U.S. airports was once more evenly split between freighters and passenger aircraft, between 1990 and 2000 passenger carriers reduced their use of wide body aircraft on domestic routes, opting for greater frequencies with regional jets and other smaller aircraft not conducive to carrying freight. Passenger carriers used small aircraft mostly for domestic mail and small shipments, while larger freight was trucked to/from international gateways where a mix of U.S. and foreign-flag carriers provided main-deck capacity able to accommodate containerized cargo. To the extent possible, U.S. passenger carriers might also carry international shipments on the domestic "leg" from the U.S. gateway to nearer its final destination (or from origin) for their own customers and for those of foreign-flag carriers in a hand-off known as interlining.

U.S. passenger airlines have remained dominant carriers of mail because traditional U.S. Postal Service contracts were rarely lucrative enough to justify freighters and because foreign flag carriers were excluded from much of the competition. With the advent of more lucrative express mail, integrators FedEx and DHL have competed for priority mail business but report it mostly as freight.

In the last decade, U.S. legacy carriers have cut frequencies, trimmed networks and shed wide-body aircraft from domestic systems. Consequently, they carry less domestic cargo and fewer domestic legs of international services for interlining partners with clear implications favoring trucking.

While their market share of total cargo has dwindled, airport operators cannot dismiss the revenue function of cargo for belly carriers. While pure belly carriers do not make routing decisions for passenger flights on the basis of cargo, they readily acknowledge that cargo revenues may make the difference between profitability and loss on routes – particularly long-haul transcontinental segments. On routes for which freighters are not justified by shipper demand, belly carriers provide nonstop service to critical gateways.

3.5 Combination (Mixed Fleet) Carriers

So-called combination (or mixed-fleet) carriers operate both passenger and freighter aircraft and are preponderant in Asia and Europe. In fact after FedEx and UPS, the next four largest international cargo carriers (by freight tons carried) are combination carriers Korean Air, Emirates, Cathay Pacific and Singapore Airlines. Six of LAX's top13 cargo carriers were Asian mixed carriers, including two of the top three and cumulatively the market share of these mixed carriers exceeds that of the integrators.

Asian and European carriers have used wide-body belly capacity to 'develop' shipping lanes, then added dedicated freighters when sufficient volume and customer loyalty dictated. Combining freighter and belly operations give them frequencies, capacity and a diversity of network destinations superior to all-cargo airlines and pure belly carriers. The last U.S. passenger carrier (Northwest Airlines) to have also operated freighters abandoned that activity upon acquisition by Delta Airlines.

Occasionally, freighter operations become sufficiently successful that they are spun off as separate subsidiaries or cost centers. Alternatively, all-cargo airlines such as China Cargo and Shanghai International Airlines may be acquired or strategically partner with mixed and/or pure belly cargo carriers. Capacity is carefully coordinated within combination carriers operating mixed fleets, as well as between alliance partners and subsidiaries – making such carriers less willing to leave traditional gateways in favor of possibly less expensive, less congested but ultimately less "connected" alternatives not served by critical airline partners.

3.6 All-Cargo Airlines

Contrasting with door-to-door services of integrated carriers, all-cargo airlines provide airport-to-airport transport largely for freight forwarders and large industrial shippers. Excluding integrators and aircraft, crew, maintenance and insurance (ACMI) carriers (explored shortly), all-cargo airlines account for just less than 13 percent of all cargo transported at LAX in 2007 and about 4 percent at SFO.

Owned by KLM and partner Air France, Martinair suspended U.S. west coast flights, leaving Cargolux as the only European all-cargo airlines operating at LAX. Cargolux eliminated its SFO service. Japanese all-cargo airline Nippon Cargo Airlines operates at both LAX and SFO. Several other Asian all-cargo airlines operate at LAX often cooperatively with combination carriers.

Rather than their own scheduled service, ACMI carriers operate all-cargo flights on behalf of other carriers and occasionally forwarders. At LAX, Kalitta operates flights on behalf of Pacific Air Cargo and Southern Air operates on behalf of Korean Air. Something of a hybrid, Polar Air Cargo operates a forwarder-driven scheduled service while sister company Atlas operates ACMI flights on behalf of other carriers. Other ACMI carriers occasionally operating in California include Evergreen and a host of small carriers flying on behalf of FedEx to small markets.

3.7 Freight Forwarders

The freight forwarder segment that includes divisions of integrators controls about 76 percent of international shipments. Forwarders collect smaller shipments and negotiate rates with carriers based on higher volumes achieved by grouping multiple customers' cargo. The spread between what forwarders pay carriers and what they charge shippers is the yield. To balance carrier competition (driving down rates) and secure available capacity for the greatest number of customers, air forwarders favor gateways. The unique mix of carriers, direct destinations and frequencies, as well as the pricing discipline imposed by competition, support traditional gateways and impede would-be alternatives. The intersection of freighter and belly capacity, as well as international and wide-body domestic service, favor traditional gateways in spite of high operating costs and congestion.

3.8 Ground Handlers

Cargo carriers may be self-handled, handled by other carriers or by third-party handlers. Ground handling includes warehouse operations storage, buildup and breakdown of containers/pallets; but also aircraft unloading and loading (ramp operations) and transport between the ramp and warehouse. For many years, each cargo carrier performed the handling functions for their own flight operations or contracted these services to a larger carrier in the market who could recoup some of its fixed costs for warehouse and equipment by charging for these services. Otherwise, individual carriers were compelled to lease dedicated space even for service that was daily or less.

Third party ground handlers such as - Menzies, Swissport, Mercury and Worldwide Flight Services - have enabled carriers to minimize proprietary investments in equipment and labor, while maximizing the productivity of on-airport warehouse space. Ground handlers get numerous turns for a variety of carrier-clients through a single location or a variety of sites. In addition to higher facility utilization, 3rd party ground handlers offer a dynamic and variable operation size and cost structure (i.e. variable lease costs depending on space used) when airlines may not want to lease a whole building or fixed amount of space. This flexibility is particularly critical in highly seasonal markets, such as during peak agricultural export season.

3.9 Trucking

Surface transportation is vitally important to the air cargo industry, operating as both an essential complement and as a substitute (competitor) for air transport. 'Cartage' is generally understood to represent pick-up and delivery of cargo usually between the airport and the local service area. Alternatively, over-the-road (OTR) trucks may be required to haul consignments hundreds of miles to support international consolidations. Either the

forwarder or carrier may designate the cartage or OTR carrier. After having been responsible for much of the air cargo growth of the 1990's, FedEx and UPS have used their trucking resources to replace air transport in many small and medium markets.

3.10 Survey Methodology – Feedback from Cargo Operators

TranSystems, in conjunction with Webber Air Cargo conducted an internet based survey in November and December of 2009, entitled, "CalTrans Air Cargo Survey". The purpose of the survey was to gather high level information from the air cargo transportation community that will assist CalTrans when planning future infrastructure improvements around California's airports.

The Survey questionnaires developed by Webber Air Cargo and approved by CalTrans, contained sixteen questions covering topics such as future cargo growth, occurrences of peak trucking volume and inquiries about perceptions of future air cargo transportation issues that might impact California's roadways. A copy of the questionnaires and the tabulated results are included in Appendix A of this report. 158 survey invitations were e-mailed, and survey reminders were sent at weekly intervals. Carriers that control large volumes also received an invitation phone call. These larger carriers are presumed to carry the majority of air cargo on California's highways; therefore, every effort was made to obtain their participation.

The survey candidate list was provided by Webber Air Cargo, and was comprised of personal contacts, and contacts listed in airport directories throughout California. The overall response rate for this study was approximately 19 percent, which is slightly higher than expected for an internet based survey. It should be noted that November and December fall at the height of the air cargo season, which makes the response rate even more impressive, as busy air cargo managers made time to respond to this study.

4 Airports

California has four of the top sixteen cargo airports in North America. In terms of air cargo operations, California's airports fall into recognizable groups distinguishable by much more than scale. These top four California airports include two international gateways – Los Angeles International Airport and San Francisco International Airport – and two regional hubs for integrated carriers in FedEx hub Oakland International Airport and UPS hub LA/Ontario International Airport. While lacking their scale, other California airports more closely resemble OAK and ONT in being dominated by FedEx and UPS with nominal contributions from passenger carriers' belly cargo.

Table 4-1: 2008 Top Fifteen California Airports by Tonnage

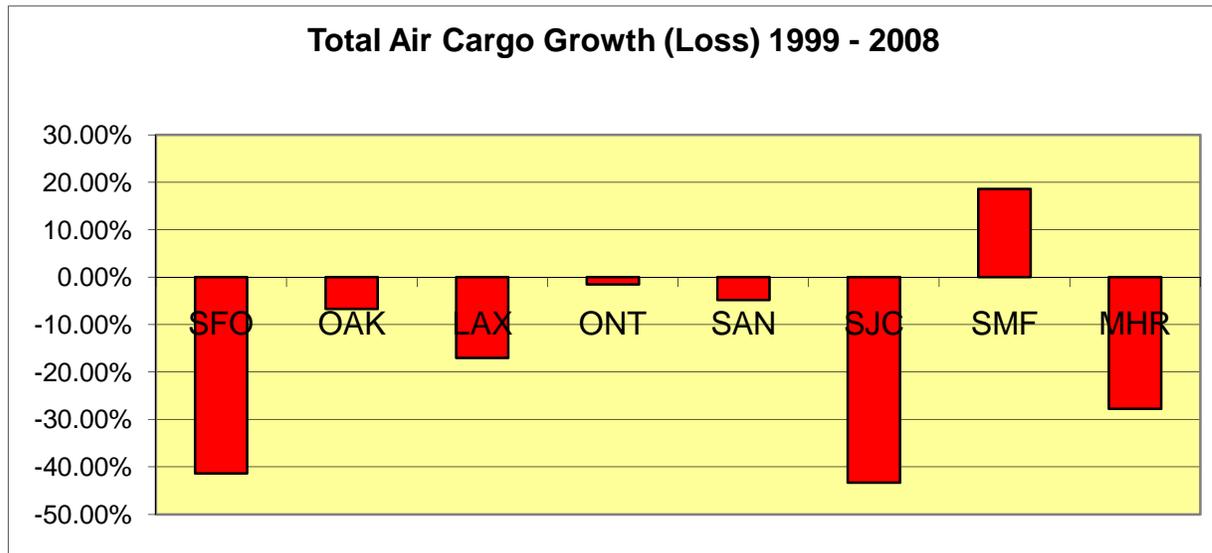
2008 California Airports			
RANK	CITY (AIRPORT CODE)	TOTAL CARGO (Metric Tons)	PERCENT CHANGE (2008 versus 2007)
5	LOS ANGELES (LAX)	1,629,525	(11.9)
12	OAKLAND (OAK)	622,009	(4.0)
14	SAN FRANCISCO (SFO)	493,628	(12.3)
16	ONTARIO (ONT)	436,525	(9.7)
36	SAN DIEGO (SAN)	121,461	(13.4)
57	SAN JOSE (SJC)	73,671	(11.2)
58	SACRAMENTO (SMF)	71,922	(9.1)
59	SACRAMENTO (MHR)	69,930	(6.3)
73	LONG BEACH (LGB)	42,169	(10.4)
75	BURBANK (BUR)	38,920	(20.3)
101	SANTA ANA (SNA)	16,921	(14.8)
120	FRESNO (FAT)	8,732	(14.3)
133	SANTA BARBARA (SBA)	2,571	(4.4)
138	SAN LUIS OBISPO (SBP)	1,210	(7.2)
145	MONTEREY (MRY)	555	(7.7)

Source: Airports Council International – North America

California's top four airports account for about 88 percent of the state's total air cargo with LAX accounting for about 45 percent, alone. Beyond ONT, volumes drop precipitously as San Diego International Airport accounts for only 3.3 percent of the group total. San Jose and the two Sacramento airports account for about 2 percent each of the group total.

All of the substantial cargo airports in California suffered annual losses in 2008 with many incurring double-digit losses from 2007 (as shown in Table 4-1). Moreover as Figure 4-1 below reveals, the last decade was almost cumulatively difficult with seven of California's eight largest cargo airports (in annual tonnage) suffering losses. Of those, four experienced double-digit losses, including international gateways LAX and SFO.

Figure 4-1



Data Source: Airports Council International – North America

4.1 Los Angeles International Airport (LAX)

As an international passenger and cargo gateway, as well as the principal airport for Southern California, LAX has the greatest carrier diversity among California’s airports. It accounts for almost as much annual cargo as Oakland, San Francisco and Ontario combined. FedEx Express operates what it describes as a “metro hub” at LAX, accounting for about 20 percent of total freight¹³⁶ (excluding mail) at LAX in 2007. UPS has a relatively minor operation at LAX in deference to its regional hub at nearby Ontario. Given its international focus and reliance on international passenger carriers for capacity, DHL retains a substantial presence at LAX. Combined the three integrators accounted for about 26 percent of total freight at LAX – much less than at non-gateways.

About 30 percent of LAX’s total freight in 2007 was transported by combination carriers operating both passenger and freighter flights at LAX. Two carriers, Korean Airlines and Singapore Airlines, ranked second and third for the period. Such carriers carefully coordinate capacity from both operations to provide frequencies, capacity and even destinations not matched by carriers operating only passenger or freighter aircraft. Scheduled all-cargo airlines account for about 13 percent of total freight and ACMI carriers (described in Section 3.6) for another 7 percent. Belly carriers accounted for another 22 percent of total freight – led by U.S. hub carriers American and United Airlines, which rank fourth and sixth respectively among LAX’s air freight carriers and are dominant in mail carried.

Approximately 54 percent of LAX’s total cargo in 2008 was comprised of international freight and mail. LAX has an imbalance with 58 percent of all international cargo inbound, compared with only 42 percent outbound. Domestic cargo is more balanced, slightly favoring outbound with 53 percent against 47 percent inbound.

¹³⁶ All LAX statistics refer to freight, which excludes mail from total cargo. Freight accounted for 96.4 percent of total cargo for the period cited.

4.2 San Francisco International Airport (SFO)

San Francisco International Airport is most similar to LAX in having a diversity of international and domestic carriers. Contrasted with their dominance at other California airports, the integrators accounted for slightly more than 21 percent of total cargo at SFO in Fiscal Year 2008 but did account for about 58 percent of domestic freight. FedEx is SFO's second ranked carrier and DHL maintains a significant presence given its dependence on international passenger carriers for supplemental cargo capacity. UPS does not operate aircraft at SFO. Other all-cargo airlines including ACMI carriers accounted for another 6 percent of total cargo.

SFO is far more dependent upon passenger carriers than is LAX. Pure belly carriers accounted for 56 percent of total cargo at SFO. With a domestic hub and international gateway at SFO, United Airlines is the airport's largest cargo carrier even without operating a freighter. American Airlines ranks fourth although it has only about one-fourth the annual volume of United. Among belly carriers, American is followed by three Asian carriers – Taiwan-based EVA Airways, Japan Airlines and All Nippon Airways (both Japanese). The combination carriers, which are all Asian, account for another 17 percent of total cargo at SFO.

For Calendar Year 2008, roughly 58 percent of total cargo was international. Again like LAX, SFO had an imbalance in favor of inbound international cargo accounting for 54 percent of total international cargo against 46 percent outbound. Domestic cargo reverses the pattern with a slight (52 percent) imbalance favoring outbound cargo.

4.3 Oakland International Airport (OAK)

Oakland International Airport is the integrated carriers' preferred airport to serve Northern California. FedEx has a regional hub there. UPS uses OAK and San Jose with no scheduled service at SFO, although its forwarder division buys capacity from SFO's international carriers. Citing higher operating costs and constraints on industrial warehouse development, logistics companies have located on the East Bay nearer OAK while using cargo capacity offered most importantly by international carriers at SFO.

FedEx opened its OAK regional hub in 1988 to serve the US western region but it is also a secondary gateway to Asia with the flights clearing US Customs in Anchorage, Alaska. It is anchored by a 350,000 square foot warehouse with activity about 20 hours per day and employs 2,241 full and part-time workers. It averages between 260,000 and 300,000 packages per day but during the holiday season can reach 430,000 pieces per day. "It starts getting busy in September, and the volumes really increase in November and December."¹³⁷ The facility has a published capacity of 53,000 pieces per hour.

For years, the Port of Oakland attempted to attract transpacific carriers to no avail. While OAK passed SFO in annual cargo volumes, SFO's international cargo carriers were unwilling to move. SFO lost freighters to other West Coast gateways but none to OAK. Integrators FedEx and UPS have their own aircraft, ground handling and trucking, as well as adequate volume to justify such investments. They are able to establish hub operations at strategically located airports offering access to major markets but often not the principal regional gateways. However, other carriers rely on the network connectivity offered by complementary carriers at major gateways, as well as the freight forwarders who support and rely upon them. The Port has stated its emphasis is accommodating existing tenants such as FedEx, rather than recruiting new cargo carriers.

¹³⁷ "FedEx braces for Challenging Season" by Tim Simmers, Oakland, November 2, 2006.

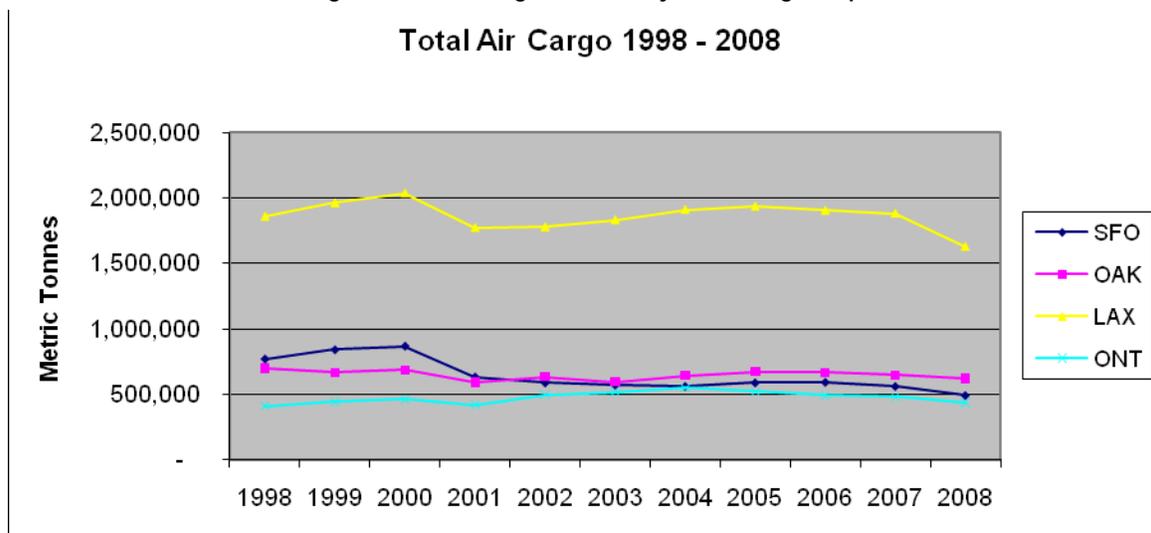
4.4 LA/Ontario International Airport (ONT)

In many respects, LA/Ontario International Airport has followed a development trajectory parallel to OAK. Due to UPS, ONT ranks sixteenth in annual cargo volumes among North American airports. While the “Inland Empire” served by ONT has attracted warehousing and other logistics driven from the more expensive and congested coast, efforts to attract international carriers have not been rewarded. Some of ONT’s air cargo growth has been more organic as Ontario and its surrounding markets have attracted industry that created demand for cargo services. Moreover, as integrated carriers captured market share in general, ONT and OAK fared better than most.

UPS’s west regional air hub at ONT occupies 48 acres with 22 aircraft parking positions. UPS’s ONT sort hub facility entails 502,000 square feet with an additional 49,000 square foot facility dedicated to heavy freight. The hourly capacity for the main sort is 36,000 packages and documents per hour. The ONT operation averages 45 daily in/outbound UPS flights. For the multi-state region it serves as a hub, any shipments both originating and destined for within the region will only traverse the ONT sort, while shipments to/from beyond the region are sorted at ONT but will also move through the Louisville hub. As with FedEx’s OAK operation, ONT is also a gateway for UPS flights to/from China, although cargo clears U.S. Customs at Anchorage. Contiguous to UPS’ air hub is a UPS trucking hub that serves the surface transportation needs of the air operation but is much more geared toward regional truck-to-truck transfers wholly unrelated to air cargo.

Before the U.S. economic slowdown, ONT stood to benefit as LAX approached the absolute limits of capacity imposed by regional accommodations in its master plan. While international carriers and forwarders have interdependencies at LAX, they increasingly accepted that capacity limitations would compel future freighter growth move to an alternative. ONT was close to the heaviest density of industrial shippers, has a tolerant noise environment and other logistics track record established by the UPS hub, and the support of Los Angeles World Airports (LAWA) whose “regionalization” plan identified ONT as intended beneficiary of LAX’s limitations. LAWA selected cargo facilities developer Aeroterm to develop the Pacific Gateway Cargo Center just as the global and regional air cargo markets began to collapse. With LAX having lost a decade’s growth and gaining surplus existing capacity in its own facilities due to failure and consolidation of cargo tenants, cargo carriers feel less pressure to move to ONT.

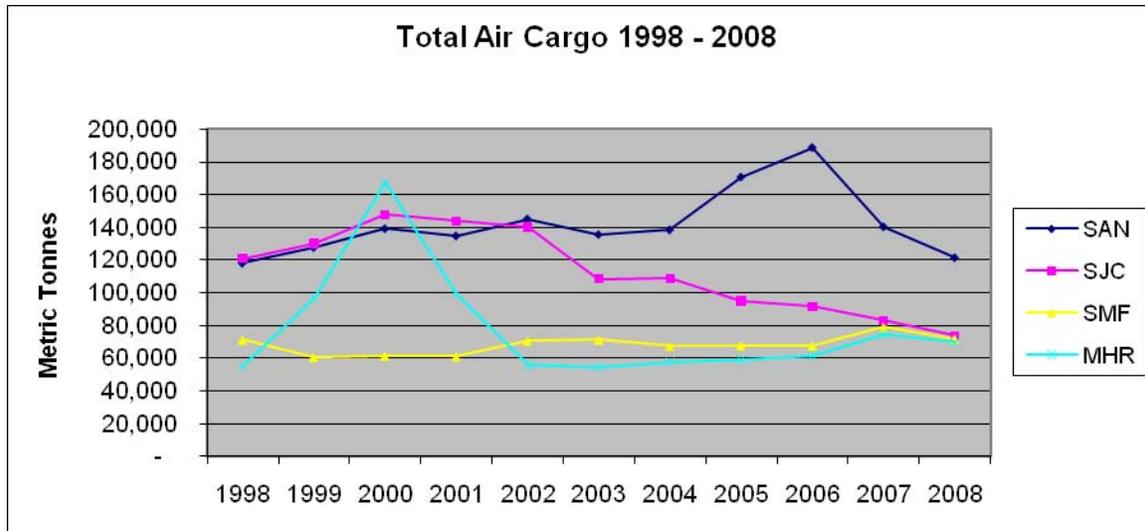
Figure 4-2: Tonnage for the Major Air Cargo Airports



Source: Airports Council International – North America and Webber Air Cargo

Beyond the two international gateways (LAX and SFO) and the two regional integrator hubs (OAK and ONT), cargo volumes have dropped precipitously for the next four largest (by annual tonnage) California cargo airports (see Figure 4-2 above). Because the volumes are so much smaller, individual adjustments by cargo carriers make a far more dramatic immediate impact evident in Figure 4-3 below. These will be explored in the following sections.

Figure 4-3: Tonnage for the Second Tier Air Cargo Airports



Source: Airports Council International – North America and Webber Air Cargo

4.5 San Diego International Airport (SAN)

Given severe limitations to on-airport expansion and competitive disadvantages against the industrial base of Greater Los Angeles, SAN has rarely been perceived as a prospect for major air cargo development. The Regional Aviation Strategic Plan (RASP) and other efforts have championed Brown Field Municipal Airport and Tijuana International Airport for area cargo development growth.

Presently, demand for SAN's cargo operations are almost entirely driven by local industry and consumers. Absent regional consolidations, SAN's annual tonnage is only about one-eighth that of LAX and one-fourth that of SFO. When its last master plan was completed, SAN was served by all six then-existing integrators, which had increased their market share from just over half in 1996 to 80 percent by 2002. At the time, FedEx was the largest cargo carrier with 53 percent, followed by UPS with 9 percent and pre-DHL acquisition Airborne with 7 percent. The largest belly carrier was Delta with 4.5 percent.

While several integrators have disappeared through acquisition and collapse, their market shares have likely been captured by FedEx and UPS. With UPS' regional hub at relatively nearby ONT and FedEx with a large metro hub at LAX, the two dominant cargo carriers at SAN have little incentive for ambitious local expansion. Moreover, the two integrators are likely to limit SAN traffic to the most time-sensitive overnight demand of local industry and consumers, while deferred traffic (2-day delivery and beyond) are likely to be transported wholly by truck or on a short-haul basis from regional hubs at ONT and LAX.

4.6 *San Jose International Airport (SJC)*

Long the sixth largest cargo airport in California, SJC shares a local market with a nearby international gateway at SFO and a FedEx regional hub at OAK.¹³⁸ Like SFO, San Jose serves Silicon Valley, which enjoyed meteoric economic growth until the end of the 1990's. With the demise of much of the high-tech manufacturing in the region and larger ripple effects on consumer demand, SFO and SJC both lost more than 40 percent of their 1999 cargo tonnage by the end of 2008.

SJC is served by two major integrators FedEx and UPS, as well as all-cargo airline Air Transport International flying freighters on behalf of the former BAX Global – now known as DB Schenker. In addition, SJC has marginal cargo capacity provided by narrow body passenger aircraft. As UPS does not operate scheduled freighters at SFO, it uses SJC (along with OAK) to meet its domestic express needs for San Francisco area industry and consumers. FedEx uses SJC and SFO to complement its OAK hub, specifically for overflow of local origin and destination shipments while leaving gateway traffic at OAK.

Long-term, SJC is unlikely to expand its role dramatically in terms of air cargo development. The dramatic drop in cargo at nearby SFO has left the area's principal international gateway with more surplus capacity than has existed in many years and OAK has made satisfying FedEx's needs a major priority. Consequently, SJC is most likely to only experience organic growth in demand from local economic activity most likely to manifest itself in cargo terms with changes to larger UPS aircraft that rarely lead to additional flights.

4.7 *Sacramento International Airport (SMF) and Mather Airport (MHR)*

Both SMF and MHR are managed by Sacramento County Airport System. When exceptional cargo growth was anticipated, considerable efforts were made to induce all-cargo carriers to transfer their operations from SMF to MHR. The region's principal air cargo carrier, FedEx, elected to remain at SMF, however. Noise has been an aggravating issue at MHR, but compared with SMF's two runways of 8,600 feet each, MHR arguably has the more accommodating airfield with twin commercial runways, the longer of which is 11,300 feet.

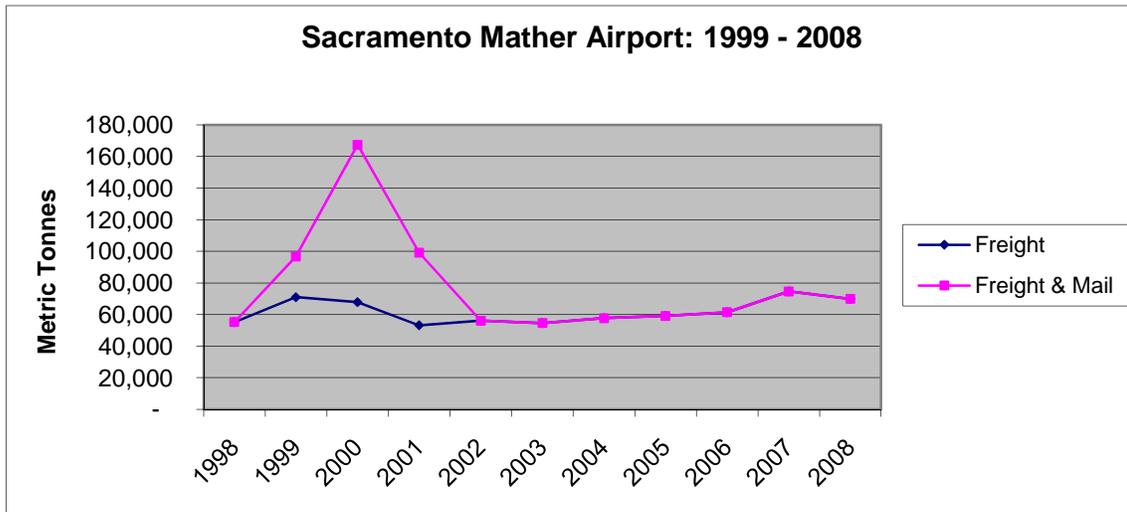
In 1999, private developer LYNXS Holdings constructed the Sacramento CargoPort at Mather Airport with 33,000 square feet of warehouse and 1.5 million square feet of adjacent ramp. Availability of 17,600 square feet of ramp-accessible cargo sort (warehouse) space in the cargo facility is currently advertised and given the attrition of integrators, prospects are scarce.

A tenant profile of MHR from 2001 includes several carriers no longer operating there: integrators BAX Global, Airborne Express and Emery Worldwide; all cargo airlines, Kitty Hawk and the U.S. Postal Service. MHR still hosts DHL and UPS. The largest integrator in the Sacramento market, FedEx remained at SMF, causing cargo at the two airports to run fairly even with a slight advantage to SMF.

For all of 2000 and parts of 1999 and 2001, the U.S. Postal Service had its western region hub at Mather. As revealed in Figure 4-4 below, absent mail volumes (well over 50 percent of total 2000 cargo tonnage), MHR would have experienced a far less erratic decade in terms of annual cargo volumes. While MHR drew integrators and postal operations from SMF, operators unwilling to leave SFO for OAK were even less likely to make the move to Sacramento.

¹³⁸ In 2009, SJC was overtaken by Sacramento International as the state's sixth largest cargo airport. See Figure 1.14.

Figure 4-4



Source: Airports Council International – North America and Webber Air Cargo

The two Sacramento airports and San Jose all ended 2008 with roughly equivalent cargo volumes of around 70,000 metric tons each. However, the economic turmoil of 2009 and the departure of DHL from the domestic express delivery market had graver results for SJC and MHR than for SMF. While air cargo tonnage slipped by 26.8 percent at SJC and 47.1 percent at MHR, the fall-off from 2008 tonnage was just 2.6 percent at SMF. Looking ahead, the three airports have similar development outlooks in continuing to serve needs of local industry and consumers but having little near-term likelihood for extensive regional distribution given the state of the industry and their proximity to larger cargo airports.

4.8 Other California Airports with Scheduled Air Cargo Service

The next three highest ranked California airports have considerably smaller annual volumes. Operators of Long Beach (LGB), Burbank's Bob Hope (BUR) and Orange County's John Wayne Airport (SNA) have little desire to nurture air cargo growth and have noise abatement programs and other limitations that constrain the ability of express carriers to operate effectively. In November 2009, the FAA denied the Burbank-Glendale-Pasadena Airport Authority a proposed ban on nighttime operations that would have negatively impacted cargo carriers and their trade association. FedEx and UPS account for large shares of these airports' relatively modest annual cargo totals. None of the three can reasonably be considered candidates for anything more than modest growth associated with localized demand for overnight packages and parcels. Still, BUR did enjoy the singular distinction of being the only major California airport to report an actual increase in air cargo tonnage in 2009, posting an 8.6 percent gain over 2008.¹³⁹

The top eleven California airports that report to Airports Council International, North America account for 99.6 percent of the state's total reported air cargo tonnage. Airports ranking lower include Fresno's airport, which has expressed interest in air cargo growth in the past but with little benefit. While Fresno and others have aspired to accommodate overflow growth and specifically regional agriculture demand, the last decade has produced net losses at major gateways that run counter to supporting alternatives.

4.9 Prospective All-Cargo Airports & Other Long-Term Prospects

Several former military bases have attempted to develop cargo service but only Mather has been able to retain scheduled operations and even then only by subsidizing MHR. March Global Port in Riverside had what was briefly projected as the largest success to date by would-be all-cargo airports when it attracted the western

¹³⁹ BUR has reported it had handled 42,271 metric tons of cargo in 2009, up from 38,927 during the previous year.

regional hub for DHL to the site of the former Air Force Base approximately 60 miles from the Los Angeles Basin. March is home to a 13,300 foot runway – longest in California. The 262,000 square foot hub employed about 300 staff. Because only integrators have the proprietary resources and internal volumes to operate independently, the DHL regional hub was considered critical to the viability of an all-cargo airport because UPS already has its regional hub at Ontario, while FedEx has a metro hub at LAX and a substantial presence at ONT. While DHL must honor its lease with March, its contraction in the U.S. ended its air operation there and leaves no obvious prospect for such a large, customized facility. During the second half of 2009, March reported zero cargo movements.

The Inland Empire is also home to San Bernardino International Airport (SBIA) and Southern California Logistics Airport (SCLA) in Victorville. SBIA has not attracted scheduled cargo carriers but has attracted distribution and other industry to stimulate local demand for cargo services. SCLA briefly had freighters operating a western U.S. service for freight forwarder Panalpina, but lasted less than a year, underscoring the difficulty of non-integrators sustaining scheduled air cargo service outside of the principal gateways. While operators at both airports cultivate associations with air carriers, the indirect approach both have taken to encourage demand through industrial development is more appropriate while surplus capacity exists at LAX and ONT.

4.10 Survey Results - Feedback from Airport Operators

The consultants made site visits to interview airport operators of LAX, MHR, OAK, ONT, SFO, SMF, as well as March Global Port in Riverside and San Bernardino International Airport. In addition, surveys were sent to the preceding, as well as operators of San Diego International Airport and San Jose International Airport. Surveys were also sent to 3rd party cargo developers of on-airport cargo facilities in these markets and interviews conducted with two of these private developers.

Tremendous distinctions exist between international gateways (LAX and SFO), regional integrator hubs (OAK and ONT), and other commercial airports better compared within – rather than between - groups. Such a perception informed the decision to present individual and group airport summaries in Sections 4.1 through 4.9, rather than generalize about all airports regardless of operational realities.

Airports update master plans and forecasts about every five years. Each airport respondent had approved master plans or updates since 2005 – two in 2009. While more recent cargo forecasts better capture trends, growth rates vary due to factors explored earlier in this section, such as local economies and carrier composition. International gateways will be most directly affected by global trends.

The need for new facilities is now based on how performance is pegged to actual results, rather than simply forecasted. Airports currently have surplus capacity due to carrier failures and consolidations, such as UPS's acquisition of Emery Worldwide and DHL's acquisition of Airborne, and then DHL's decision to leave most U.S. domestic markets. Almost no new on-airport cargo facilities have been developed since 9/11 and major new developments in Ontario and elsewhere have been delayed in response to a lack of perceived market demand. Again, individual responses to facilities questions offer limited insight as existing warehouse space ranges from 2.1 million square feet at LAX to 30,000 square feet in smaller airports. Even occupancy statistics can be misleading because these are more tied to leases than to actual utilization. Unused facilities leased to DHL, for example, will continue to generate revenue but not necessarily activity while the carrier continues to pay until leases mature even at airports where they no longer fly.

Generally, none of the airports is concerned about the adequacy of cargo facilities capacity to accommodate projected growth after having lost a decade or more worth of growth already. Several pragmatically noted that a decade may be required simply to return to former peak levels that were already met by their existing facilities. The larger question before several airports is whether or not to replace cargo facilities capacity that may be lost collaterally as passenger terminals and other expansions creep onto land that previously accommodated cargo

activity. A concern shared by LAX and SFO but of less urgency to other system airports is the potential impact of 100 percent screening of belly cargo by summer 2010. Intercontinental wide-body passenger aircraft at the two big gateways translates into much higher shares of affected belly cargo than at ONT and OAK where belly cargo is less than 5 percent of total annual cargo and less than 10 percent at other California airports due to the dominance of FedEx and UPS. Surplus facilities capacity at the gateways may be reserved to accommodate potential innovations in cargo screening. SFO has been involved in several cargo screening pilot programs of the U.S. Transportation Security Administration.

The cargo industry's tendency toward nighttime flight operations and sorting minimizes its residual impact on roadways during conventional peak hours. Roadway issues cited by the airports were not functions of the cargo industry contributing to congestion but rather being victimized by general traffic issues. LAX and SFO have a large number of discrete cargo facilities and roadway congestion tends to be more localized to specific locations around the airport.

Responses to questions relating to market share of leading carriers, as well as belly cargo versus freighters, were introduced into charts and narratives presented in Sections 4.1 through 4.9 for each airport.

5 Air Cargo and Related Truck Traffic Forecasts

5.1 Introduction

Although comprehensive, long-term air cargo forecasts for each of California's top cargo-handling airports are beyond the scope and resources budgeted for this project, this report will provide data and commentary on the various factors that are apt to promote (or constrain) future growth in air cargo traffic at California airports. Exhibits 1 through 8, found in Appendix C, describe in considerable detail recent patterns of air cargo routing and regional origin/destination traffic at the thirteen largest of California's cargo-handling airports. Exhibit 9 displays Boeing's most recent updated forecasts of domestic and international air cargo flows. Exhibit 10 applies those forecasts to the thirteen selected California airports based on the volumes and distribution of cargo tonnage reported in 2008.

The forecasts presented in Exhibit 10 are provided as an economical benchmark which indicates the volume of air cargo the thirteen individual airports would be handling in 2015 and 2020 in the event that each attained the domestic and international growth rates forecast by Boeing for an aggregate composed of leading cargo airports nationally and thus are optimistic forecasts. It must be noted, the air cargo volumes in California peaked in 2000 and since then the outlook has changed substantially, deflating subsequent forecasts. Overall, the 2000 peak will not be reached again until sometime around 2014 –15, even based on the optimistic Boeing forecast. However, for some major airports, like SFO and SJC the peak will not be reached again until well after 2020. That being said, some of the factors that contributed to this decline in air cargo volumes may have played out for the state of California. The overall California market is driven by the inbound volumes which are mainly composed of international cargo from Asia. As the Asian economies are growing at a much stronger pace than other regions, this should benefit the west coast as LAX is the top gateway for Asia.

The Boeing forecasts represent expected *average* gains in air cargo traffic. As with all such broad forecasts, some airports will fall short of the forecast growth rates while others will exceed them. Use of the Boeing benchmarks in Exhibit 10 should not substitute for regularly updated forecasts based on careful analysis of each airport's unique position within the national or international air transport system as well as an understanding of the regional economy each serves.

5.2 Historical Air Cargo Traffic Patterns at California Airports

After decades of rapid growth, the volume of air cargo tonnage handled at California airports crested in 2000 at 5.2 million tons. Forecasts at the turn of the century uniformly expected that the volume of cargo passing through the state's airports would continue to grow at fast-paced rates over at least the next two decades. In Southern California, a forecast issued by the Southern California Association of Governments in June 2000 predicted that air cargo in the Los Angeles region would reach 7.5 million tons in 2015 and 8.9 million tons in 2020.¹⁴⁰ In Northern California, a forecast published in 2000 by the Metropolitan Transportation Commission forecast that air cargo tonnage at San Francisco International would swell by 400 percent by 2020, while Oakland and San Jose airports would see 157 percent growth in cargo tonnage.¹⁴¹ In the Central Valley, the Sacramento County Airport System received a forecast in March 2001 calling air cargo at Sacramento International to increase to 118,536 tons in 2005,¹⁴² a year in which the actual amount of air cargo at the airport totaled 77,408 tons. Similarly, an August 2001 base case forecast for Mather Airport expected that airport to be handling between 151,000 tons of cargo in 2005, a year in which the actual volume of air cargo at the airport was 65,228 tons.¹⁴³

140 "Air Transportation in the Los Angeles Region" (Southern California Association of Governments, June 14, 2000), Chapter Three: Future of the Regional Air Transportation System, p. 41. See: http://www.laxmasterplan.org/publications/pdf_brochures/airtran/pg41.pdf.

141 Metropolitan Transportation Commission, "2000 Regional Airport System Plan: Update 2000." September 2000, p. 20. See: http://www.mtc.ca.gov/planning/air_plan/RASP_FinalReport.pdf.

142 <http://www.sacairports.org/mather/planning/DraftMatherAirportPlan.pdf>.

143 <http://www.sacairports.org/mather/planning/DraftMatherAirportPlan.pdf>, p. 3-9.

As the Literature Review portion of this report showed, forecasting air cargo activity has been a difficult enterprise. Highly optimistic projections of air cargo growth issued earlier this decade were not achieved, often by substantial margins. The problem was not limited to California. The FAA's Aerospace Forecast 2001-12 anticipated that air cargo (freight/express plus mail) would reach 21,219.1 million revenue ton miles (RTMs) on the domestic side by 2008 and 26,371.8 million RTMs on the international side of operations. While that forecast's prediction for international traffic did prove fairly accurate (6.6 percent short), its domestic air cargo forecast fell 32.6 percent short of the mark.¹⁴⁴ It must be noted, that the domestic shortfall is due to national economic factors and is not therefore just California related.

Beginning in 2000, a series of largely unanticipated developments severely disrupted the air cargo industry in California, yielding a decade of negative net growth in the state's air cargo tonnage. Even before the terrorist attacks of September 11, 2001, air cargo volumes at the state's airports had fallen off sharply as a consequence of the collapse of the asset bubble popularly known as the "dot.com boom" and the ensuing recession. As employment levels in California's high-tech sector began to plummet during the winter of 2000-01, so too did air cargo tonnage. By August 2001, tonnage had already fallen by 16.1 percent from the same month a year earlier. (The fall-off was steepest at SFO, which saw a 25.7 percent year-over-year decline in air cargo tonnage in August 2001.)

The adoption of more intensive security measures in the aftermath of 9/11 and the gradually rising cost of fuel throughout the decade prompted many shippers to opt for less onerous and costly surface modes of transport, especially for domestic shipments. By mid-decade, supply-chain managers were recalculating the economic virtues of just-in-time delivery strategies and were often concluding that time-definite delivery of goods was the acceptable, if not preferable, alternative. At the same time, trucking companies, railroads, and steamship lines had grown more efficient and reliable in meeting delivery schedules, especially for less-than-truckload shipments. If not eroding aviation's share of the goods movement market, such factors certainly helped stymie growth in the volume of goods shipped by air. That trend was then accelerated by the volatile run-up in fuel costs in 2007-08 which, while affecting all transportation modes, had a particularly deleterious impact on air carriers. Then the nation's worst recession since the 1930s befell the air cargo industry.

By 2008, statewide air cargo tonnage stood at 4,027,321 tons, 22.4 percent below the amount of tonnage handled in 2000. Based on data from the state's ten largest air cargo airports, air cargo tonnage through the first eleven months of 2009 dropped a further 15.9 percent from the same period in 2008. (On an annualized basis, total air cargo tonnage handled statewide in 2009 will be nearly 35 percent lower than the tonnage levels reported in 2000.)

5.3 Current (2008) Air Cargo Operations in California

The following discussion is tied to a series of exhibits appended to this section of the report which provide extensive detail on air cargo flows at California's leading airports. The data appearing in these exhibits are drawn from FAA reports and are expressed in metric tons.

- Exhibits 1 through 8 provide a wealth of detailed data on domestic and international air cargo activity at California airports for the years 2003 through 2008.
- Exhibit 9 summarizes Boeing's latest air cargo growth forecasts for domestic and international routes.
- Exhibit 10 applies Boeing's latest domestic and international forecasts to the state's thirteen top air cargo airports, with 2008 as the base year and with forecasts for 2015 and 2020.

144 Compare the data in Table 16R in the FAA Aerospace Forecast 2001-1012 with the data in Table 19 in the FAA Aerospace Forecast 2009-2025.

California airports handled a total of 3.6 million metric tons of air freight in 2008 including 2.2 million metric tons enplaned or deplaned from domestic flights¹⁴⁵ and 1.4 million metric tons of international traffic (Table 5-1). The combined traffic is roughly equivalent to the 2004 total after a 14 percent decline from 2007 to 2008.

Table 5-1: Air Cargo Traffic for California Airports 2003 – 2008 (in Thousands of Metric Tons)

	Domestic	International	Total
2003	2,630	1,359	3,990
2004	2,702	1,436	4,138
2005	2,706	1,514	4,220
2006	2,650	1,598	4,248
2007	2,546	1,596	4,142
2008	2,202	1,366	3,568
CAGR* 2003-08	-3.5 percent	0.1 percent	-2.2 percent

Source: Exhibits 1 and 2 from Appendix C

**CAGR = Compound Annual Growth Rate*

Domestic traffic is slightly imbalanced in the outbound direction (54 percent of total traffic in 2008). Integrated express carriers (FedEx, UPS and DHL¹⁴⁶) accounted for 79 percent of total domestic traffic, up from 70 percent in 2003. Traffic handled as belly cargo on passenger flights accounted for 17 percent of the traffic (down from 22 percent in 2003) with the remaining 5 percent of domestic traffic on freighter flights operated by general all-cargo carriers. FedEx is the top airline for California airports' domestic traffic, with 47 percent of 2008 traffic, followed by UPS with 27 percent.

Of the top ten origin/destination airports for California's domestic traffic, seven are hub or gateway airports for the integrated carriers including Memphis (TN), Indianapolis, (IN) Oakland (CA), Alliance (TX) and Newark (NJ) for FedEx, Louisville (KY) for UPS, and Wilmington (OH) for DHL. Honolulu was the top non-hub airport followed by Chicago O'Hare and JFK. Los Angeles (LAX) was the top domestic traffic airport in California for 2008 with 28 percent of total traffic followed by the regional hubs for FedEx (Oakland) and UPS (Ontario).

Based on transpacific trade imbalances, inbound traffic accounted for 57 percent of total international traffic at California airports in 2008, although outbound traffic for 2008 was 12 percent higher than the 2003 level. Freighter flights accounted for 62 percent of the total traffic including 9 percent operated by integrated carriers. The top freighter operators were Asian combination airlines such as Korean, Asiana, China Airlines, and Cathay Pacific. Belly capacity on passenger flights accounted for 38 percent of total traffic for 2008 with United, EVA, British Airways and Lufthansa as the top airlines.

Los Angeles is the dominant international gateway for the Western United States and accounted for 72 percent of 2008 traffic with San Francisco accounting for most of the rest. The only other significant airports for international traffic were regional hubs for the integrated carriers (Oakland for FedEx, Ontario for UPS, and March for DHL) which handle traffic that "bypasses" the primary national hubs (with most of the UPS and FedEx traffic transferred via Anchorage). The FedEx and UPS hubs experienced significant traffic increases from 2003 to 2008 and maintained traffic levels from 2007 to 2008 in contrast to both LAX and SFO. Traffic for the DHL gateway at March came to a halt in 2008 as the airline contracted its U.S. operations and cancelled its service at March.

As would be expected, Asia is the predominant trade area for California airports accounting for 72 percent of total traffic in 2008 with Europe accounting for 18 percent and Latin America for 9 percent. From 2003 to 2008,

¹⁴⁵ USDOT statistics identify "domestic" and "international" traffic based on whether the enplanement airport or deplanement airport is an international point. Due to the significant amount of traffic that is transferred at anchorage, it is assumed that all traffic on flight segments between California and Anchorage is international traffic.

¹⁴⁶ DHL's airborne traffic is moved by contract carriers Airborne (ABX).

Asia traffic declined 5 percent while Europe traffic increased 5 percent and Latin America traffic went up by 56 percent. The top foreign airports were Seoul, Tokyo and Taipei, which are the Asian hubs for Korean, JAL and EVA Airlines respectively. London-Heathrow was the top European airport with Mexico City as the top Latin American airport

5.4 Primary Cargo Airports in California

California's cargo airport system consists of three primary elements:

- Primary international gateway airports (LAX and SFO)
- Regional integrator hubs/gateways (OAK and ONT)
- Local service airports primarily for integrator traffic distributed via national and regional hubs

Table 5-2: Air Cargo Traffic for Top California Airports (2008)

	Domestic			International			Total	
	(000 MT**)	Percent of Total	Integrator Share	(000 MT)	Percent of Total	Asia Share*	(000 MT)	Percent of Total
<u>International Gateways</u>								
Los Angeles	626.9	28%	57%	988.0	72%	69%	1,614.9	39%
San Francisco	181.3	8%	36%	276.2	20%	77%	457.5	11%
	808.2	37%	52%	1,264.2	93%	70%	2,072.4	50%
<u>Regional Hubs</u>								
Ontario	415.2	19%	97%	39.9	3%	100%	455.1	11%
Oakland	509.7	23%	98%	53.2	4%	100%	562.9	14%
March ARB	15.9	1%	100%	3.9	0%	100%	19.8	0%
	940.8	43%	97%	93.1	7%	100%	1,018.0	25%
<u>Service Airports</u>								
San Diego	123.9	6%	86%				123.9	3%
Long Beach	40.0	2%	97%				40.0	1%
Bob Hope Airport	33.5	2%	96%				33.5	1%
John Wayne Airport	20.7	1%	86%				20.7	1%
San Jose	76.8	3%	80%				76.8	2%
Sacramento – Mather	71.8	3%	100%				71.8	2%
Sacramento International	60.4	3%	86%				60.4	1%
Fresno	8.9	0%	99%				8.9	0%
	436.1	20%	89%				436.1	11%
Top Airports	2,185.1	99%	79%	1,357.3	99%	73%	3,526.5	86%
All Airports	2,202.0	100%	79%	1,365.7	100%	72%	4105.5	100%

*Excludes minor international traffic at service airports. **MT=Metric Tons

Source: Exhibits 3 and 4 in Appendix C

Combined, these airports account for the majority of air cargo¹⁴⁷ that originates or terminates in the state, while also serving as transshipment points (by air and ground) for other parts of the U.S. and overseas markets.

5.5 Domestic Air Cargo Traffic

Domestic air cargo traffic at California airports is primarily handled by integrated carriers such as FedEx and UPS. (While maintaining its role in international shipping, DHL left the domestic express delivery business in early 2009, a decision which had a very substantial impact on air cargo operations at airfields such as March and Mather.) In 2008, the integrators accounted for 79 percent of total traffic at California airports. The integrators operate two regional hubs in California (Ontario for UPS and Oakland for FedEx), but also route a significant amount of cargo via 11 “service” airports.¹⁴⁸ Each of the integrators operates a West Coast regional hub in California that is used to transfer intra-region traffic that need not be routed via the primary hub. The regional hubs were Ontario for UPS, Oakland for FedEx, and (until early 2009) March for DHL. Ontario and Oakland also handle Asian traffic for UPS and FedEx via Anchorage flights, while DHL directly routed some Asian traffic via March. The regional hubs also handle traffic for origins and destinations within the local delivery area.

In California, the integrators serve the Los Angeles region with flights to LAX, Long Beach, Burbank, and John Wayne airports in addition to regional hub flights at Ontario. The Bay Area is served via San Francisco, Oakland and San Jose. The Sacramento region is served by UPS and DHL at Mather while FedEx uses Sacramento International. To achieve overnight delivery requirements, San Diego and Fresno airports also have direct hub flights. Los Angeles and San Francisco are the only airports with a significant share of domestic traffic moving on non-integrated airlines with some of the traffic likely transferred to and from international flights.

Competition from trucking lines has eroded the air cargo share of the domestic goods movement market in recent years. Part of this migration to ground transport was induced by heightened security affecting airborne shipments, especially cargos carried aboard passenger aircraft. Inevitably, more extensive inspection procedures resulted in added costs and delays in shipment. At the same time, though, capital investments made by several major trucking lines in more fuel-efficient tractors and Global Positioning Systems (GPS) to guide drivers yielded a trucking industry better equipped to ensure timely delivery over long distances at rates significantly lower than air carriers could afford to charge.

5.6 International Air Cargo Traffic

International air trade is highly concentrated at a few primary U.S. gateway airports based on their proximity to international trade lanes (e.g., Miami for Latin America) and the large volume of belly capacity available on international passenger flights. These gateways are distribution points for large U.S. regions and compete with secondary gateways for local origin and destination traffic.

LAX is one of the top U.S. airports for handling international air cargo and the top gateway for Trans-Pacific air trade. LAX handled 72 percent of the international cargo for California airports in 2008 with 69 percent of that total involving flights to or from Asia.¹⁴⁹ SFO handled significantly smaller volumes but is more conveniently located for traffic to or from the Bay Area and north into the Pacific Northwest (which has secondary gateways at Seattle, Portland and Vancouver). Both LAX and SFO handle mostly Asian air trade but also have direct service

¹⁴⁷ Almost all air cargo requires some ground transfer at the originating and terminating airports, so “air cargo” for the State of California includes all domestic and international freight shipments that include some air transport as part of their full transit.

¹⁴⁸ The integrator networks are built on flights and express trucks that transfer overnight shipments at a combination of national hubs (Louisville for UPS, Memphis for FedEx and Cincinnati for DHL) and regional hubs with the latter used to handle intra-region domestic traffic and to handle international traffic that “bypasses” the primary hub. “Service” airports handle local origin/destination traffic routed to or from the transfer hubs with those hubs also handling origin/destination traffic for their local regions.

¹⁴⁹ A significant amount of air trade between the U.S. and Asia moves on flights making technical stops at Anchorage Airport where some traffic is transferred between domestic and international flights, while most of the rest appears in the data as being transferred due to a change in flight number. Air cargo traffic between California and Alaskan airports was therefore identified as U.S.-Asia air trade for this analysis. The T-100 data is based on flight origin/destination and does not account for transshipment activity in the U.S. or overseas.

to Europe and Latin America. As described above, FedEx, UPS and DHL also route Asian traffic via their California-based regional hubs.

As mentioned above, in terms of flight origin and destination, Asia accounted for 72 percent of international air traffic for California airports in 2008 with 18 percent for Europe, 9 percent for Latin America (including Mexico), 1 percent for Canada and less than 1 percent for other world areas. LAX was the dominant gateway for all of the world areas with 69 percent of Asia traffic, 75 percent of Europe traffic and 99 percent of Latin America traffic. San Francisco had about one-third of LAX's traffic for Asia and Europe. LAX's share of Canada traffic was just 54 percent with Oakland handling one-third of the state's traffic (based on FedEx hub operation) and SFO having an 11 percent share. Ontario is heavily dominated by Asian traffic, having a four percent share of total state traffic, just below that of Oakland.

International air trade via California airports can also be measured using U.S. Bureau of the Census foreign trade statistics which include detailed commodity information and shipment value.¹⁵⁰ Combined, the Los Angeles and San Francisco Customs Districts handled 1.2 million metric tons of direct international air trade (i.e., excluding transfers via Anchorage) with slightly more inbound than outbound trade (Exhibit 5, Appendix C). Between 2003 and 2008, air trade averaged 1.4 percent annual growth in terms of weight with imports declining 1.2 percent per year and exports increasing 4.7 percent per year. The total value of the air trade handled via both Districts was \$132 billion for an average of \$113 per kilogram.

Los Angeles Customs District handled 847,000 metric tons of traffic in 2008 and had a compound annual growth rate of 1.8 percent since 2003.¹⁵¹ Total trade value was \$52 billion in 2008 for an average of \$97 per kilogram. The distribution of traffic between world areas has Asia accounting for 64 percent of total traffic (76 percent of imports) with Europe having a 25 percent share and Latin America having a 6 percent share. The Los Angeles District handled 12 percent of total air trade weight for the U.S. including 18 percent of U.S. Asia trade.

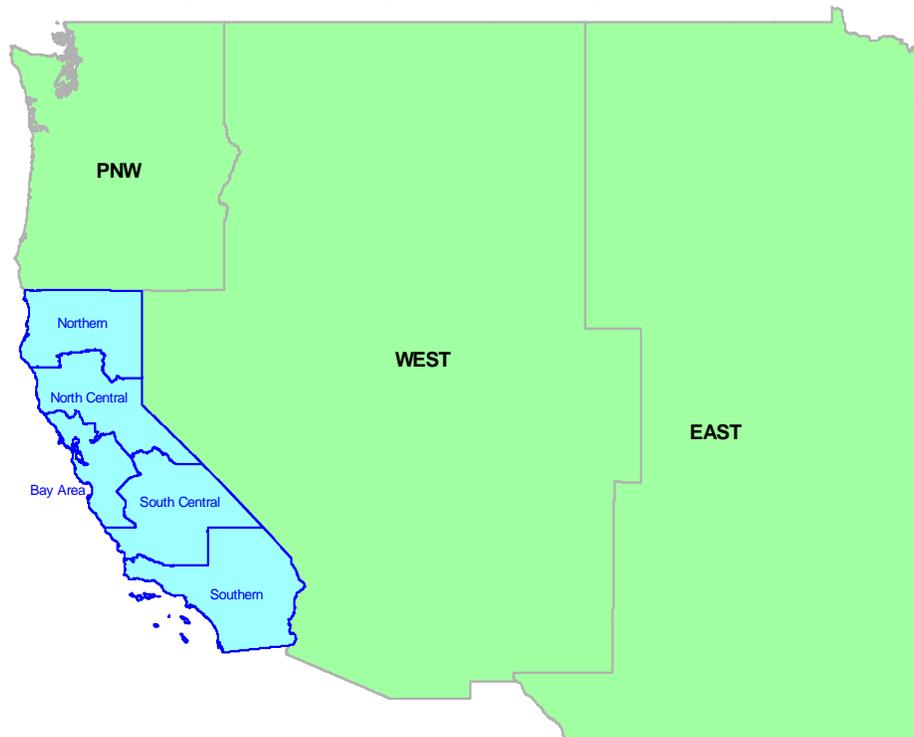
San Francisco District handled 249,000 tons of traffic in 2008 valued at \$43 billion. The relatively high average commodity value (\$174 per kilogram) compared to the averages for Los Angeles and the U.S. reflects the continued high concentration of high-tech activity in the Bay Area region. Asia accounted for 77 percent of total traffic (85 percent of imports) with most of the remainder being Europe trade (20 percent). Overall, San Francisco accounted for 5 percent of total U.S. air trade and 8 percent of Asian trade.

The flow of air trade via airports in these two California Customs Districts can be associated with the true U.S. origin and destination regions to estimate and analyze patterns for connecting to traffic via air and truck. Air trade by direction and world region is allocated first to five U.S. regions with the California region further allocated within the state to five sub-regions (Figure 5-1).

¹⁵⁰ Census air trade statistics identify the U.S. Customs District where a shipment is transferred to or from first international flight exiting or entering the U.S., while also identifying the true origin/destination country rather than the first foreign airport for the international flight (in contrast to the T-100 data). Air trade with Asia that is transferred between flights at Anchorage is assigned to that Customs District, but not through traffic on flights that change flight number (as with T-100). While Census provides detail for the airport of exit or unloading, confidentiality requirements for integrated carrier traffic obscures the true flows for Ontario and Oakland, so Customs District detail is used for this analysis. Minor traffic for the San Diego Customs is not included and the Los Angeles and San Francisco District totals include minor traffic for Las Vegas and Reno airports respectively.

¹⁵¹ The total traffic of 846,000 metric tons is 18 percent less than the combined traffic for Los Angeles, Ontario and March in the T-100 statistics. This difference is primarily due to the Anchorage transfer traffic which affects Los Angeles more than San Francisco based on the need to make technical stops for the longer stage lengths. In 2008, Anchorage Customs District handled 316,000 metric tons of air trade with the large majority being transferred to or from the continental U.S.

Figure 5-1: U.S. Origin/Destination Regions for Air Trade



California origins and destinations (O and D) accounted for the majority of air trade for California airports with 77 percent of the Los Angeles Customs District trade and 87 percent of San Francisco Customs District trade (Exhibit 6, Appendix C). Los Angeles had a higher share of export trade (82 percent) than of import trade (73 percent) with the Western region accounting 12 percent of total trade and 11 percent for the Eastern region. The world market with the highest concentration of trade from California O and D's was Canada (92 percent) followed by "All Other" (which includes Middle East/Africa), Europe, Latin America and Asia.

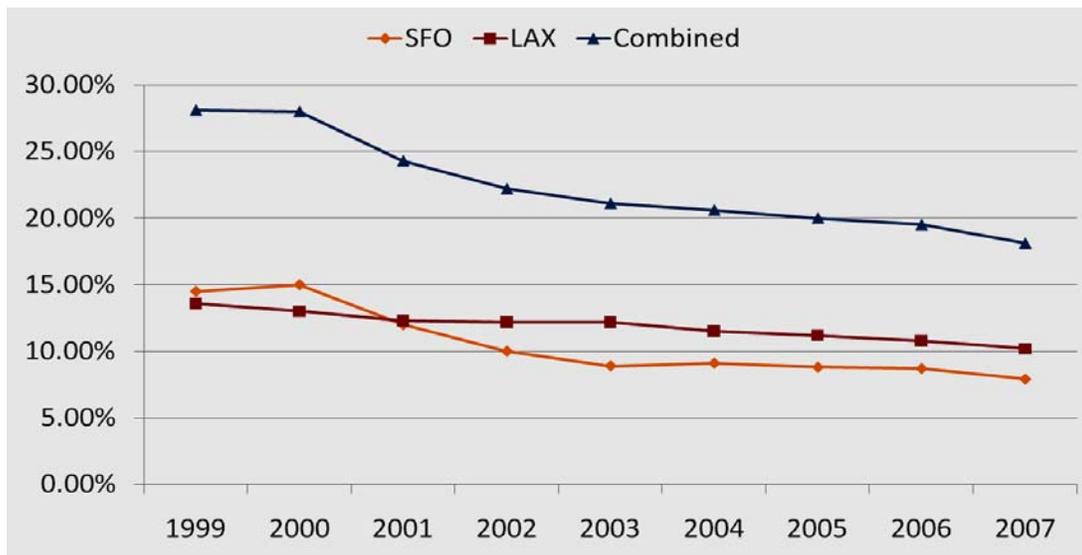
San Francisco derived a relatively equal share of export and import trade from California (88 percent and 87 percent respectively) with the remaining about equally split between the Pacific Northwest, West and East regions. San Francisco's Europe air trade was the most highly concentrated in California (92 percent) followed by Middle East/Africa, Latin America, Asia and Canada.

Within California, the Southern sub-region accounted for over half of the total air trade, including 54 percent of state exports and 59 percent of state imports (Exhibit 7, Appendix C). The Bay Area sub-region accounted for about half of the Southern region's trade, including 30 percent of the state's exports and 28 percent of the state's imports. The South Central sub-region accounted for 8 percent of state trade with 6 percent for the North Central sub-region and 1 percent for the Northern sub-region. The worldwide distribution of air trade among the different sub-regions differs slightly for the different world market regions (Appendix C, Exhibit 7). For example, the Southern California sub-region has a proportionally higher share of air trade with Canada (60%) and a lower share of air trade (48%) with the Middle/East/Africa (included in the "All Other" category in Appendix C, Exhibit 7).

As illustrated in Figure 5-2, California's share of U.S. airborne international trade has been diminishing in recent years both in tonnage terms and, even more sharply, in dollar terms. In 2008, SFO actually handled less international tonnage (259,000 tons) than it had in any year since 1994. Much of this decline has been due to the

greater use of long-distance aircraft flying Great Circle or polar air routes between the Far East and cities throughout North America. Some of the decline is also attributable to a more general fall-off in California's share of the nation's merchandise export trade, from a peak of 15.4 percent in dollar terms in 2000 to 11.1 percent in 2008. The outlook for increased international air cargo traffic is not uniformly sobering. According to the World Trade Organization, trade between Asia and South America/Central America more than doubled between 2000 and 2006. As a result of the limited direct air service between the two continents, cities in North America such as Miami, Los Angeles, Dallas, New York, and Vancouver are serving as transit points between the two markets, making it difficult to determine the exact size of this air cargo market.

Figure 5-2: SFO/LAX Share of Airborne Trade by Dollar Value



Source: U.S. Bureau of Transportation Statistics

5.7 Future Air Cargo Flows

As much as it may appear that the forces that brought about a severe contraction in air cargo tonnage in California over the past decade have largely run their course, forecasting future cargo volumes is an exercise demanding close and ongoing attention to a host of variables. As the Federal Aviation Administration's latest national forecast readily concedes, "Developing forecasts of aviation demand and activity levels continues to be challenging as the aviation industry evolves and prior relationships change. In times of amplified volatility, the process is filled with uncertainty, particularly in the short-term."¹⁵²

In general, future cargo flows for individual California airports will be determined by an interplay of factors, some specific to each airport and the origin and destination market each serves and some of a more systemic or global nature. Among the former are local economic and demographic developments that affect regional demand for air cargo services, the level of service provided by air carriers, and airport capacity and efficiency in handling airborne shipments. Among the latter are changes in national and international economic conditions, the tightening or loosening of restrictions on global trade, fuel price levels, enhanced security measures, diplomatic progress in opening new international air routes (as well as expanding service along existing routes), competition from surface modes of transport, and paradigm shifts in the operation of global supply chains.

¹⁵² FAA Aerospace Forecast Fiscal Years 2009–2025, p. 26.

A number of forecasting methodologies are available, some more intensive and expensive than others. Perhaps the most common forecasting methodology assumes that the future will resemble the past. It is certainly the most straight-forward. In the case of air cargo in California, however, that methodology is not particularly helpful. Replicating the past decade's experience would return air cargo volumes in California to levels not seen in decades. To be sure, there are conditions under which that outcome would seem reasonable. In an era when terrorists have singled out civilian aviation as a target and when rapidly emerging economies like China and India drive up demand for oil, it is far from clear how the air cargo industry would fare in the face of soaring fuel costs or an outright ban on belly cargo.

Another economical forecasting methodology involves the assumption that a specific airport or collection of airports within a certain state or region will experience the air cargo growth rates charted by Boeing, the FAA or other industry consultants for a much larger aggregate of airports nationally. Boeing, for example, forecasts that domestic air cargo volumes will grow at a 2.4 percent average annual rate from 2009 through 2028, while international volumes will increase at a 6.1 percent average annual rate. (See Exhibit 9, Appendix C for a detailed breakdown of Boeing's current forecast.)

The air cargo industry, particularly its domestic segment, has matured and stabilized. At the same time, the role of California airports as international trade gateways for the nation has receded in favor of a more sustainable level of operations in which California's airports primarily serve the goods movement needs of the regions immediately surrounding them. Forecasting growth, therefore, will require less reliance on broad industry forecasts such as those periodically issued by Boeing Aircraft, the Federal Aviation Administration, or consulting organizations such as OAG than on a more acute understanding of regional economies and the level of demand for air cargo services they are apt to generate. Indeed, in assessing the prospects of air cargo growth at specific airports, it is important to bear in mind that the forecasts prepared by Boeing and the FAA for, say, air cargo traffic within the U.S. or between North America and the Far East are merely averages which not every airport will achieve. Some will exceed the forecast; others (and perhaps most) will not.

The FAA's forecasts of revenue ton miles (RTM) are based mainly on models that link cargo activity to GDP. The agency's forecasts of domestic cargo RTMs are developed with real U.S. GDP as the primary driver. Projections of international cargo RTMs are based on growth in world GDP, adjusted for inflation. In the FAA's most recent forecast,¹⁵³ total RTMs are forecast to go down 7.6 percent in 2009 and grow 4.1 percent in 2010. For the balance of the forecast period, driven by steady economic growth, total RTMs are forecast to increase at an average annual rate of 5.1 percent. The forecast of 78.6 billion RTMs in 2025 represents an average annual increase of 4.2 percent over the entire forecast period.

Domestic cargo RTMs are forecast to drop 8.3 percent in 2009 and then grow slowly in 2010, 2.5 percent, driven by growth in the U.S. economy. Between 2010 and 2025, domestic cargo RTMs are forecast to increase at an average annual rate of 2.4 percent. The forecast of 19.3 billion RTMs in 2025 represents an average annual increase of 1.8 percent over the entire forecast period. The freight/express segment of domestic air cargo is highly correlated with capital spending. Thus, the growth of this segment in the future will be tied to growth in the economy. The mail segment of domestic air cargo will be affected by price and substitution (electronic mail). The all-cargo carriers have increased their share of domestic cargo RTMs flown from 65.4 percent in 1997 to 85.0 percent in 2008. This is because of significant growth in express service by FedEx and United Parcel Service coupled with a lack of growth of domestic freight/express business for passenger carriers.

The all-cargo share is forecast to increase to 88.4 percent by 2025 based on increases in wide-body capacity for all-cargo carriers and security considerations. International cargo RTMs are forecast to fall 7.2 percent in 2009

¹⁵³ "FAA Aerospace Forecast Fiscal Years 2009-2025," pp. 38-39.

reflecting the impact of the global economic downturn and grow 5.0 percent in 2010 as world economic growth rebounds and trade expands.

For the balance of the forecast period, international cargo RTMs are forecast to increase an average of 6.2 percent a year based on projected growth in world GDP. The forecast 59.3 billion RTMs in 2025 represents an average annual increase of 5.3 percent over the entire forecast period. All-cargo carriers share of international cargo RTMs flown, decreased from 66.8 percent in 2007 to 63.3 percent in 2008. The decrease is due to the reduction in capacity resulting from the bankruptcy of three all-cargo carriers. Beyond 2009, the all-cargo share of RTMs flown is forecast to increase to 68.4 percent by 2025. Forecasts utilizing RTMs as the principal metric for analysis correlate imperfectly with forecasts using tonnage as the preferred metric.

Economic and demographic factors, which theoretically should be indicative of air cargo growth, have often behaved peculiarly in the case of California. Between 1976 and 1998, freight tonnage enplaned grew at an annual rate of 5.7 percent for the U.S. compared to 4.7 percent for California and 4.4 percent for Southern California. As a July 2000 study commissioned by SCAG observed, this was contrary to what was indicated by other statistical indicators, such as employment and population, which rose faster for Southern California and California than the rest of the nation.¹⁵⁴

Today, air cargo forecasts commissioned by California's leading airports tend to see only modest growth potential. For example, a new analysis and long-term forecast for the Bay Area's Regional Airport Planning Committee similarly concludes that the high rates of growth in air cargo tonnage once forecast for the region's airports will not materialize. The analysis by consultants SH&E noted that, after advancing at an average annual growth rates of 7.0 percent from 1990 to 2000, air cargo volumes in the Bay Area had contracted by an average annual rate of -3.9 percent since 2000. Looking ahead, their Base Case forecast expects air cargo volumes in the Bay Area to increase at a slower pace than for the U.S. as a whole. More specifically, SH&E's Base Case cargo forecast for Bay Area airports expects tonnage to grow at a 2.4 percent average annual rate from 1,426,000 tons in 2007 to 2,740,000 tons in 2035. Tonnage at SFO, in particular, is expected to increase from 621,000 tons in 2007 to 1,411,000 tons by 2035. By way of comparison, the 2000 RASP forecast anticipated that SFO would have achieved that level of tonnage in 2008. Remarkably, the SH&E forecast expects no appreciable growth in air cargo volumes in the Bay Area through the end of next year.

According to a 2006 report prepared for the Sacramento Area Council of Governments: "Absent some development that would fundamentally alter air cargo operations at SMF and MHR, air cargo volumes will most likely increase at an average annual growth rate of about 1.8 percent at both airports over the next decade. As rising jet fuel costs increasingly push all but the most time-sensitive shipments from air to surface modes of transportation, the air cargo growth rate is expected to slow to 1.2 percent between 2016 and 2032, and to 0.8 percent between 2032 and 2050."¹⁵⁵

Airport and industry representatives surveyed for this study observed that an entire decade may be required simply to return to former peak levels. Respondents were asked what their expected cargo volume growth will be within the next five years. Most respondents said they expected air cargo to grow at a rate of about 1 to 2 percent per year over the next five years. One large carrier¹⁵⁶, however, indicated that growth could be as high as 5 percent per year over that time.

¹⁵⁴ CIC Research, Inc. (San Diego), Southern California Aviation Industry Impact Analysis, a study commissioned by SCAG and published on July 11, 2000. The study is reproduced in SCAG's 2002 Regional Transportation Plan: Aviation Appendix, pp. B-85 through B-183.

¹⁵⁵ Sacramento Area Council of Governments, "SACOG Regional Goods Movement Study: Phase One Report," September 10, 2006, pp. 51ff.

¹⁵⁶ Based on the confidential nature of the information shared for this report by the air carriers, they declined to be named when giving this information.

Although Boeing's latest air cargo forecast (see Exhibit 9) looks for a resumption of a healthy rate of growth in airborne shipments between North America and the Far East, this does not necessarily mean that California's airports will see a commensurate rise in the volume of transpacific trade they handle. Not all airports will meet or even exceed the forecast. Many, in fact, will see disappointing growth or even contraction in the volume of air cargo they handle over the forecast period. The actual likelihood that the tonnage levels forecast for each airport will be realized differs from airport to airport. The fact is that California's share of the nation's airborne foreign trade has been shrinking almost steadily since the mid-1990s.¹⁵⁷ In 1996, for example, SFO and LAX held a 34.7 percent share of all airborne U.S. foreign trade, by dollar value. By 2000, that share had fallen to 28.0 percent. In 2007, it was 18.1 percent. Drilling down into the data reveals that the two airports' share of U.S. airborne exports dropped from 33.8 percent in 1996 to 19.5 percent in 2007, while their share of U.S. airborne imports shrunk from 35.7 percent to 16.9 percent. During this period, SFO saw its share of U.S. airborne trade drop from 18.6 percent in 1996 to 7.9 percent in 2007, while LAX went from a 16.1 percent share in 1996 to a 10.2 percent share in 2007.

A closer look shows that SFO's share of all U.S. airborne exports fell from 17.2 percent in 1996 to 8.1 percent in 2007, while its share of U.S. airborne imports slid from 20.0 percent to 7.7 percent. At LAX, airborne exports accounted for 16.6 percent of the U.S. total in 1996, but just 11.4 percent in 2007. Meanwhile, its share of the nation's airborne import trade went from 15.7 percent to 9.2 percent. Expectation that the volume of international tonnage at SFO will pick up in the next decade rests largely upon hopes that the Bay Area's leading role in the development of new products associated with the green-technology and medical equipment-pharmaceutical sectors.

A major reason for the diminished role of the two California's aviation gateways in U.S. airborne trade was the introduction of aircraft capable of traversing huge distances without refueling. That development, by permitting air carriers to utilize new routes leading directly to and from cities throughout North America, has somewhat undermined the historic role of California airports had played as transshipment points serving the airborne trade between the U.S. and the Asia-Pacific region. Instructively, Chicago's O'Hare Airport saw its share of U.S. airborne trade grow from 8.6 percent in 1996 to 11.1 percent in 2007. This trend seems to have played itself out to some extent as countervailing trends such as larger aircraft not having to stop at Anchorage to refuel and these same larger aircraft being able to come from points farther away in Asia (such as Singapore), tend to counteract the loss of cargo to inland airports such as Chicago and Dallas.

5.8 California Air Cargo Flows and Forecasts

The volume of air cargo traffic during the past decade has confounded expectations. Forecasters have relied extensively on guidance from predictions developed by Boeing Aircraft Company and the Federal Aviation Administration for national and international traffic. Despite buoyant forecasts issued just a few years ago, traffic in 2008 was roughly equal to traffic recorded in 1996, meaning that the U.S. air cargo industry has gone through 12 years with no net growth. The express segment, which had grown at a 10 percent annual rate as recently as the 1990s, has also seen significant contraction - down 19 percent from its peak in 2000. First-half data for 2009 gives little hope of any short-term turnaround, as industry-wide ton-mile totals were down about 18 percent for the first six months of 2009, and the Air Cargo Management Group (ACMG) estimated that express volumes were off about the same amount.¹⁵⁸

¹⁵⁷ Data on individual airports' shares of U.S. airborne trade were obtained from the U.S. Bureau of Transportation Statistics' annual *Pocket Guide to Transportation*.

¹⁵⁸ Industry data supplied by Air Cargo Management Group's 16th annual *US Domestic Air Freight and Express Industry Performance Analysis*, July 2009, as reported in *International Freightling Weekly*, August 3, 2009.

The worldwide collapse of air traffic, which began in late 2008 and has extended into 2009, is unprecedented in the industry's 60-plus years of existence. December 2008 volumes reported by the International Air Transport Association (IATA) fell by 22.3 percent over December 2007. Year-over-year volumes dropped by more than 20 percent in each of the next four months before showing a slight improvement in May and June, when they declined 17.4 percent and 16.5 percent, respectively.

The variance between forecast and actual levels of air cargo traffic at the national level underscore the difficulty of adapting national forecasts for a less aggregated subset of individual airports within a single state. According to the FAA, "Historically, air cargo activity tracks with GDP. Additional factors that have affected the growth in air cargo traffic include declining real yields, improved productivity, and globalization. Significant structural changes have occurred in the air cargo industry. Among these changes are the following: air cargo security regulations by the FAA and TSA; market maturation of the domestic express market; modal shift from air to other modes (especially truck); increases in air fuel surcharges; growth in international trade from open skies agreements; use of all-cargo carriers (e.g., FedEx) by the U.S. Postal Service to transport mail; and increased use of mail substitutes (e.g., e-mail)."¹⁵⁹

Our prevailing assumptions are three-fold. First, security restrictions on air cargo transportation will remain in place. Second, most of the shift from air to ground transportation has occurred. Finally, long-term cargo activity will be tied to economic growth.

The FAA reports that the all-cargo carriers increased their share of domestic cargo RTMs flown from 65.4 percent in 1997 to 85.0 percent in 2008. This is because of significant growth in express service by FedEx and UPS coupled with a lack of growth of domestic freight/express business for passenger carriers. The all-cargo share is forecast to increase to 88.4 percent by 2025 based on increases in wide-body capacity for all-cargo carriers and security considerations. All-cargo carriers share of international cargo RTMs flown decreased from 66.8 percent in 2007 to 63.3 percent in 2008. The decrease is due to the reduction in capacity resulting from the bankruptcy of three all-cargo carriers. Beyond 2009, the all-cargo share of RTMs flown is forecast to increase to 68.4 percent by 2025.

For purposes of this report, Boeing's latest revised air cargo forecasts have been used to generate an optimal but, in our view, an unlikely scenario of future air cargo activity at California airports. This optimal forecast is based on the following assumptions:

- As described above, the base year (2008) traffic for each of the 13 airports is disaggregated by market region (domestic and five world areas), direction, and U.S. origin and destination area (four U.S. regions and five California sub-regions).
- Traffic growth is forecast based on the Boeing Company's air cargo forecasts by world market (Exhibit 9, Appendix C).
- For each airport, the share of air cargo traffic that is trucked to particular U.S. origin and destination markets is used to estimate total truck traffic (in metric tons).

¹⁵⁹ FAA, op. cit. p. 38.

Table 5-3: Optimistic Air Cargo Forecasts for Top California Airports (2008-2020)

	Cargo Traffic (1,000 Metric Tons)				Weekly Truck Trips			
	2000*	2008	2015	2020	2000	2008	2015	2020
Los Angeles	2,039	1,615	2,196	2,757		4,747	6,278	7,727
LA Ontario	464	455	550	631		1,719	2,067	2,365
March ARB		20	25	29		73	90	105
San Diego	139	124	146	164		1,191	1,404	1,578
Long Beach		40	47	53		385	454	510
Bob Hope		34	39	44		322	380	427
John Wayne		21	24	27		199	235	264
Sub Total	2,642	2,308	3,028	3,706		8,637	10,906	12,976
San Francisco	870	457	622	781		1,072	1,376	1,658
Oakland	685	563	681	783		2,079	2,490	2,838
San Jose	148	77	91	102		739	871	979
Sub Total	1,703	1,097	1,394	1,666		3,890	4,737	5,475
Sacramento Mather	167	72	85	95		691	814	915
Sacramento International	61	60	71	80		581	685	770
Fresno		9	11	12		86	101	114
Sub Total	228	141	167	187		1,358	1,600	1,799
Totals	4,573	3,546	4,589	5,559		13,885	17,243	20,250

Source: Exhibit 11, Appendix C

*Note – 2000 volumes only represent major California Airports.

Even before the onset of the current economic downturn in December 2007, California's state's airports were handling substantially less tonnage than they had in 2000. Tonnage at the state's four largest cargo airports, which account for 87 percent of all cargo handled statewide, was off 12.6 percent in 2007 from 2000's levels. By 2008, air cargo tonnage statewide was 22.4 percent below the 5.2 million tons recorded in 2000, and estimates for 2009 indicate a further decline of approximately ten percent. Remarkably, though, California's real (i.e., inflation-adjusted) gross state product in 2008 was 20.1 percent higher than in 2000.¹⁶⁰ Moreover, the state's share of national GDP remained fairly stable throughout the decade, fluctuating between a 13.0 percent and 13.5 percent. The often cited correlation between GDP growth and air cargo activity had apparently come unhinged during the past decade.

That poses a serious problem for forecasters looking to devise estimates of how fast (or even whether) air cargo activity will increase at specific California airports over the next couple of decades. So, too, does the fact that there is really no single California economy but rather a collection of regional economies loosely knitted together and often sprawling across state lines. Indeed, the California Economic Strategy Panel reports that California is composed of as many as nine coherent economic zones with widely varying industrial, demographic, and

¹⁶⁰ Source: California Department of Finance and U.S. Bureau of Economic Analysis.

geographical characteristics.¹⁶¹ Under the circumstances, transportation planners would be advised to develop a capacity for frequently adapting forecast estimates to emerging developments affecting air cargo flows. This will require a much keener appreciation of the economies of the regions directly served by each of the state's major airports and the propensity of these economies to generate demand for air cargo services.

¹⁶¹ The California Economic Strategy Panel recognizes the following nine economic zones: Northern California (comprising predominantly rural counties in the state's northwestern corner), Northern Sacramento Valley, Central Sierra, Central Coast, San Francisco Bay Area, Greater Sacramento, San Joaquin Valley, Southern California, and Southern Border (San Diego and Imperial Counties).

6 Appendix A - Survey Questionnaires

Survey for Air Cargo Handlers, Truckers, Forwarders and Air Carriers

Airport Cargo Survey

The California Department of Transportation's Division of Transportation Planning, Office of Goods Movement has engaged TranSystems and Webber Air Cargo to study air cargo operations at California's airports. This study is undertaken to better understand how air cargo transport fits into goods movement and specifically mode choice in California. Of particular interest is how trucking acts as both complement and substitute for air transport. Your responses will be helpful as context for cargo forecasts to inform state transportation planning related to infrastructure and other needs. We estimate that it will take approximately fifteen minutes to answer the following questions. Please note that all stations (San Francisco, Los Angeles, etc.) will be evaluated separately.

PLEASE REPLY WITHIN THE NEXT FEW DAYS TO ENSURE YOUR INPUT IS INCLUDED!

Thank you in advance for your time and assistance.

DIRECTIONS

There are eighteen questions on three pages. If more than one station serves a particular airport, please base your responses on the station that has the highest proportion of air cargo transiting that airport. It is understood that answers will be "best guesses" in some cases.

Responses on each page ARE ONLY SAVED WHEN YOU CLICK THE [Next] or [Done] BUTTON at the end of the page that you are filling out. You may leave the questionnaire and come back at a later time, and your responses will be saved as long as you click the [Next] or [Done] buttons. When you are ready, please proceed to question one. Thank you.

*** 1. Are you the person named in the email survey invitation?**

Yes

No



*** 2. Please enter your name and location. Only City and State are required fields.**

Name:

Company (if different from original email invitation):

City/Town (Required):

State (Required):

3. How much annual cargo growth, if any, does your company anticipate at this airport in the next five years? Please indicate a range of growth.

Example answer: 1 to 2 percent per year over five years.

% Growth per year over 5 years:

4. How much additional space, if any is needed for on-airport air cargo facilities, to accommodate anticipated growth indicated in Question 3? Air cargo facilities are defined as warehouse and ramp facilities.

Additional Warehouse Sq Ft

Additional Number of airport ramp positions

5. If your company has off-airport sorting operations, please indicate:

Miles from airport

No. of daily truckloads to airport

No. of daily truckloads from airport

Peak inbound time of day to airport

Peak outbound time of day to airport

6. Is future growth more likely to occur on or off-airport grounds?

On Airport Grounds

Off Airport Grounds

Not Sure

7. If your answer to Question 6 was "Off Airport Grounds", what factors will cause this move?

Click the [Save and Next] button to save your entries. You have ten minutes to go!

8. Will your company's growth more likely be at airports in California or in other US states?

- Growth in California only
- Growth will occur mostly in states outside of California

9. If you indicated growth in states outside of California in Question 8, which states will grow, and what factors will cause growth in those states?

10. What percentage of local on-airport operations are for the following service areas?

% Local metro (overnight)	<input type="text"/>
% Regional (Southern/Northern California)	<input type="text"/>
% Regional multi-state	<input type="text"/>
% National/International	<input type="text"/>

11. What percent of tonnage is moved to and from the airport by truck, as opposed to being interlined with another air carrier?

% enplaned to the airport by truck?	<input type="text"/>
% deplaned from the airport by truck?	<input type="text"/>

12. Please rank the following factors in order of importance, 1 being most and 6 being least important, when considering modal preference between trucking versus air:

	1	2	3	4	5	6
Distance	<input type="radio"/>					
Available lift (proprietary or interline)	<input type="radio"/>					
Forwarder/Shipper Specified	<input type="radio"/>					
Cargo Security (Screening) Requirements	<input type="radio"/>					
Fuel Prices	<input type="radio"/>					
Shipping Cost/Contract-Pricing	<input type="radio"/>					
Other (please specify)	<input type="text"/>					

13. What is the shortest distance in miles where you would consider air versus truck?

Minimum miles

Click the [Save and Next] button to save your entries. You have five minutes to go!

14. Truck information: At your facility, what is the:

% of short-haul trucks (versus long-haul)
Average number of trucks used per week

15. At the peak(s), how many trucks per week are utilized to support this station? (Space is provided below for multiple peaks if needed.) Please specify season/event, i.e. Christmas Rush, etc. and number of trucks typically for each event. Example response: Christmas peak, 45 trucks

- 1. Peak event description, and number of trucks
- 2. Peak event description, and number of trucks
- 3. Peak event description, and number of trucks
- 4. Peak event description, and number of trucks

16. Considering your facility, please comment on ground-access challenges already experienced (e.g. local land-side bottlenecks, arterials, interstates)?

17. Do you anticipate surface issues cited in question #16 to improve or worsen in the next 5 years? Why? (Roadway improvements, security requirements?)

18. Are challenges mentioned in Question 16 more likely to divert cargo from air to trucks or to another airport? Please explain.

Click the [Save and Done] button to save your entries. You have finished the questionnaire! Thank you for your participation in this study. Information that you have provided will be used to improve air cargo transportation in the coming years.



Survey for Airport Operators and Developers

November 1, 2009

The California Department of Transportation's Division of Transportation Planning, Office of Goods Movement has engaged TranSystems and Webber Air Cargo to study air cargo operations at California's airports. This study is undertaken to better understand how air cargo transport fits into goods movement and specifically mode choice in California. Of particular interest is how trucking acts as both complement and substitute for air transport. Your responses will be helpful as context for cargo forecasts to inform state transportation planning related to infrastructure and other needs.

In addition to airport operators and private developers of air cargo facilities, we will contact air cargo carriers, ground handlers, freight forwarders and trucking companies. **No** responses will be attributed to individual private operators but will be aggregated by airport and industry segment. In terms of individual companies, the public version of the final report will contain only content already available from secondary or public sources.

Respondent Contact Information:

Airport _____

Address _____

Contact Person/Title _____ Phone/Fax: _____

Email Address _____

1. In what year was your last master plan (update) or other independent air cargo forecast completed?

2. Please provide cargo volumes forecasted for the specified last year of the planning horizon. _____
_____ year _____
3. Has the airport implemented planning "contingencies" for unexpected changes? _____ If so, what?

4. Have slowdowns at other gateways impacted expectations of need for prospective alternative gateways? Specify gateway and explain why. _____





5. Please provide total square footage for all cargo terminals located on airport.

_____ Warehouse _____ Ramp

6. How do current on-airport air cargo resources suit projected growth? What constraints are anticipated?

(runway, apron, warehouse) _____

7. Do roadway congestion and other landside issues currently impact air cargo operations? If so, where?

During what hours, days or other periods? _____

8. What roadway improvements are anticipated to accommodate roadway issues (if any)? _____

9. What improvements have been completed or are anticipated to accommodate cargo security requirements? _____

10. In 2008, about what percent of cargo was _____ percent belly, ___ percent freighter.
Please list Top 5 carriers & market shares:



-
1. _____
 2. _____
 3. _____
 4. _____
 5. _____

Please send responses by November **xx**, (date to be filled in when survey sent to respondent) 2009 to:
Michael Webber, Webber Air Cargo Inc.

WebberAirCargo@aol.com

Or contact by phone: 913-961-8596 (or substitute TranSystems contact info, including fax)

7 Appendix B

Survey Results from Air Cargo Operators

Table 7-1: Response Rate

Source	Segment	Invitations Sent	Number of Survey Participants	Response Rate by Segment
Webber Air Cargo Contacts	Cargo Agents	32	3	9.4 percent
	Carriers	54	24	44.4 percent
	Ground Handlers	7	3	42.9 percent
Total Webber Air Cargo		93	30	32.3 percent
Airport Directory Contacts	Air Cargo Truck Lines	4	1	25.0 percent
	Airlines & GSAs*	20	0	0.0 percent
	Container Freight Stations	1	0	0.0 percent
	Forwarders & Brokers	40	1	2.5 percent
Total Airport Directory		65	2	3.1 percent
Total Study		158	32	20.3 percent

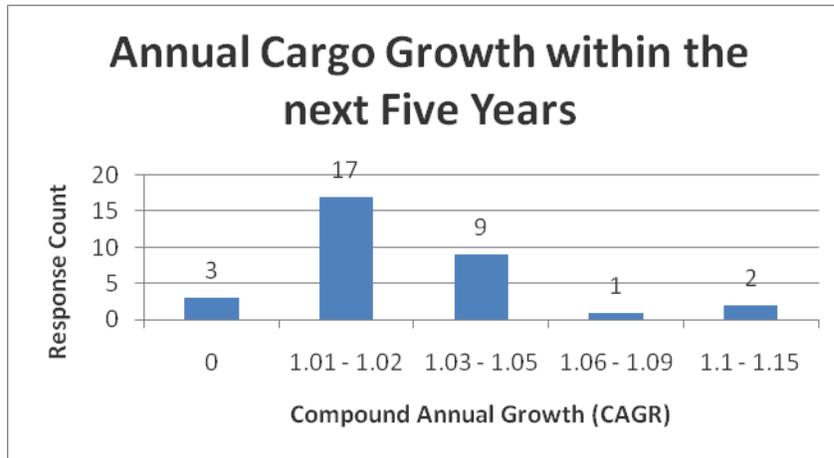
*General Sales Agents

The following is a recap of responses to this survey. When appropriate, responses will be graphically displayed. Questions one and two were designed to confirm the identity of the respondent. Questions that are relevant to air cargo begin at question three.

Question 3: Growth

Respondents were asked what their expected cargo volume growth will be within the next five years, "How much annual cargo growth, if any, does your company anticipate at this airport in the next five years?"

Figure 7-1: Anticipated Growth in Air Cargo

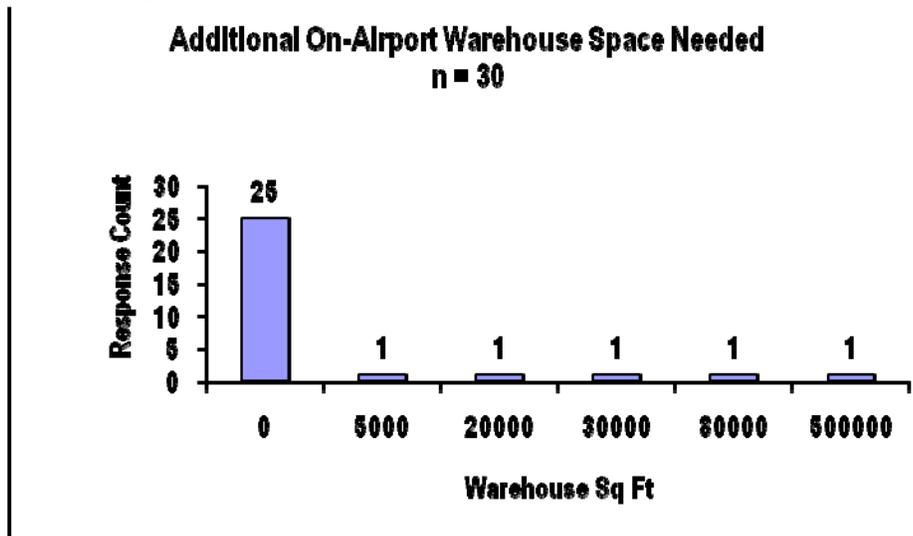


Source: TranSystems

Most respondents expected air cargo to grow at a rate of about 1 to 2 percent per year over the next five years. One large carrier; however, indicated that growth could be as high as 5 percent per year over that time.

Questions 4: How much additional space is needed for on-airport air cargo facilities (warehouse and airport positions)?

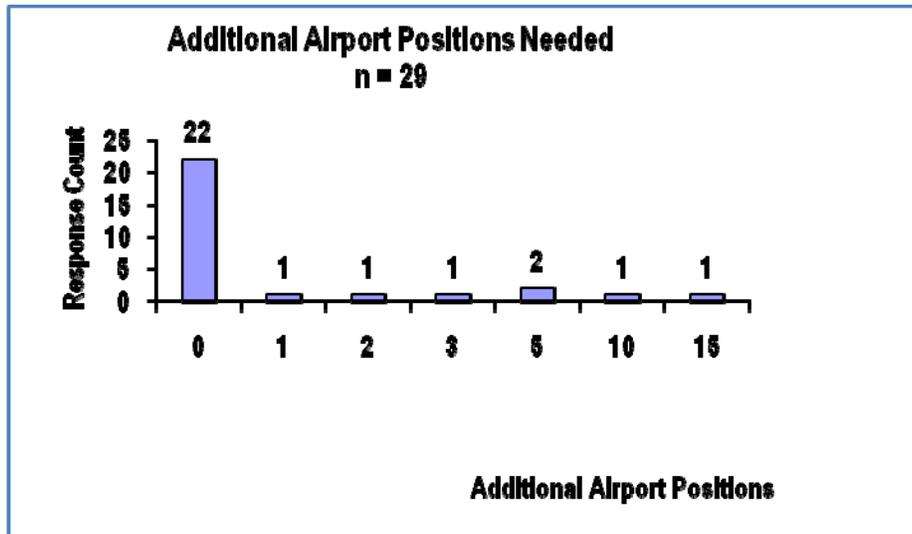
Figure 7-2: Additional On Airport Warehouse Space Required



Source: TranSystems

Twenty-five of 30 respondents do not require additional airport space within the next 5 years.

Figure 7-3: Additional Airport Ramp Positions Required



Source: TranSystems

Twenty two respondents did not anticipate needing more airport ramp positions, while almost 25 percent (7 of 29) did see anticipate needing more positions.

Question 5: Off Airport Sorting Operations Information

Responses to this question were few (n=6), indicating that most survey participants replied from the “on-airport” perspective.

Of the six respondents to this question, four had facilities located ten miles from the airport; two had facilities located five miles from the airport.

Figure 7-2: Daily Truckloads

Respondent	No. of Trucks to Airport	No. of Trucks from Airport
A	2	2
B	4	4
C	5	2
D	10	10
E	14	14
Total	35	32

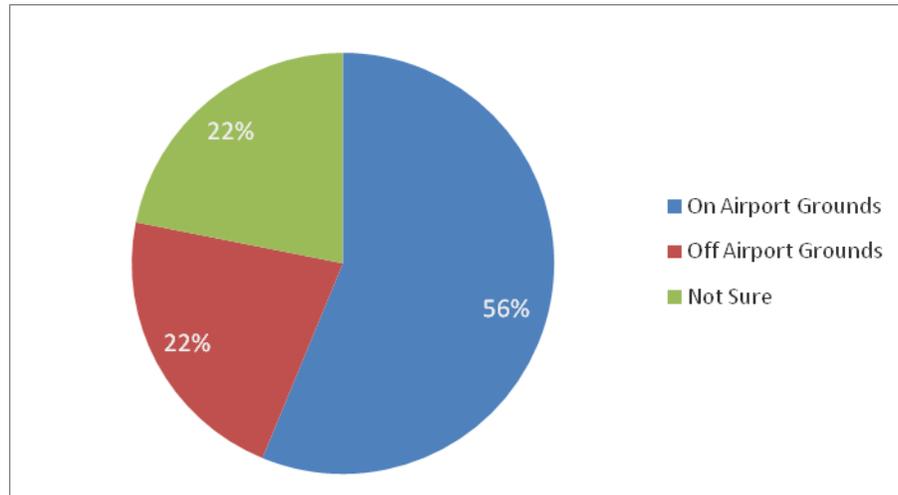
Source: TranSystems

7-3: Peak Travel Time To/From Airport

Respondent	Airport Inbound Peak	Airport Outbound Peak
A	1200-1400	
B	1730-1830	0530-0700
C	1700	1200-1400
D	0600	1900

Source: TranSystems

Question 6: Is future growth likely to occur on or off Airport Grounds?
Future Growth on or off Airport Grounds
N=32

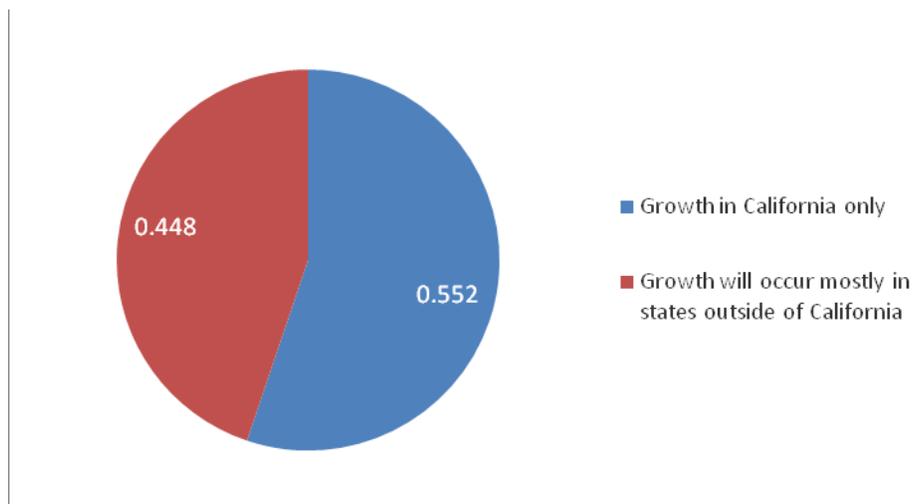


Source: TranSystems

Question 7: If your answer to Question 6 was "Off Airport Ground", what factors will cause this move?

Few comments were offered in this area, but respondents who indicated growth "off airport grounds" suggested that if off airport facility costs were lower, and service levels could be maintained, they might consider an off airport location.

Question 8: Will your company's growth more likely be at airports in California or in other US states?
Will Air Cargo Growth More Likely Occur in or outside California?
n = 29



Source: TranSystems

Question 9: If you indicated growth in states outside of California in Question 8, which states will grow, and what factors will cause growth in those states?

Comments supporting growth outside of California suggest that it will be driven by population growth in general. Airports that are close to large population centers in the Midwest or East, or that are relay point to Europe or South America were also favored.

**Question 10: What percentage of local on-airport operations are for the following service areas?
Average of Responses to Percentage of Service Areas**

Local Metro	Regional	Regional Multi-State	National/International
19.3 percent	15.5 percent	12.1 percent	53.1 percent

Source: TranSystems

Note that responses are not weighted by volume, and figures displayed above are averages; therefore these results should not be interpreted to mean that 53.1 percent of California air cargo volume is trucked Nationally/Internationally. Considering their business, most respondents to this survey do move the majority share of their cargo to destinations outside of California.

Question 11: What percent of tonnage is moved to and from the airport by truck, as opposed to being interlined with another air carrier?

Average of Responses to Percentage of Tonnage Transferred between Plane and Truck

Percent Enplaned	Percent Deplaned
60.7 percent	64.3 percent

Source: TranSystems

Similar to question ten, figures displayed above are averages, and not weighted by volume. Survey responses indicate that a little more than half of respondents' share of cargo is moved by truck.

Question 12: Please rank the following factors in order of importance, 1 being most and 6 being least important, when considering modal preference between trucking versus air:

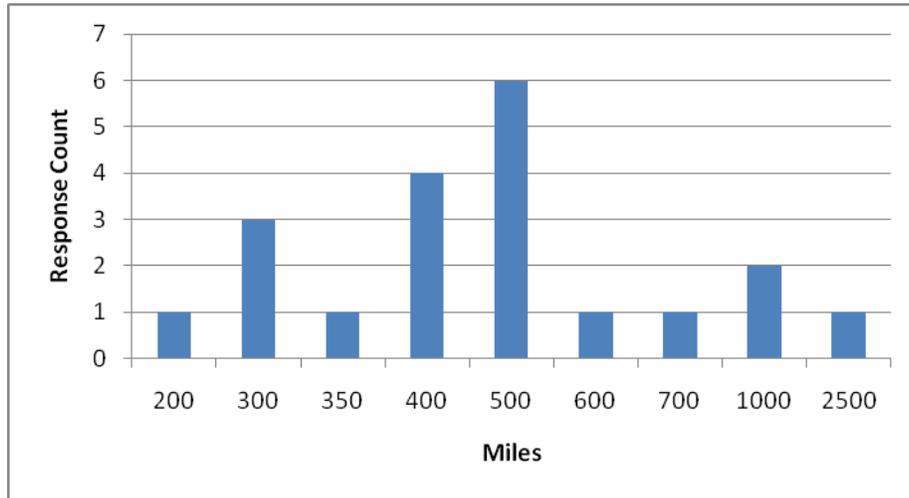
	Rating						Rating Average	Response Count
	1 Most Important	2	3	4	5	6 Least Important		
Distance	34.8 percent (8)	13.0 percent (3)	17.4 percent (4)	21.7 percent (5)	0.0 percent (0)	13.0 percent (3)	2.78	23
Available lift (proprietary or interline)	9.1 percent (2)	27.3 percent (6)	18.2 percent (4)	9.1 percent (2)	18.2 percent (4)	18.2 percent (4)	3.55	22
Forwarder/Shipper Specified	8.3 percent (2)	12.5 percent (3)	12.5 percent (3)	4.2 percent (1)	50.0 percent (12)	12.5 percent (3)	4.13	24
Cargo Security (Screening) Requirements	19.2 percent (5)	23.1 percent (6)	7.7 percent (2)	19.2 percent (5)	15.4 percent (4)	15.4 percent (4)	3.35	26
Fuel Prices	11.1 percent (3)	18.5 percent (5)	25.9 percent (7)	29.6 percent (8)	3.7 percent (1)	11.1 percent (3)	3.30	27
Shipping Cost/Contract-Pricing	21.4 percent (6)	14.3 percent (4)	21.4 percent (6)	0.0 percent (0)	17.9 percent (5)	25.0 percent (7)	3.54	28

Source: TranSystems

Question 13: What is the shortest distance in miles for which you would consider air versus truck?

Minimum Air Cargo Distance

N = 20



Source: TranSystems

Responses to this question were few; however, a consistent minimum mileage threshold does not exist for air cargo based on this sample.

Question 14: Truck information: At your facility, what is the:

Truck Haul Volume

N = 23

Percent Short-haul Truck	Total Trucks per Week	Total No. of Short-haul Trucks per Week
51.3 percent	3418	1615

Source: TranSystems

Question 15: At the peak(s), how many trucks per week are utilized to support this station?

Average of Responses to Percentage of Service Areas

Season	Average Weekly Truckloads	Peak Truckloads	Percent Increase	N=
Agricultural Growing	117	236	202 percent	3
Valentine's Day	1200	1300	108 percent	1
Holiday (Nov/Dec)	914	1120	123 percent	16

Source: TranSystems

Question 16: Considering your facility, please comment on ground-access challenges already experienced (e.g. local land-side bottlenecks, arterials, interstates)?

Few comments were received for this question – those that did reply mentioned airport congestion has been most pronounced at terminal access points connecting to surface streets.

Question 17: Do you anticipate surface issues cited in question #16 to improve or worsen in the next 5 years? Why?

Again, only a few comments were received, generally indicating conditions will worsen due to the following factors: future construction, TSA security requirements and a general increase in traffic.

Question 18: Are challenges mentioned in Question 16 more likely to divert cargo from air to trucks or to another airport? Please explain.

As with the two previous questions, few responses were received, those that did respond were split. Respondents indicated international cargo has to move via LAX as that is the only option, for domestic cargo, competing airports may become more attractive if they can offer easier access and better, cost competitive services.

8 Appendix C – California Air Cargo Flows and Forecasts – Exhibits 1 - 11



Cargo Forecast
Exhibits 1 - 11, REV 3