The Role of Air Cargo in California's Agricultural Export Trade

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CATI
CENTER FOR AGRICULTURAL BUSINESS

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California State University, Fresno

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The Role of Air Cargo Services in the Shipment of California's Agricultural Exports

Executive Summary

This study examines the expanding role of air cargo services in transporting agricultural exports from California. Although air cargo accounts for a seemingly modest share of the state's farm export trade, California's airborne agricultural exports in 2004 totaled $659 million, an increase of nearly 60 percent since 2000. Moreover, for several highly perishable, high value-added crops such as cherries, strawberries, asparagus and a range of fresh organically-raised produce, air cargo generally offers the only effective means for exploiting overseas markets. The principal destinations of California's airborne agricultural export trade are in the Far East, primarily Japan, China, South Korea, Taiwan and Hong Kong. A much more moderate airborne export trade is conducted with Europe and Latin America. Not surprisingly, given the efficiency of modern trucking and rail operations, there is very little airborne trade with Canada and Mexico.

Looking ahead, there are several reasons to expect that California's agricultural exporters will be making even more extensive use of air cargo in the future. Chief among those are the following:

- Maritime shipping – the customary mode for moving most farm products to overseas markets – is becoming an increasingly problematic partner for exporters of high value-added perishable farm products.
- There has been a dramatic expansion of worldwide demand for high-quality and typically high value-added food products grown and processed under conditions conducive to wholesomeness and food safety.
- Multinational food companies are embracing sourcing and logistics practices that place a heavy burden on transporting produce over vast distances in a timely and reliable fashion.

- California agriculture's progressive shift toward higher and higher value-added crops that command premium prices will place more of the state's agricultural output in the category of goods for which air transport is economical.
- Efforts to liberalize both trade in agricultural products and international air transport regulations should open new markets while expanding existing markets for California farm exporters.

A worrisome issue facing California's transportation planners is whether the state's air transport infrastructure will be able to cope with ever increasing levels of international passenger air travel as well as a volume of international air cargo that is expected to double or even triple by 2025. With approximately half of all air cargo shipped in the bellies of passenger aircraft, it is hardly surprising that much of the state's airborne foreign trade passes through its two principal gateway airports, Los Angeles International Airport (LAX) and San Francisco International Airport (SFO). What is remarkable, though, is the extent to which these two airports have maintained an effective monopoly over the state's foreign airborne trade. In 2004, for example, LAX and SFO together handled 98.8 percent of all airborne imports into California and 93.2 percent of all airborne exports from the state. Yet both airports face severe constraints on their ability to handle significantly greater levels of additional cargo. LAX has little room for expansion and faces very stiff political opposition from neighboring communities to any increase in flight operations. SFO suffers from high rates of weather-induced flight delays and diversions and has been slow to upgrade its air cargo handling capabilities. Highway access to both facilities is increasingly congested, posing a particular problem for shipments of perishable commodities.

To be sure, exporters have a somewhat different take on airport congestion than do importers. For one thing, so long as there is a substantial trade imbalance, the lack of 'back-haul' cargos commensurate with the level of airborne imports serves to depress the rates air carriers can charge for outbound shipments. What should be of great interest to exporters are the efforts under way to relieve burden on SFO and LAX by shifting more passenger and cargo flights to other California airports.

To better manage increasing air cargo traffic, aviation and surface transportation planners in Southern California have sought – so far with very limited success – to encourage air carriers to shift more air cargo activity away from LAX to other regional airports, most notably Ontario International Airport. By contrast, there is no similar strategy in Northern California to alleviate the burden on SFO. Indeed, SFO officials have consistently discouraged efforts to formally coordinate operations of the San Francisco Bay Area's three major airports.

A substantial portion of the state's international air cargo capacity will necessarily migrate from LAX and SFO to airports further inland and, hence, nearer to California's agricultural heartland. This migration will be spurred not merely by the need to ease the air cargo burden on LAX and SFO but also to provide better air transport services to the fast-growing population and industrial centers in California's Inland Empire and Central Valley. It will also be shaped by investment decisions made by the so-called integrated carriers (most notably, FedEx, UPS and DHL) that are poised to seize larger and larger shares of the international air cargo market.

Several inland airfields between Sacramento's Mather Field and March GlobalPort in Riverside County have been aggressive in promoting themselves as future air cargo hubs. Clearly, not all will succeed, since airlines are typically reluctant to provide scheduled passenger service to the less densely-populated regions where some of these vying airports are located. Geographic remoteness would not necessarily be a disqualifying factor for a dedicated air cargo airport were it not for the fact that an airport needs to attract both air carriers and the myriad logistical and other support services needed to sustain significant air cargo operations. Freight-forwarders, customs brokers, trucking companies, aircraft servicing firms, and other providers of essential support services are more apt to be persuaded to establish a presence at or very near airports featuring passenger as well as air-freighter flights. For that reason, this report submits that demographic considerations – the presence of a burgeoning population and expanding economic base – will be critical in determining which of California's airports garner significant shares of the state's international air cargo trade.

In Southern California, the migration will most likely benefit Ontario International and March GlobalPort. These airports are situated in San Bernardino and Riverside

counties, two of the fastest growing counties in California. The airports also happen to be regional hubs for UPS and DHL, respectively. (The FedEx hub for Southern California is LAX.) Meanwhile, San Diego will have to resolve a long-standing controversy over if and where to build a major new airport before it attracts appreciable international air cargo, despite being California's second largest city.

In Northern California, Oakland International should gain larger shares of the San Francisco Bay Area's international air cargo traffic, but SFO will remain Northern California's dominant hub for international air cargo so long as passenger aircraft carry a substantial portion of air cargo. However, there is some expectation that some foreign air carriers will shift their all-cargo operations from SFO to Oakland.

In the Central Valley, Sacramento International Airport (SMF) and Mather Field should emerge as important conduits for international trade. Even today, the passenger market served by SMF is reportedly large enough to warrant regularly scheduled non-stop passenger flights to Europe. The introduction of new aircraft such as Boeing's 787 and a possible competitor in the Airbus 350 should only enhance the prospects that SMF will be offering overseas service in the next decade. Both the 787 and 350 are medium-sized, long-distance aircraft specifically designed to provide non-stop service between non-hub airports. Because of the synergies available to companies providing support services for air cargo operations at airports in such close proximity, Mather would enjoy an advantage in its efforts to attract all-cargo operations.

For grower-exporters in the Central Valley, the initiation of overseas flights out of the two Sacramento airports would offer easier and more direct access to foreign markets. There is a substantial likelihood that Mather will feature all-cargo service to markets in the Far East. Meanwhile, cargo space available on passenger flights from SMF to one or more European destinations will enable growers to better serve the European Union's growing demand for California food products.

Projections should come with caveats. Although proximity to a major metropolitan area presents a powerful lure for air transport providers, civic opposition to the noise, air pollution and surface traffic congestion associated with expanded flight operations could easily thwart airport expansion or construction plans. Less

frequently acknowledged is the concern likely to be raised by growers themselves. Although the introduction of international air service to airports nearer to the state's agricultural packers and shippers may seem an unmitigated boon, it is indeed far from clear whether the initiation of overseas flights would be cheered by growers justifiably nervous about the risks of disease or pest infestation that return flights might bring. Even though the almost relentless urbanization of agricultural land – especially in the Central Valley and Inland Empire – will almost certainly make regular international air service inevitable, growers have a legitimate reason to fear pest or disease invasion – either accidental or deliberate – into California's farmlands. Appropriate prophylactic measures would have to be devised to protect state agricultural production.

Ultimately, the issue of whether California's agricultural exporters as well as other businesses will continue to enjoy the quality and frequency of air cargo services needed to sustain a presence in the global economy will hinge on the fostering of a political climate hospitable to increased flight operations. That climate is currently conspicuous by its absence in virtually ever corner of the state. As was seen in the defeat of proposals to establish a new regional airport at the former El Toro Marine base in Orange County, even those who make extensive use of air transport for personal or commercial reasons resist having a major airport in their neighborhood.

Even though the need for greater air transport capacity seems self-evident, community resistance to expanded operations at existing airports and construction of new airports is strong and pervasive. It is also largely unbalanced by a business constituency that depends on efficient air links to the national and global economies. A generation of aggressive out-sourcing of logistical functions has evidently left many companies indifferent to the need to maintain and expand the state's transportation infrastructure. That infrastructure projects are typically expensive, socially unsettling and environmentally sensitive make political leaders reluctant to tackle them. Undertaking massive infrastructure projects implies a major role for government, which makes the process ideologically offensive to some. Still, if California is to continue to enjoy the kind of transportation infrastructure essential for full participation in a global economy, a stronger constituency will have to be mobilized in support of an expanded and more diversified air transport system.

PREFACE

Introduction

This report examines the steadily expanding but generally unacknowledged role air cargo[1] services are playing in transporting California's agricultural exports to worldwide markets. In this and in succeeding chapters, we will describe the use currently being made of air freight by California's agricultural exporters, explain why agricultural exporters' demand for air cargo services is likely to continue to increase, and illuminate the challenges both private industry and public agencies will have to overcome if a major segment of California's agricultural economy is to compete successfully in foreign markets.

There are two fundamental questions this report will seek to answer:

> To what extent and under what conditions does air transport offer a viable alternative to ocean-going vessels in transporting California's agricultural exports to foreign markets?
>
> How will the air cargo industry meet the needs of California's agricultural exporters over the next two decades?

Outline

This introductory chapter provides a comprehensive overview of the facts, figures, and issues involved in transporting California's agricultural products by air to overseas markets. Chapter 2 looks more closely at the available statistical data on California's airborne agricultural export trade and also addresses the methodological challenges associated with finding numbers to accurately describe the state's farm export trade. Chapter 3 provides a description of the air cargo industry worldwide. Chapter 4 looks more closely at the air cargo system in California and how various

[1] "Air cargo" is customarily defined as any property carried on an aircraft with the exception of passenger baggage or items which are incidental to the carriage of passengers (e.g., in-flight meals). However, the International Air Transport Association's definition of cargo excludes mail and material owned by the air carrier. The term "air freight" is generally defined as airborne property other than mail and passenger baggage. For the purposes of this report and unless otherwise specified, the two terms will be used synonymously to indicate all third-party goods other than passenger baggage and mail.

economic, technological and demographic trends are combining to alter that system profoundly. Chapter 5 describes the results of our survey of fruit and vegetable packers/shippers and other agricultural industry representatives. The report concludes with a statistical appendix displaying detailed data on airborne exports of 250 agricultural commodities and processed food products from California in the period from 1999 through 2003.

A Preliminary Word On Trade Data

As Chapter 2 will discuss in greater detail, there are at least three very different calculations purporting to describe California's farm export trade.

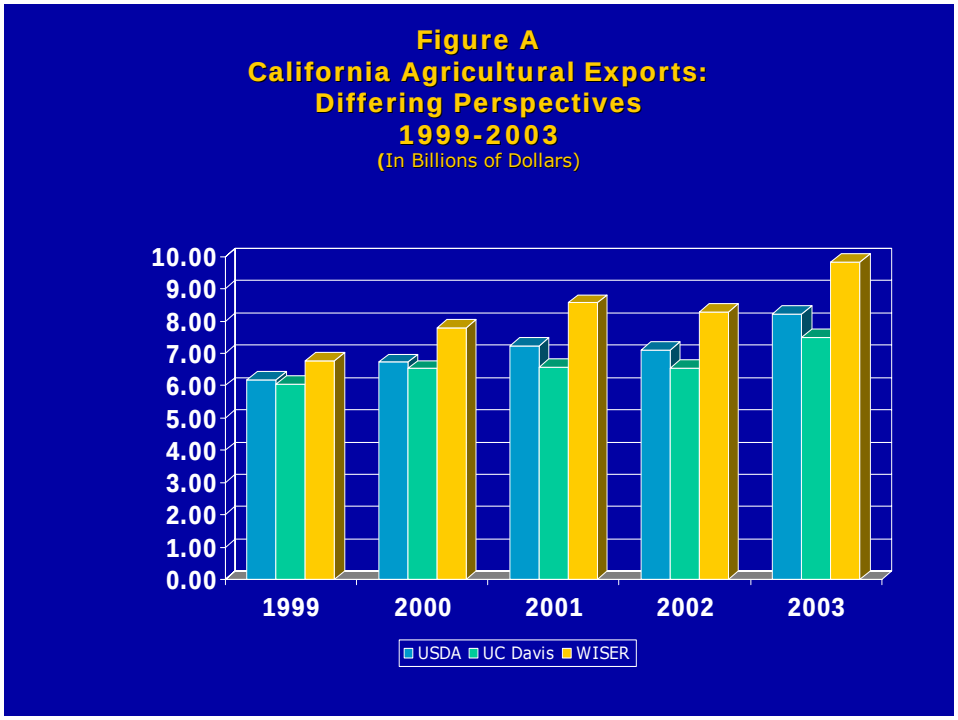
Agricultural Issues Center Export Data. The most precise California agricultural export figures are undoubtedly those compiled by the Agricultural Issues Center (AIC) at the University of California at Davis.[2] Since 1997, AIC has been working with the California Department of Agriculture to develop more accurate estimates of California's farm exports. The collaboration was begun in response to widely acknowledged deficiencies in existing sources of state-level export statistics. AIC devised a commodity-specific methodology, focusing primarily on fifty commodities which together account for more than 90 percent of the value of California's farm production. For each of those commodities, AIC tapped a variety of data sources, including industry sources who furnished AIC with both export data and guidance. AIC began by developing export data for 1995-1997 and has since published data through 2003. In the process, it has also refined some of its estimation techniques and revised some of its earlier estimates. Unfortunately for the purposes of this study, AIC does not seek to distinguish the various modes of transportation used to ship California's farm products to foreign markets.

USDA Export Data. A second but rather less informative set of state farm export data is published by the U.S. Department of Agriculture. Those figures are really apportionments of total U.S. farm exports based on USDA's estimates of each state's share of the overall production of the commodities in question. Thus, if California growers were known to produce ten percent of the nation's kumquats, California would be credited with ten percent of the nation's kumquat exports – even if all of

[2] AIC describes its methodology for determining California's agricultural exports at: http://aic.ucdavis.edu/pub/exports.html.

the Golden State's kumquats were consumed locally. (Despite their hugely different methodologies, AIC and USDA have yielded oddly consistent export figures, as Figure A indicates.) As with the AIC data, the USDA state export figures are of limited use for the purposes of this study. Perhaps because the vast bulk of U.S. farm exports have gone either overland to Canada and Mexico or by sea to more distant markets, USDA analysts have until very recently given scant attention to airborne agricultural exports. More importantly, USDA's apportionment method of calculating a given state's farm exports is not conducive to determining how vital air cargo may have been in supporting that state's agricultural export trade.

FIGURE A.



Origin of Movement Export Data. The third source of state agricultural export figures is based on information provided by the exporter-of-record on the Shippers Export Declarations (or their electronic equivalent) that by law must be filed for all outbound shipments worth at least $2500. Compiled by the U.S. Customs and Border Protection Agency, the raw information is then processed and analyzed by the U.S. Census Bureau's Foreign Trade Division. Since 1988, the Census Bureau has contracted with outside parties to refine the raw data to yield useful figures describing the exports of the individual states and of several metropolitan areas.

Since at least the early 1990s, the data officially used by the State of California to describe California's merchandise export trade has been provided by the Massachusetts-based Western Institute for Strategic Economic Research (WISER) and its forerunner, the Massachusetts Institute for Social and Economic Research (MISER). One major virtue of this data source is that it provides insight into the mode of transportation and point of departure not possible with the AIC or USDA data sets. In completing the Shippers Export Declaration, exporters are required to identify the state in which the export shipment was initiated as well as the port of embarkation, the mode of transportation, and the destination abroad. The WISER data do have some drawbacks, though. Probably the most troubling deficiency is that the data – despite considerable algorithmic efforts to the contrary – will inadvertently include some shipments of items that, while shipped from a California airport, were actually grown or processed outside of the state. As a result, WISER's agricultural export totals for California are substantially higher than the estimates published by either AIC or USDA. Still, the WISER data are consistent year-to-year and do represent the only available source of data on California's *airborne* agricultural export trade. Therefore, unless otherwise specified, the agricultural export figures cited in this report are derived from origin of movement data supplied by the U.S. Census Bureau's Foreign Trade Division via WISER.

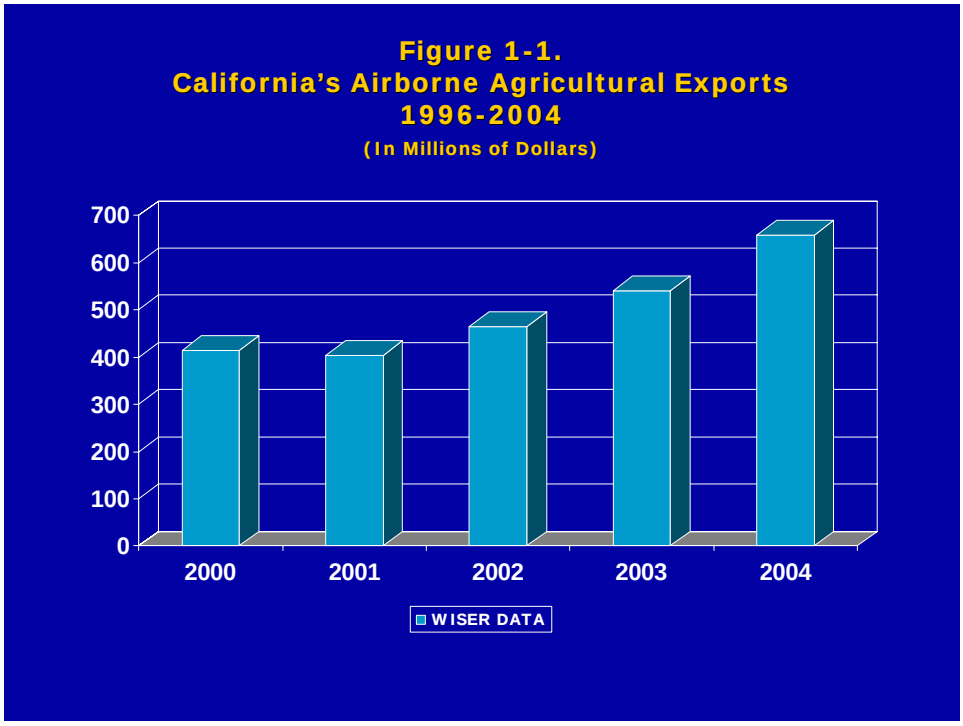
Chapter 1

The Current and Future Role of Air Cargo Services in the Shipment of California's Agricultural Exports

The Current Picture

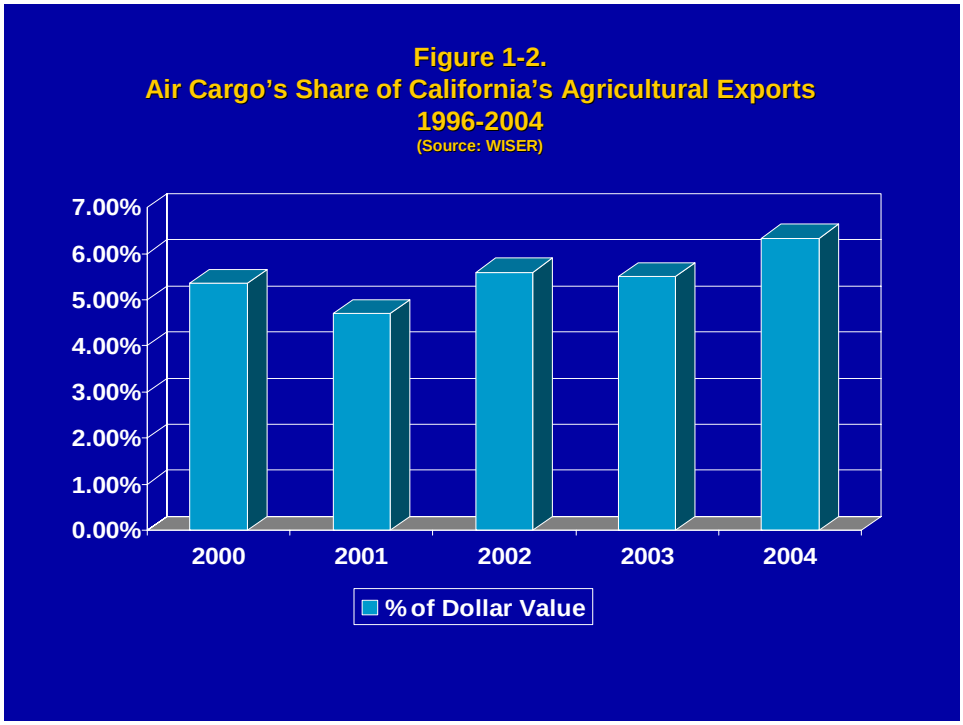
During the past five years, a relatively modest but growing share of California's agricultural exports has been transported by air (Figure 1-2). In 2004, for example, airborne shipments amounted to just 6.3 percent of the $10.4 billion value of all agricultural products exported from California in that year. Still, even this ostensibly meager percentage represents a substantial volume of business. More importantly, the nominal value of the state's airborne agricultural exports has increased by nearly 60 percent since 2000, from $414 million to $659 million in 2004 (Figure 1-1).[3]

FIGURE 1-1.



[3] As of May 1, 2005, neither USDA nor AIC have released data on California's agricultural export trade in 2004. For the period from 1999 through 2003, however, WISER reports a 31.4 percent increase in California's *airborne* agricultural export trade (from $411 million to $540 million), while AIC reports an increase of 23.6 percent (from $6,061 million to 7,491 million). On the other hand, USDA reports a 32.5 percent jump in California's overall farm export trade during those years (from $6,195 million to $8,210 million).

FIGURE 1-2.



Furthermore, in the case of certain high value-added crops such as fresh cherries, strawberries, asparagus and a range of perishable organically-raised produce, air cargo simply may offer the only effective means for meeting some of the overseas demand for these highly perishable crops. Figures 1-3 and 1-4 show the leading agricultural and specialty-crop exports shipped by air from California in 2004.

Figure 1-3.

Figure 1-3.
Ten Top California Airborne Agricultural Exports and Their Share of California's Farm Exports By All Transportation Modes – 2004
(In Millions of Dollars)
Source: WISER

Food Preparations NESOI (HS-210690)	$174.0 (25%)
Fresh Cherries	$91.5 (85%)
Vegetable Seeds for Sowing (HS-120991)	$77.9 (43%)
Fresh Strawberries	$30.6 (18%)
Fresh Grapes	$24.2 (5%)
Asparagus, fresh or chilled	$22.2 (50%)
Odoriferous mixtures used in food or drink (HS-330210)	$16.5 (25%)
Seeds of herbaceous plants, principally flowers (HS-120930)	$16.2 (90%)
Bovine Semen	$13.1 (94%)
Seeds, fruits and spores for sowing (HS-120999)	$12.7 (36%)

Figure 1-4.

Figure 1-4.
California's Top Ten Airborne "Specialty Crop" Exports and Their Share of the State's Farm Exports By All Transportation Modes – 2004
(In Millions of Dollars)
Source: WISER

Fresh Cherries	$91.5 (85%)
Fresh Strawberries	$30.6 (18%)
Fresh Grapes	$24.2 (5%)
Asparagus, fresh or chilled	$22.2 (50%)
Lettuce, all varieties	$9.2 (6%)
Onions & Shallots, fresh/chilled	$6.0 (14%)
Peaches & Nectarines	$5.7 (7%)
Raspberries, blackberries, etc.	$4.8 (24%)
Tomatoes, fresh or chilled	$3.3 (5%)
Vegetables NESOI fresh/chilled (HS-70990)	$2.1 (10%)

California's airborne agricultural exports go primarily to markets in the Northern Asia (Japan, China, Korea, Taiwan and Hong Kong) (Figures 1-5 and 1-6). By contrast, airborne shipments to neighboring Canada and Mexico are understandably limited by the ready availability of less expensive truck and rail routes. Japan, not surprisingly, has been the top destination for California's airborne agricultural exports, although shipments there have plateaued in recent years. Most startling has been the huge surge in airborne shipments of California agricultural products to China in the brief period since that country joined the World Trade Organization in 2001. Over the next three years, the state's airborne agricultural exports to China tripled, then quadrupled, and then doubled again for an overall thirty-fold increase in trade, from $3.1 million in 2001 to 94.4 million in 2004. By comparison, California's overall farm export trade with China grew immensely during the same period, increasing from $186.3 million in 2001 to $663.6 million in 2004, a somewhat more decorous pace of growth. (The sharp increase in airborne shipments to China apparently did not come at the expense of California's airborne agricultural export trade with Hong Kong, which saw a fairly robust 41 percent increase, from $11.1 million in 2001 to $15.7 million in 2004.)

Figure 1-5.

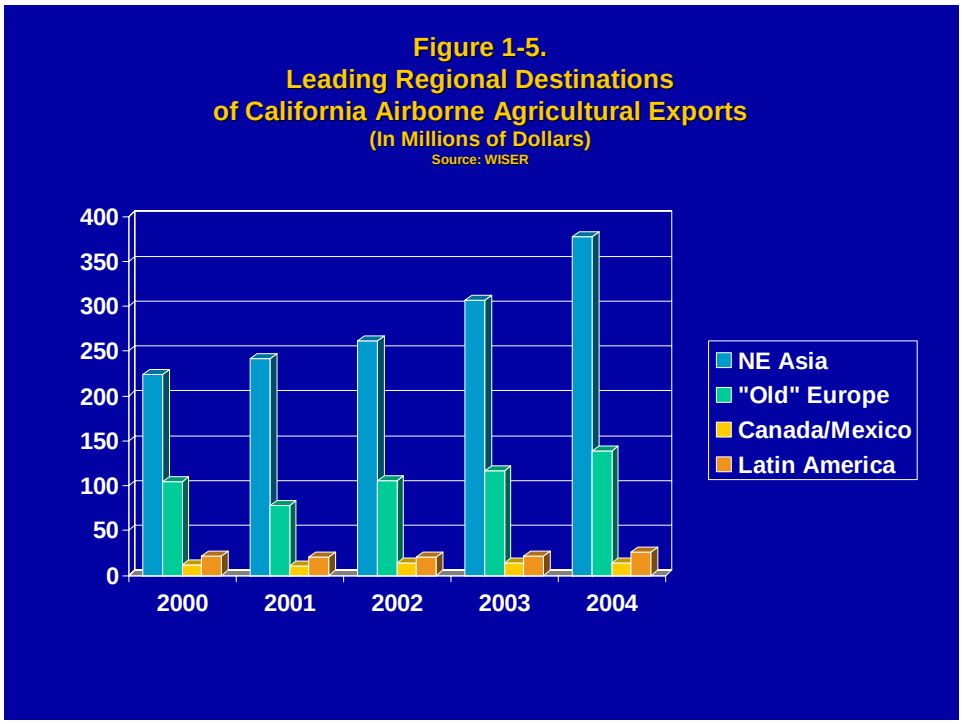
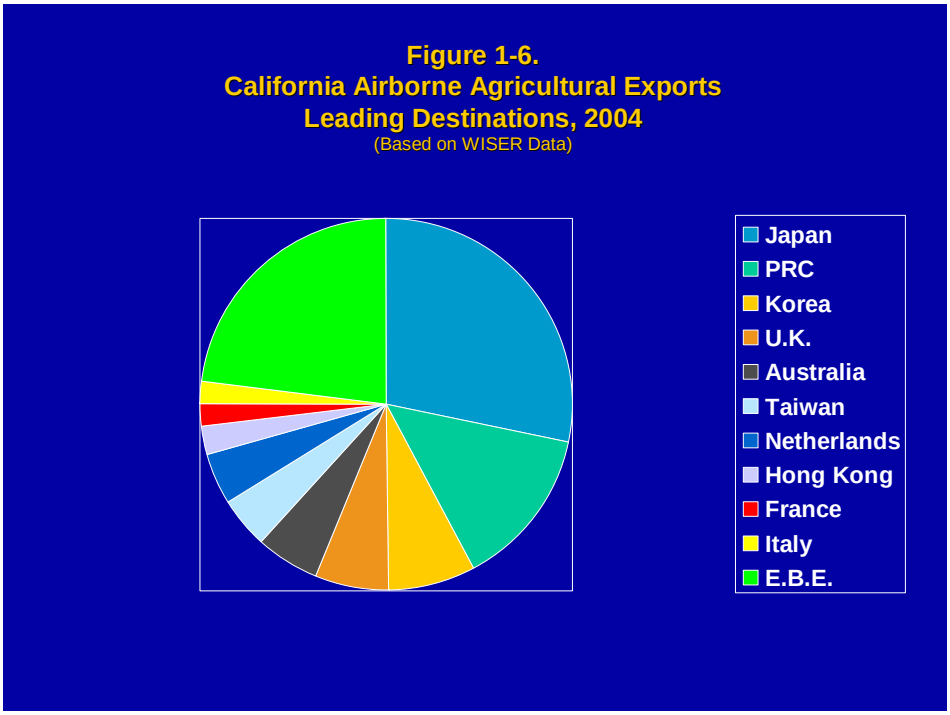


Figure 1-6.



Of additional interest is the value of airborne exports to the advanced economies of Western Europe and to the developing economies of Latin America. Although the increase of California's airborne agricultural exports to Europe parallels the recent strong growth in the state's overall farm export trade with the European Union,[4] the findings in both cases are noteworthy for being somewhat counterintuitive, given the popular impression that the EU is intensely hostile to importing U.S. food products. That the conventional wisdom in this instance is evidently erroneous not only suggests that the state's growers and shippers should reconsider their global marketing strategies but also regard in a new light the likely prospect that at least one Central Valley airport – most probably Sacramento International – will be offering direct or even non-stop flights to London and Frankfurt within a decade. As for the data on Latin American exports, there is considerable reason to believe that the available data actually understate the value of California's airborne agricultural exports to Central and South America.[5] Considering the fast if sometimes turbulent

[4] The European Union outdistanced Canada and Japan to become the leading destination for California farm exports in 2003, according to the Agricultural Issues Center at UC Davis. See: http://aic.ucdavis.edu/pub/03_table4.pdf.

[5] Despite efforts to improve the quality of state export data, shipments of commodities originating in one state are often misreported as an export of the state from which the

pace of economic growth in major Latin American economies like Brazil and Chile, California's agribusiness strategists should not discount the possibility that urban areas throughout Latin America will emerge as significant markets for California's high-quality, high value-added food products.

Future Prospects for Airborne Agricultural Exports

Looking ahead, there are at least five reasons to anticipate that demand for air freight services among California's agricultural exporters will expand.

1. Changes in the maritime shipping industry may not be especially conducive to the needs of food exporters. Maritime shipping – the customary mode for moving most farm products to overseas markets – is becoming an increasingly problematic partner for exporters of high value-added perishable farm products. The congestion plaguing the Ports of Los Angeles and Long Beach during much of 2004 has been well-documented in the media. But a transportation infrastructure over-stressed by surging cargo traffic is only one manifestation of broader developments that are reshaping the maritime shipping industry both here and abroad.

To achieve new economies of scale, shipping lines have been investing heavily in the construction of larger and larger vessels capable of carrying more and more standardized shipping containers. Over the next four years, no fewer than 227 container ships too large to pass through the Panama Canal will enter service. These so-called "post-Panamax" vessels account for more than half of the total number of container ships on order. By at least one authoritative estimate, two-third of the containers that will be imported into the United States in 2020 will arrive on ships too large to navigate the Panama Canal.[6]

Huge, new container ships bearing more than 8,000 twenty-foot equivalent units (TEUs) have begun calling at the Ports of Los Angeles and Long Beach. (Until a channel dredging project is completed in 2006, vessels of that size will be unable to

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shipment leaves the U.S. See Jock O'Connell, "California's New Latin American Trade Strategy Based on Flawed Data," *Sacramento Bee*, March 7, 1999.

[6] Cited in *The New York Times*, "New York Port Hums Again, With Asian Trade," November 22, 2004.

call at the Port of Oakland.) Yet, because of their size, these vessels and the even larger one now entering service can be handled by fewer and fewer of the world's ports.[7] Even now there is an unprecedented level of congestion at major seaports as well as along the highways and railways that carry cargoes to and from inland locations. In many regions where rapidly expanding economies are spawning newly affluent customers and new geographic markets for value-added food products, surface transportation systems are often inadequate, especially for the purpose of moving perishable commodities.

Inadequate infrastructure is not restricted to developing countries. In Southern California, traffic generated by the movement of containers through the twin Ports of Los Angeles and Long Beach has led to serious air pollution problems and to congested and frequently dangerous highway conditions. Those consequences have, in turn, spurred a political backlash that imperils plans to expand port operations to cope with an anticipated doubling or even tripling of cargo volumes by 2020.

While virtually all of the media attention has been focused on lengthy delays in unloading vessels and transporting containers to railyards near downtown Los Angeles, exporters are likewise affected by congested ports for the simple reason that inbound ships lying at anchor cannot load containers filled with perishable agricultural exports. Such delays not only impose additional direct costs on shippers, they risk undermining the confidence of overseas customers who are often able to source the same goods they are importing from California from other regions of the world.[8] In several instances, congestion in San Pedro Bay prompted the diversion of vessels to other West Coast ports, a development which left exporters who had

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[7] Without completion of a multi-million dollar dredging project, it is problematic whether the Port of Oakland could accommodate the latest generation of container ships.

[8] A plan announced in November 2004 to establish a new rail connection between the Port of Oakland and a transport facility in Shafter (Kern County) promises to afford agricultural shippers will access to maritime shippers that circumvents highway congestion in the San Francisco Bay Area. The port has entered a three-way alliance with an intermodal operator, Northwest Container Services Inc., and the city of Shafter, which developed the California Integrated Logistics Center. Imported containers would be rail-shuttled to the Shafter facility. Unloaded containers would be available for agricultural products to be shuttled back to Oakland for export. Construction has been initiated on an intermodal yard near the Oakland Army base to handle the new Shafter shuttle.

already delivered their cargoes to the Southern California ports with little choice but to chase those ships up the coast.

Traffic congestion in and around seaports is not, however, a condition idiosyncratic to Southern California. If anything, the problem is broadly endemic all up and down the Pacific coast at a time when trade volumes are burgeoning.[9] In Northern California, traffic problems linked to demographic trends have been especially unkind to agriculture. The infamous absence of sufficient stocks of affordable housing in the San Francisco Bay Area has been a major factor in propelling a population boom in adjacent San Joaquin Valley counties, where the resulting suburban sprawl increasing threatens valuable farm land. Yet, because many of those seeking less expensive housing in the San Joaquin Valley continue to work in the Bay Area, highways leading from the San Joaquin Valley into the East and South Bay have become a commuter's nightmare. More to the point, highways leading from the farms and packing houses of the San Joaquin Valley to the Port of Oakland (as well as to Bay Area airports) have become among the most congested in the state.[10]

Still, the situation in San Pedro Bay through 2004, which saw over 100 ships diverted to other West Coast ports, could prompt permanent changes in trade routes.[11] The ports' last cargo crunch, which began in July 2004 and ended in November, stranded as many as 94 vessels at a time, up from the usual range of 30 to 50 ships. The wait to unload stretched as long as nine days. With the expiration of U.S. quotas on clothing and textile imports scheduled for January 1, 2005, it is expected that all West Coast ports will see a dramatic increase in shipments of these products from China, India and other East Asian sources. In short, the shipping crisis seen at the

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[9] See William Armbruster, "US Infrastructure a big challenge to China trade growth." *Pacific Shipper* magazine, October 18, 2004. Armbruster comments that as much, if not more time is required to transport a container between Chengdu, a city of nearly 9 million 1,500 miles up the Yangtze River, and Shanghai as to transport the same container from Los Angeles to Shanghai.

[10] Leslie Fulbright, "I-580 home to 3 of Bay Area's worst traffic bottlenecks East Bay gridlock fueled by growth in San Joaquin Valley," *San Francisco Chronicle*, January 7, 2005.

[11] *The Los Angeles Times* reported on November 18, 2004, that Southern California "port officials and shipping lines expect another surge of cargo after global tariffs that have kept a tight cap on Chinese exports of textiles and apparel expire Jan. 1." See "L.A. Ports Unclogged but Not in the Clear."

Southern California ports during the second half of 2004 could become a permanent condition.

On November 16, 2004, the *Financial Times* observed that "express delivery operators such as UPS and FedEx report more customers switching to expensive air cargo for their most valuable products because of congestion elsewhere." In a November 2, 2004 report, the California Farm Bureau Federation noted that shipping "delays at the ports of Los Angeles and Long Beach worry orange exporters as the peak shipping season looms." [12] Maritime congestion is not limited to California seaports. In 2004, Hyundai Merchant Marine and the "K" Line announced they would halt service to the Port of Portland by the end of the year, leaving only Hanjin Shipping to handle oceangoing container traffic along the Columbia River to Portland.[13] Both lines are shifting to larger vessels requiring deeper channels than the Columbia River port currently offers. The upshot, according to one prominent transportation analyst, is that shippers may increasingly opt to "overfly some of the congested West Coast ports."[14]

2. Demand for the kinds of specialty crop products grown in California is increasing. There has been a dramatic expansion of the worldwide market for high-quality and typically high value-added food products grown and processed under conditions conducive to wholesomeness and food safety.[15] Prosperity has been spreading to ever-larger segments of populations in most of the world's countries, especially in those often classified as Newly-Industrialized Countries (NICs). No longer are significant markets for imported food products confined to the largest metropolitan areas. With that prosperity comes more discerning and demanding tastes for food products that are considered nutritious, wholesome and safe to

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[12] California Farm Bureau Federation, *Food and Farm News*. November 2, 2004.

[13] "Container Liners Pullout To Affect Western U.S. Farm Shippers," *Taiwan News*, September 6, 2004.

[14] Kevin Neels, vice president of Charles River Associates, quoted in "China Provides Lift" by Ed McKenna in *Traffic World* magazine (December 20/27, 2004), p. 37.

[15] According to a World Trade Organization report: "Since the mid-1980's there has been a rather dramatic acceleration in the growth of world exports of highvalue and processed agricultural products. The share of this dynamic product category in world agricultural trade has increased from 39% in the early 1980's to 52% on average in 1995-1997." *Market Access: Unfinished Business* (Geneva: WTO, Special Study 6, 2001).

consume. As a June 2004 report from the Economic Research Service (ERS) of the U.S. Department of Agriculture observed:

> "High income-growth rates in developing countries portend higher rates of fruit and vegetable consumption and trade in the future. In the meantime, developed countries will dominate global consumption and trade of fruits and vegetables, not only because of their high income levels but also because of consumers' increasing concerns about healthy eating, which tend to increase fruit and vegetable intake in their diets. The United States is well placed to take advantage of the potential for greater horticultural trade."[16]

In an update issued in February 2005, the ERS forecast that U.S. horticultural product exports this year would reach a record $14.5 billion. That revision largely reflects generally higher prices due to increased foreign demand and a weaker dollar. A further depreciation in the U.S. dollar, and continued strength in the global economy support this forecast, which is up $1.2 billion from the previous year.[17]

Historically, California's food exports have gone to a small number of high-income countries. According to the Agricultural Issues Center at UC Davis, "California exports agricultural products to almost 150 countries, but the 10 principal destinations account for 85 percent of the export value, and the main four destinations—the North America Free Trade Area (Canada/Mexico), the EU, Japan, and China/Hong Kong—account for more than two thirds of that total."[18] While these are likely to remain major markets for California food products, the dramatic expansion of middle and upper-class populations in China as well as in a host of other developing countries suggests the emergence of important new markets for California's agricultural exporters. The logistical challenge will be to ensure that California-grown

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[16] *Global Trade Patterns in Fruits and Vegetables* by Sophia Wu Huang et al. Agriculture and Trade Report No. (WRS0406) 88 pp, June 2004 (Washington, D.C. USDA, Economic Research Service), p. iv. The report further notes that: "*Demand-side factors*, which include rising incomes and the creation of a middle class that demands quality produce in all seasons and is willing to pay, have had major consequences for trade."

[17] See *Outlook for U.S. Agricultural Trade*/AES-45/Feb. 24, 2005 issued by the Economic Research Service, USDA.

[18] José E. Bervejillo and Daniel A. Sumner. "California's International Agricultural Exports in 2002" (UC Davis: Agricultural Issues Center report no.23, 2003), p. 5.

food products can be shipped to discerning consumers in geographically dispersed markets. An economically vibrant China, for example, boasts 166 cities with populations over one million (compared with nine in the United States). Yet the country is plagued with a shoddy surface infrastructure that will inhibit distribution to metropolitan centers not directly served by a major sea or river port. Similarly, the surface transportation infrastructure in Brazil, another fast-growing developing economy, is notoriously deficient.[19] In India, nearly 35 metropolitan areas have populations exceeding one million. More importantly, India's recent economic boom has been spreading to more and more of the nation's second-tier cities.[20]

USDA analysts expect economic growth in developing countries to exceed 6 percent in 2004 and 5.5 percent in 2005. Asia continues to be the fastest growing region.[21] Overall growth in Asia is likely to exceed 7 percent in 2004 and 6 percent in 2005. India is continuing rapid GDP growth in excess of 7 percent in 2004 and its growth is expected to be near 7 percent again in 2005. Growth in South Korea and Southeast Asia will be in the 5 to 6 percent range in 2005, while Vietnam will continue growing at a rate over 7 percent.

The five major economies in Latin America--Argentina, Brazil, Mexico, Venezuela, and Chile--are all experiencing strong growth. The region as a whole is likely to grow around 4 percent in 2004 and 2005. Growth in Brazil is expected to reach almost 4 percent in 2004 and 2005 due in large part to growing exports to China. Argentina is likely to have growth of around 7 percent in 2004 and near 4 percent in 2005. The impact of peso depreciation on Argentine exports keeps Argentina a strong agricultural export competitor through 2005. Mexico's economy is strongly tied to the United States. GDP in Mexico is likely to grow over 4 percent in 2004 and 2005. Chile, which has followed a strong export-oriented policy, continues to have growth of around 5 percent in 2004 and 2005.

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[19] "Drive for Global Markets Strains Brazil's Infrastructure ," *The New York Times*, October 27, 2004.

[20] Saritha Rai, "India's Boom Spreads to Smaller Cities," *The New York Times*, January 4, 2005.

[21] USDA Economic Research Service, *Outlook for U.S. Agricultural Trade*/AES-44/ (November 22, 2004).

GDP growth rates continue to be substantial in most of the countries of the former Soviet Union. While Africa's GDP growth has improved markedly to an average rate exceeding 4 percent in 2004, performance varies considerably from country to country.

Most pertinent was the standing of perishable items in a forecast of the fastest growing air shipper industry segments, ranking behind capital equipment, computers, and intermediate materials but ahead of telecommunications equipment, consumer products and textiles. As the forecast's authors conclude: "The size of perishables flows testifies to rising consumer demand for cut flowers, exotic fresh seafood, and contra-seasonal vegetables."[22]

As the world's population and food consumption continue to expand, so will the demand for the high-value products where California maintains a comparative advantage. Indeed, during the 1990s, world trade involving high-value and processed food products like those grown in California rose with particular vigor.[23] Nationwide, exports of all agricultural products grew more than three times as fast as the total of all U.S. exports in the last year. The U.S. Department of Agriculture has forecast record agricultural exports of $61.5 billion through Sept. 30. The United States is the foremost exporter of fresh fruits and nuts and runs second in the export of fresh vegetables.

Another demographic trend worth noting is the increasing urbanization of the world's populations.[24] According to a study prepared for the Asia-Pacific Economic Cooperation Forum Ministerial Meetings in Bangkok in October 2003: "The most significant demographic change in the Asia-Pacific region in the next two decades will be the rapid growth of urban populations. *Future urban growth will test the efficiency and capacity of the region's food system to deliver a continuous flow of safe,*

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[22] Brian Clancy and David Hoppin, "After The Storm: The MergeGlobal 2004-2008 World Air Freight Forecast," *Air Cargo World*, May 2004.

[23] Tiffany Arthur, Colin Carter, and Alix Peterson Zwane, "International Trade and the Road Ahead for California Agriculture" in Jerry Siebert (ed.) *California Agriculture: Dimensions and Issues* (University of California Giannini Foundation of Agricultural Economics, 2003), p. 127.

[24] For a cursory survey of the history of urbanization, see Joel Kotkin, *The City: A Global History* (New York: The Modern Library, 2005), especially Part VI, "The Modern Metropolis.

reasonably priced fresh and processed foods."[25] [Emphasis added.] The region's urban population is projected to grow by over 580 million people between 2000 and 2020, an increase of about 45 percent. During the 1990s, for the first time in history, the region's urban population grew larger than its rural population. Urban diets typically differ from those of people living in rural areas, largely due to higher incomes and the substitution of animal products, fruits, and vegetables for more traditional food staples. In many urban areas in rapidly developing economies like India and China, residents are also developing an increasing appreciation for food products and dietary regimes normally associated with Western societies.[26]

In the Far East, economic growth has been driven largely by fast-growing urban agglomerations in coastal China, Indonesia, Thailand, Malaysia, and Vietnam. Levels of urbanization in this region are not high by international standards (at 36 percent of the population in 2000), but they are set to rise dramatically, to over 50 percent by 2025. By then, half a billion more people will live in urban areas. Cities drive East Asia's growth. Cities account for up to 70 percent of East Asian GDP growth. [27]

Just fifty years ago, 103 cities worldwide had populations of more than a million people, with New York and Tokyo the only two with populations over 10 million. Today, there are 20 cities that have topped the 10 million mark, and an additional 428 are above one million. Since 1980, for example, Bogota has grown from 3.7 to 7.6 million people; New Delhi from five to 15 million; Lagos from 2.6 to 11.1 million; Bandung from 1.8 to four million; Sana'a from 240,000 to 1.6 million; and Bamako from 500,000 to 1.7 million. At the very top are Tokyo with a metro population of 35 million followed by Mexico City, Mumbai, Sao Paulo, and New York City. Overall, three billion of the world's 6.2 billion people now live in cities. This is up from only 1.7 billion in 1980, and forecast to hit five billion by 2030. Rural populations, meanwhile, have peaked and are expected to start declining by the end of the current decade. The United Nations' Department of Economic and Social Affairs

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[25] William Coyle, Brad Dilmour and William J. Armbruster, "Where Will Demographics Take the Asia-Pacific Food System," in *Amber Waves* (USDA ERS), June 2004.

[26] See Monica Bhude, "As Cash Flows In, Indian Goes Out to Eat, *The New York Times*, April 20, 2005.

[27] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, "Connecting East Asia: A New Framework for Infrastructure" (March 2005), pp. 42-46.

forecasts that almost all population growth expected for the world in the next thirty years will be concentrated in the urban areas.[28]

Exports are crucial to California fruit, nut and vegetable growers. Four of our country's top 10 specialty crop exports -- almonds, wine, table grapes and raisins -- are grown principally in California. In 2002, over 90 percent of all table grapes, lemons, processed tomatoes and garlic that the U.S. exported were produced in California. More than 80 percent of the California almond crop -- over $1 billion worth -- is exported. Fresh lettuce and strawberries, two other commodities grown primarily in California, have increased their exports by 85 percent and 76 percent respectively since 1999.

Exports to our traditional markets continue to grow. For example, fruit and nut exports to the European Union were nearly $1.1 billion in 2003, a 33 percent increase over 1999, while exports of fresh vegetables to Canada increased over 29 percent in the same time period.

Finally, given the growing importance of product differentiation in which California agricultural exporters may find it useful to emphasize the issue of food safety, air shipments of fresh produce minimize the risks associated with improperly shipped edible products.

3. The business of feeding the world's people is becoming increasingly consolidated and standardized along Western marketing lines. The multinational businesses that feed much of the world's population are becoming more and more concentrated and globalized. The trend toward greater and greater consolidation in the wholesale, retail and food processing segments of the food industry continues not only in North America and Western Europe but throughout the world. In recent decades, there has been a distinct trend in the world's food and beverage industries toward larger and fewer enterprises in production, processing, and distribution. Spurring this trend forward has been factors such as the ongoing progress toward economic integration in Europe, the continued consolidation of North American food processors, wholesalers and retailers through mergers and

[28] United Nations, Department of Economic and Social Affairs, *World Urbanization Prospects: The 2003 Revision* (New York, 2004), p. 4.

acquisitions, and the imperative facing major North American and European corporations to expand beyond their respective domestic markets, which especially in Europe's case, have limited growth potential.[29] According to one leading food industry executive, both the globalization of the food industry and its consolidation are also being driven by the need to satisfy the expectations of stock markets, which have become an increasing source of capital for food companies.[30] What could be called the first stage of consolidation in the global food and beverage industry, up to about the mid-1990's, has predominantly been a matter of larger companies like Nestle, PepsiCo, Unilever, Danone, etc, steadily buying up smaller national or region companies in their areas of core business and strengthening their global market share in those areas.

At the retail level, chains like France's Carrefour have been busily opening or acquiring large stores in Asia and Latin America. In just the first six months of 2004, Carrefour opened 21 new hypermarkets in Asia, bringing its total in that region to 165 – eleven more than it operates in Latin America and just 14 fewer than Carrefour has in France.[31] Wal-Mart has more than 1,100 stores in Mexico, Puerto Rico, Canada, Argentina, Brazil, China, Korea, Germany and the U.K. This includes 11 Supercenters in Argentina, 16 in Brazil and in Korea. The retailing giant plans to open 15 new stores in China next year as it competes for a foothold against Carrefour and the Metro Group. Wal-Mart already has 41 stores in 20 Chinese cities.

In Latin America during the 1990s, the transformation of the food retailing system began in the 1980's and accelerated in the 1990's as countries opened their economies, often to satisfy conditions for loans from the International Monetary Fund

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[29] By some estimates, the populations of several European countries are expected to shrink over the next few decades unless immigration restrictions are liberalized. A 2003 report from the Austrian Academy of Science in Vienna show that Europe's population could decline by as much as 88 million people if present trends continue for another 15 years. The population of the European Union was about 375 million in 2000. See Mark Henderson, "Europe shrinking as birthrates decline," *The (London)* Times, March 28, 2003.

[30] Reg Clairs A.O. is a former CEO of Woolworths Ltd. and Chairman - Supermarket to Asia Board. His remarks were presented at the 2001 World Food and Agribusiness Forum in Sydney, Australia.

[31] Carrefour also has 218 smaller "supermarkets" in Latin America. It is worth noting that, prior to troubles arising from financial reporting irregularities, the Dutch multinational food retailer, Royal Ahold, had a very strong presence in Latin America, the U.S. and Asia. It has since been obliged to dispose of many of these stores.

and the World Bank.[32] As foreign investment flooded in, multinational retailers bought up domestic chains or entered joint ventures with them. Supermarket chains went from controlling 10 to 20 percent of the region's retail food market to dominating it, according to researchers at Michigan State and the Latin American Center for Rural Development in Santiago, Chile.[33] By contrast, that degree of market penetration took fifty years in the United States. While the process is furthest along in Brazil, Argentina, Chile, Costa Rica and Mexico, the same trend is occurring in smaller, poorer economies like Guatemala. The chains now dominate sales of processed foods and their share of produce sales is growing, to as much as a 30 percent share in Argentina and a fifty percent share in Brazil.

According to a 2003 report published by the U.S. Department of Agriculture's Economic Research Service: "The rapid expansion of supermarkets in Latin America and Asia are both changing produce retailing and well as deeply transforming the agrifood sector in these regions. The supermarkets have successfully established due to their ability to offer consistent quality products at competitive prices. This has been enabled by a decrease in costs due to consolidation of product procurement and adoption of modern logistics, and an increase in food quality and safety due to implementation of private and public standards."[34]

Just as in other industries which have engineered new forms of worldwide production and distribution, the global food industry will likely place greater reliance on fast, reliable and efficient modes of moving both raw materials and finished products from one region of the globe to another. A premium will be placed on being able to meet tight supply schedules.[35]

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[32] See Thomas Reardon, C. Peter Timmer and Julio A. Berdegué, "The Rise of Supermarkets in Latin America and Asia: Implications for International Markets for Fruits and Vegetables" in Anita Regmi and Mark Gehlhar (editors). 2003. *Global Markets for High Value Food Products*, Agriculture Information Bulletin, USDA-ERS.

[33] Celia W. Dugger, "Supermarket Giants Crush Central American Farmers, " *The New York Times*, December 28, 2004.

[34] *Ibid..* The authors define "supermarkets" as self-service stores, whether in chains or independent, that are typically from about 350 to 4000m2 in size and are equipped with three or more cash registers. Hypermarkets are even larger establishments.

[35] See Hoy F. Carman, Roberta Cook and Richard J. Sexton, "Marketing California's Agricultural Production" in *California Agriculture: Dimensions and Issues*, Jerry Siebert (editor), University of California Giannini Foundation of Agricultural Economics, 2003, pp. 89-119. The authors specifically call attention to "a recent trend throughout the developing world

4. The value of California's farm exports will increase. California agriculture's progressive shift toward higher and higher value-added crops that command premium prices will continue as its farmers strive to remain competitive in the face of aggressive competition from foreign growers. As the value-to-weight ratio of California farm products increases, air cargo becomes a more economically viable alternative to maritime shipping, especially for "vine-ripened" produce and other perishable farm products where harvest-to-market delivery times are short and where care in handling is at a premium. In a 2004 report from the Public Policy Institute of California, the authors postulate that the rapidly changing composition of international trade toward goods with higher and higher value-to-weight ratios "suggests an increasing reliance on airports relative to seaports."[36] Organically-grown produce should also continue to see increasing markets.[37] This trend could accelerate if strategies to market California food products as distinctively wholesome and nutritious prove successful. Smaller volume hyper-specialty crops which command comparatively extravagant prices at gourmet markets and high-end restaurants (such as the strawberry variety known as fraises des bois as well as an increasingly wide array heirloom fruits and vegetables) are also probably candidates for air shipment.[38]

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away from wet markets and toward supermarkets [that] bodes well for international fresh produce trade, and hence, California producers." The paper's authors estimate that the 30 largest retail grocery chains now account for at least 10 percent of world food sales. "Many of these chains have stores located on several continents and their global procurement practices and cold chain management investments and exigencies mean that these modern produce departments must be kept full year-round."

[36] See Jon D. Haveman and David Hummels, *California's Global Gateways: Trends and Issues* (San Francisco: Public Policy Institute of California, 2004, p. 45.

[37] Ironically, there are those in the organic food sector who decry the use of air freight in shipping produce to distant markets. Claims that "Air freighting produce uses around 30 times as much fuel as transporting it by sea. This not only produces 30 times the carbon dioxide emissions, but also 50 times the emissions of hydrocarbons, which contribute to smog and general poor air quality. Abel & Cole, an organic foods provider in the United Kingdom, plays up its refusal to use air-freighted goods in its advertising. The Christian Ecology Link, another UK organization, likewise decries the use of air cargo. http://www.christian-ecology.org.uk/loaf-principles.htm

[38] One California grower of the intensively flavored fraises des bois told *The New York Times* that one crate of a dozen three-ounce baskets fetches as much as $50. He also stated that he ships "a few crates" by air to New York, primarily for the restaurant trade. See David Karp, "Strawberries and Dreams," *The New York Times*, April 13, 2005.

5. Barriers to trade will continue to diminish. Efforts to liberalize both trade in agricultural products and international air transport regulations will continue apace. On the one hand, it is likely that current barriers to trade in agricultural products will be reduced, creating new markets and expanding existing ones for California growers and food processors. At the same time, there are solid prospects for continued liberalization of air transport accords that should increase the likelihood that more California municipalities will enjoy non-stop or direct air service to international destinations.[39]

U.S. trade negotiators have also been helpful in establishing new markets and reducing barriers to old ones. For example, there has been a nearly 10-fold increase in the amount of fruits and nuts exported to China. Meanwhile, fruit and vegetable exports to South Korea jumped over 250 percent in the past five years. In the past two years, the U.S. has negotiated free trade agreements with eleven countries: Bahrain, Chile, Singapore, Morocco, Australia, Guatemala, Costa Rica, El Salvador, Honduras, Nicaragua and the Dominican Republic. The combined population of these countries represents a market of 117 million people. U.S. trade officials are also working on agreements with ten additional countries: Panama, Colombia, Peru, Ecuador, Thailand, and the five nations of the Southern African Customs Union (Botswana, Lesotho, Namibia, South Africa and Swaziland). These new and pending free-trade partners, taken together, would constitute America's third largest export market and the fifth largest economy in the world. When enacted and implemented, these free trade agreements should expand opportunities for California's agricultural exporters. For example, Australia has agreed to immediately remove tariffs on imports of grapes and almonds, and Morocco has committed to phasing out its tariffs on California walnuts and pears over the next five years.[40]

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[39] While the definition of a non-stop flight is self-evident, there is frequent confusion over the meaning of a 'direct' flight. Unlike a non-stop flight, a direct flight involves one or more stops en route to a final destination. However, passengers (and cargo) remain on the originating aircraft throughout.

[40] Allen F. Johnson, "Trade plays important role for California's Ag producers," August 18, 2004, *Ag Alert*, a weekly publication of the California Farm Bureau. Ambassador Johnson is the chief agricultural negotiator in the Office of the U.S. Trade Representative.

A Challenged Infrastructure

Although there is ample reason to expect that air freight will become an increasingly attractive shipping option, especially for exporters of the high value-added specialty crops that have become the hallmark of California's agricultural economy, it is far less certain how well the state's international trade infrastructure will be able to accommodate expected growth in the volume of air freight, especially on transpacific routes. Even if concerns about terrorism do not yield security measures that severely inhibit the carriage of air cargo, especially on passenger flights,[41] the air cargo industry in this state faces considerable challenges.

The nation's airline industry is in the grips of a daunting financial crisis that may see the demise of one or more of the six "legacy" carriers -- Delta, United, American, Continental, USAirways and Northwest -- which have collectively provided the bulk of the nation's passenger and cargo air service. Low-cost carriers, today's most competitive airlines, offer low-fare service to passengers but contribute little to the nation's air cargo capacity. If anything, the quick turn-around business models of most budget carriers are simply not conducive to the carriage of air freight.[42] For example, at Los Angeles International Airport (LAX), United Airlines carried half-again as many passengers as Southwest Airlines in 2002 but handled over six times the freight tonnage of the low-cost carrier. Similarly, American Airlines, which carried just 13 percent more passengers as Southwest that same year, handled over 300 percent more freight.[43]

Closer to home, there are growing concerns that California's airports will find themselves increasingly by-passed as international trade gateways as both U.S. and foreign-flag carriers shift cargo service to better situated and more accommodating

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[41] Tom Ridge, former Secretary of the U.S. Department of Homeland Security, described cargo security as "a linchpin issue, not only for the security of our homeland, but also for our economic security as well." See his commentary "Security Responsibilities" in *Air Cargo World*, January 2005.

[42] In the words of John Kasarda, professor of management at the Kenan-Flagler Business School at the University of North Carolina: "The key to airline profitability is keeping the plane in the air -- that's the only time you make money." Quoted in Mark Skertic, "Where the Skies Are Cloudy All Day," *Chicago Tribune*, December 28, 2004.

[43] "LAX Airline Market Share Summary For January 2002 To December 2002," Los Angeles World Airways website.

airports elsewhere in the country.[44] The historic stature of LAX and San Francisco International Airport (SFO) as vital entrepôts in America's transpacific trade is being dramatically eroded as more international flights over-fly the West Coast entirely. This has been particularly evident in the case of SFO, which, between 2000 and 2004, saw the value of airborne imports fall by 35.4 percent while the value of airborne exports ebbed by 41.9 percent.[45]

At the same time, increasingly sophisticated logistical practices and ever-faster expedited trucking operations ensure that international cargo can be flown to and from a variety of "secondary" airports throughout the U.S. and still meet desired delivery schedules. More and more of the nation's air freight capacity is being moved inland, especially as major importers like Wal-Mart, Costco, Target, and Home Depot establish huge new distribution centers outside of but within easy reach of major metropolitan areas.

Further contributing to the shift away from use of traditional gateway airports is the rise of integrated carriers (most notably FedEx, UPS and DHL), which have generally opted to avoid the congestion typically found at the nation's larger, busier hub airports.[46] As a result, airports such as Memphis, Louisville and Indianapolis have achieved great prominence in the global air cargo system as hubs for the integrated carriers. At the same time, ever larger volumes of transpacific air cargo are being transshipped through Anchorage's Ted Stevens International Airport because that airport sits on a more direct route between Midwestern and East Coast cities and airports in Japan, Korea, China and Taiwan.[47]

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[44] See, for example, Aaron Karp, "Cargo's New Gateways? Congestion at traditional U.S. west coast hubs could push international freighter traffic to secondary airports," *Air Cargo World*, August 2004.

[45] According to WISER, SFO's export trade shrank from $41.8 billion in 2000 to $24.3 billion in 2004. Its import traffic likewise declined from $46.9 billion in 2000 to $30.3 billion in 2004. The drop in the value of international cargo handled at SFO was the most pronounced of any of the nation's top 25 international freight gateways. See U.S. Bureau of Transportation Statistics, *America's Freight Transportation Gateways Connecting Our Nation to Places and Markets Abroad*, 2004. See in particular Table 3. Percentage Change in the Value of Merchandise Trade Handled by the Top 25 U.S. Freight Gateways: 1999 and 2003.

[46] DHL, for example, recently announced that it would be establishing its West Coast air cargo hub at March Global Port on the site of what was formerly March Air Force Base in Riverside County. UPS has a hub at Ontario International Airport in San Bernardino County. FedEx operates a hub at Oakland International Airport.

[47] In a typical transshipping arrangement, smaller aircraft will carry cargos between Anchorage and airports throughout the U.S. and Canada. Larger, long-haul aircraft carry

Then there is the issue of airport congestion. At a time when the volume of shipments moving through California airports is expected to double or even triple by 2020, the state's two principal international air gateways – Los Angeles International and San Francisco International – face similarly severe constraints on their ability to expand their cargo handling capacities. Yet the responses mounted by airport officials and transportation planning agencies in Northern and Southern California could not be more different.

The management of Los Angeles World Airports,[48] along with regional transportation planners in Southern California, has devised a strategy that seeks to divert a significant share of air cargo operations from LAX to Ontario International (ONT) in Riverside County or even to Palmdale Regional Airport in a fairly remote corner of Los Angeles County known as the Antelope Valley. As yet, however, the strategy has not generated the hoped-for level of enthusiasm from air carriers, passengers, shippers, and freight-forwarders. As a result, LAX continues to monopolize international air cargo traffic in Southern California, with a 99.5 percent share of the value of all airborne merchandise exports flown from Southern California airports in 2004.[49] (Air transport planning in Southern California was thrown a new twist on May 17, 2005, when Los Angeles voters elected Antonio Villaraigosa as the city's next mayor. Villaraigosa had opposed an ambitious plan to expand Los Angeles International that had been devised by outgoing mayor James Hahn. Villaraigosa had campaigned instead for a broader regional air traffic strategy that would shift more of Southern California's air transport burden to other airports. Three days after the election, however, the Federal Aviation Administration approved Hahn's $11 billion plan to expand and modernize LAX even as Villaraigosa renewed his commitment to sharply scale back the massive project.)

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cargos on the transoceanic routes. The connection between Anchorage and Tokyo's huge Narita Airport is especially vital since approximately half of all air freight moving from East Asia to North America passes through Narita.

[48] Los Angeles World Airports is a self-supporting branch of the City of Los Angeles and is governed by a Board of Airport Commissioners whose seven members are appointed to staggered five-year terms by the Mayor of Los Angeles with the approval of the Los Angeles City Council. LAWA owns and operates four airports: LAX, Ontario International, Palmdale Regional, and Van Nuys Airport in the San Fernando Valley, which is billed as the world's busiest general aviation airport.

[49] LAX handled $33.9 billion in exports in 2004. The Southern California airport with the next highest export volume was San Diego International with a mere $78.3 *million* in foreign shipments.

Elsewhere in Southern California, efforts to provide air transport facilities commensurate with the region's relentless population and industrial growth have been less coherent. In Orange County, hopes that El Toro, the former U.S. Marine base, might become the site of a new regional airport were quashed by public opposition. Further south in San Diego, officials in California's second largest city are trying to resolve a long-standing controversy over whether to build a new regional airport to replace Lindbergh Field or to greatly expand Lindbergh's capacity for both passengers and air cargo. Currently, Lindbergh Field plays a negligible role in supporting California's international trade.[50] Formally known as San Diego International Airport, the facility is the nation's busiest single-runway commercial airport. Despite its rapid population and industrial growth in recent decades, the San Diego region has remained singularly dependent on airports and seaports in Los Angeles County for its overseas transportation links. Even if the community aggressively rallies behind a single airport option,[51] it likely could be several years before the region could offer the kind of airport facilities that would attract regularly scheduled air service involving destinations outside of North America.

In Northern California, SFO management has consistently rebuffed calls for formally integrating flight operations at the Bay Area's three major airports (SFO, Oakland International and Mineta San Jose International). As a result, far from collaborating under a well-conceived master plan, airports within the Bay Area as well as in neighboring counties in the San Joaquin Valley are likely to remain engaged in a hurly-burly and potentially wasteful competition to lure air carriers, passengers, and cargo.

An Overlooked Mode of Transport

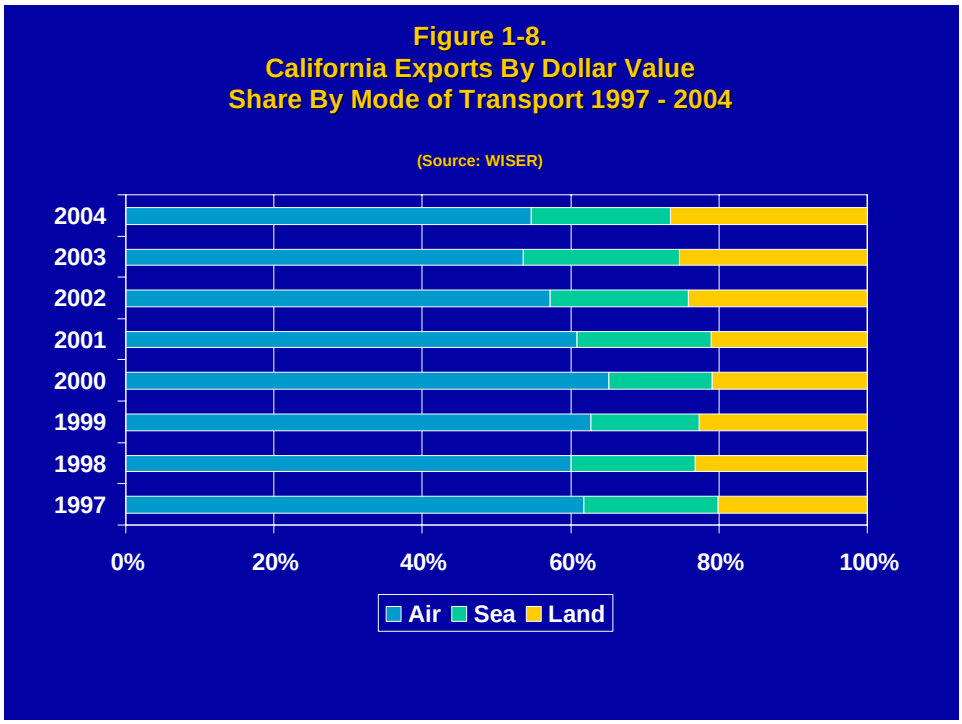
The task of ensuring that California has the international air cargo links its industries need to remain competitive in a global economy is made more difficult by the fact that few Californians are fully aware and appreciative of the vital role air cargo

[50] The airport reports having handled 155,000 international passengers and just 583 tons of international cargo in 2004. By contrast, SFO reported handling 7.6 million international passengers and 278,545 tons of international cargo in 2004.

[51] A public vote on this issue is scheduled for 2006. At present, a variety of options are being weighed by a commission charged by the State Legislature with the task of recommending final options for resolving San Diego's airport dilemma to the region's voters. The San Diego County Regional Airport Authority was established by state law in 2003 to operate San Diego International Airport and to address the region's long-term air transportation needs. The Airport Authority is governed by a nine-member appointed Board representing all areas of the County.

services play in the Golden State's export trade. Legislative hearings and conferences convened to examine the state's transportation system or the plight of the goods movement industry often dwell exclusively on surface modes of transport. Yet the truth is that, when measured by dollar value, California's economy is arguably more dependent on air cargo than on ships, trucks and trains. The reason is simple: More of California's merchandise exports are shipped by air than by either sea or land (Figure 1-8).[52] Waterborne shipments typically account for less than one-fifth of the total value of California's merchandise exports.[53] The state's huge maritime complexes are principally conduits for imported goods and for the export of bulky cargos or shipments with low value-to-weight ratios.

Figure 1-8.



[52] In 2004, airborne shipments accounted for 54.7 percent of California's $110 billion merchandise export trade according to data supplied by WISER. That was a historically meager share of exports. In 2000, prior to the collapse of the dot.com bubble and the events of 9/11/2001, air cargo's share of California's export trade was 65.1 percent.

[53] In recent years, the maritime share of the state's export trade has ranged from 14.1 percent in 2000 to 21.1 percent in 2003. In 2002, for example, exports accounted for just 16.8 percent of the total dollar value of international shipments through the Ports of Los Angeles and Long Beach.

That situation is markedly different, though, in the case of California's agricultural export trade. The vast bulk of the state's farm exports – whether calculated by weight or by value - continue to move either by sea or by overland routes to Mexico and to Canada.[54] Even so, it would doubtless surprise many Californians to learn that, in terms of sheer tonnage, vegetables, fruits and nuts comprise the largest single category of air freight exported through Los Angeles International (LAX), the state's busiest airport.[55] For certain highly perishable, high value-added specialty crops like cherries, strawberries, and asparagus, air shipments offer the only practical means for supplying lucrative overseas markets.[56] In 2004, for example, 85 percent of the state's fresh cherry exports reached their destinations by air, as did 50 percent of the state's exports of fresh or chilled asparagus. In general, perishable products now account for about 20 percent of total U.S. food and agricultural exports, and an even larger share of imports.[57]

The Logistics of Air Cargo

Many if not most California policymakers are ill-informed about modern logistics. What is more surprising is that such lack of understanding extends into the business world to include the management of companies which routinely ship and/or receive large volumes of merchandise. Over the past decade or two, companies of all sizes have tended to outsource their logistics functions. While beneficial economically, such outsourcing has had the effect of diminishing the ranks of those who might otherwise help promote the interests of the goods movement sector.

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[54] Although California ships agricultural products to nearly 150 countries, four markets — the European Union, the North American Free Trade Area (Canada and Mexico), Japan, and China/Hong Kong— account for more than two thirds of the state's total farm export trade.

[55] Measured by weight, farm products account for over 13 percent of the outbound cargo handled by LAX, according to the website of Los Angeles World Airways (LAWA). LAWA is the entity charged with operating not only Los Angeles International Airport but also Ontario International Airport, Van Nuys Airport, and Palmdale Regional Airport.

[56] For the purposes of this study, the term *Specialty Crop* refers to any agricultural commodity except cotton, feed grains, oilseeds, peanuts, rice, tobacco and wheat. California is principally known as a producer of specialty crops and, as such, has a remarkably distinctive agricultural economy, one that is far less reliant on government programs than is the case in much of the rest of the country.

[57] William Coyle, William Hall, and Nicole Ballenger, "Transportation Technology and the Rising Share of U.S. Perishable Food Trade" in *Changing Structure of Global Food Consumption and Trade / WRS-01-1* (USDA: Economic Research Service, 2001), p. 31.

Although there are sound reasons to expect increased worldwide demand for California specialty crop products, there is one issue that is seldom addressed by agricultural leaders. How, specifically, do we transport the state's farm products to market. In this case, how does air transport serve California agriculture's current and future export marketing needs?

Air cargo is carried on all-cargo freighters, in the lower-deck holds or "bellies" of passenger aircraft, and aboard "combis" – aircraft that are configured to carry both passengers and freight on the main deck. Historically, about half of all air cargo has been transported in the bellies of passenger planes. (A November 2000 report by the Bay Area Economic Forum stated that 58 percent of the air freight shipped through SFO traveled in the bellies of passenger aircraft.[58]) However, that share is diminishing as major airlines expand their freighter fleets and as integrated carriers like FedEx, UPS and DHL grab larger and larger shares of the air cargo trade.[59] Still, for shippers of perishable commodities such as fresh fruits and vegetables, scheduled passenger flights will often be the preferred option. For even though freighters offer greater cargo capacity, passenger aircraft generally offer better reliability, greater frequency, and more competitive shipping rates.[60] One major drawback for exporters, though, is that international passenger flights typically leave from some of the nation's most congested airports, where surface access frequently pose worrisome issues for shippers of perishable items.

The logistics of moving air cargo are more complicated than the business of transporting passengers. It involves packaging, document preparation, arranging insurance, picking up goods from shippers, facilitating customs clearance both at the point of origin and at the destination, and completing final delivery (Figure 1-9). In the late 1940s, the Berlin Airlift provided an extreme demonstration of the ability of

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[58] "Air Transport and the Bay Area Economy: Phase Two," Bay Area Economic Forum (November 2000), p. 10.

[59] The air transport industry customarily measures air cargo traffic in revenue mile tons (RTMS). According to the Federal Aviation Administration, all-cargo carriers increased their share of the international RTMs flown by all U.S. carriers from 52.0 percent in 1996 to 59.7 percent in 2004. That share is expected to increase to 63.6 percent by 2016. Note that the FAA data do not include foreign carriers and do not reflect the value of the goods being shipped. See the FAA's *Aerospace Forecasts: Fiscal Years 2005-2016*, p. III-50.

[60] See the comments of Scott Dolan, president of United Airlines, in the December 20/27, 2004 issue of *TrafficWorld.*

air cargo flights to circumvent barriers to surface transportation. Today's logistical barriers to goods movement more typically take the form of transportation bottlenecks caused by an imbalance between growing volumes of trade and perennially lagging programs to provide infrastructure commensurate with the needs of shippers.

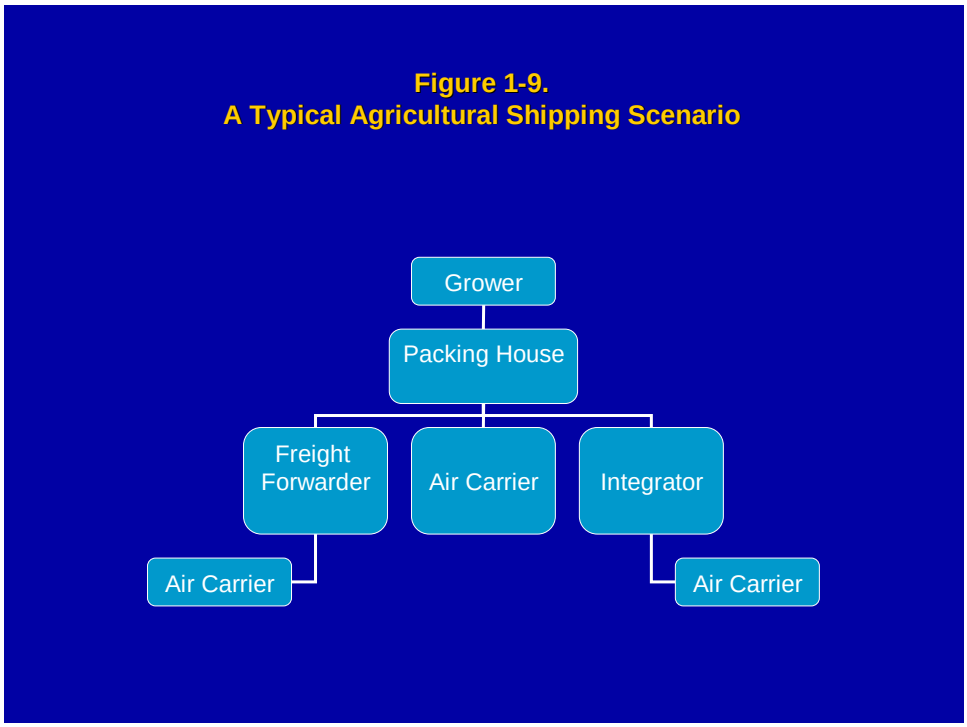
Even though California exporters may look to the air as an option to sluggish conditions at the state's maritime gateways, air cargo may not always prove to be a panacea for congested and constricted sea lanes. Any appreciable increase in air freight shipments – as is predicted for the next two decades – gives rise to a host of vexing logistical and public policy issues. Ultimately, the key question is whether the state's airports will be able to accommodate higher volumes of air cargo. As we shall see, the answer remains far from clear.

A number of recent studies have raised disturbing questions about California's international air cargo infrastructure. LAX and SFO currently dominate the international air cargo scene in California, handling between them more than 93 percent of all airborne foreign trade entering or leaving the state.[61] Both airports face serious ground access and capacity issues as well as strident political opposition to expansion plans from neighboring communities and environmentalists. The master plan guiding the $11 billion renovation of LAX allows millions of additional airline passengers a year, but fails to provide more freeway lanes or significant mass-transit projects to handle the expected crush.[62]

[61] See Chapter 4 for a detailed examination of California's air cargo system.

[62] "LAX Traffic Crunch," *Los Angeles Daily News*, November 20, 2004.

FIGURE 1-9.



For the state's agricultural shippers, the attractiveness of LAX and SFO lies chiefly in the number and frequency of non-stop and direct passenger flights departing each day for numerous destinations throughout the world. SFO serves 30 foreign airports with 369 flights per week; London's Heathrow and Tokyo's Narita are the top two destinations, with 35 weekly flights to each.[63]

LAX is the world's fifth busiest passenger airport and ranks sixth in air cargo tonnage handled. 926 scheduled weekly International Departing Operations to 64 foreign destinations. Of these, 749 of the scheduled weekly operations are non-stop, 127 are one-stop, and 50 are two-stop.[64]

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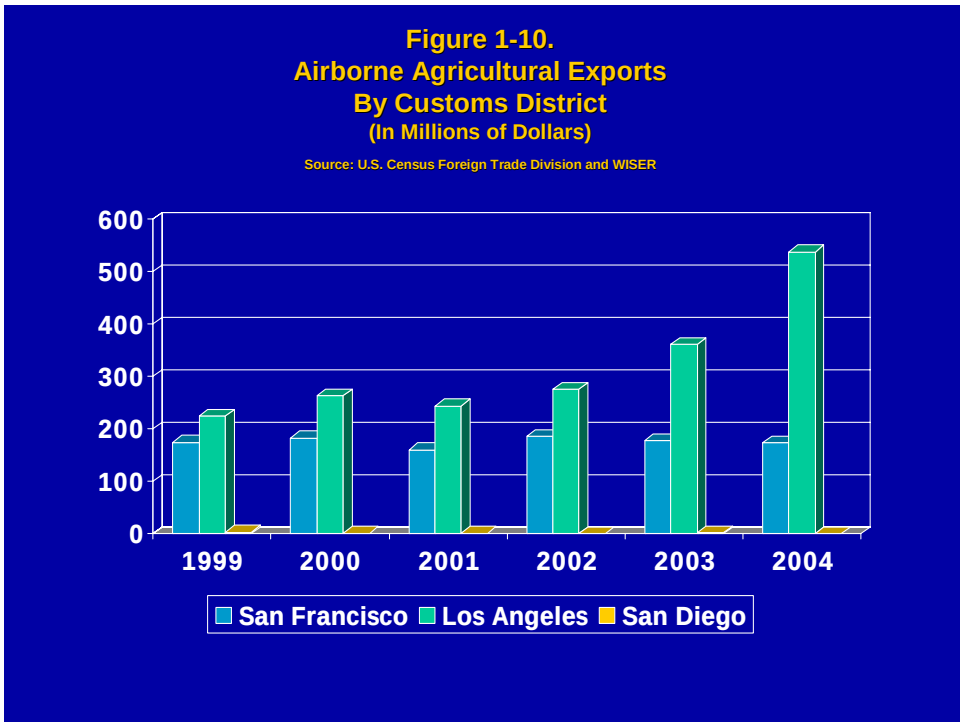
[63] These figures, on the SFO website, were valid for June 2004.

[64] These figures for LAX were valid as of November 4, 2004. They were obtained via email from LAX flight operations center.

However, traffic congestion on streets and highways in the vicinity of LAX poses a serious problem for California's agricultural exporters. In recent years, shippers of agricultural products have grown increasingly reliant on LAX.[65] (See Figure 1-10.)

The Southern California Association of Governments warned in a 2001 report that: "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."[66] A more recent 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."[67]

FIGURE 1-10.



[65] In 2000, 43.0 percent of California's airborne agricultural exports departed the San Francisco Customs district as opposed to 55.5 through the Los Angeles Customs District. By 2004, however, the LA Customs District's share of the state's airborne export trade had swollen to 74.9 percent, while the San Francisco Custom District's share had dwindled to 24.2 percent. Much of this shift reflects a substantial increase in exports of food preparations and other processed agricultural products through LAX, rather than a commensurable re-direction of shipments of fresh produce from SFO to LAX. The available data suggest a greater concentration of food processing activity in the Los Angeles area.

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

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

Numerous studies have similarly determined that SFO is not adequately equipped to provide the extensive global connections that Northern California businesses will require in the years ahead. Indeed, the latest of these reports -- an April 2004 study published by the San Francisco-based Public Policy Institute of California -- presents compelling evidence that SFO's competitiveness as an international air cargo hub has been waning since at least the mid-1990s.[68]

The PPIC report echoes complaints about SFO's air cargo operations that have been voiced in recent years by freight-forwarders, customs brokers, airline officials, and others involved goods movement.[69] 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."[70] More recently, a September 2004 commentary in *Air Cargo World* by the executive director of the Airforwarders Association of America 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."[71]

What may be more ominous, though, is that the 2004 PPIC study also identifies changes in global trade patterns that, by "compromising the ability of California's

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[68] 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?"

[69] 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.

[70] 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.

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

gateways to raise revenues through fee increases," could undermine efforts to construct and maintain the logistical infrastructure needed to cope with projected increases in the volume of domestic and international trade.[72]

Such findings have disturbing implications for agricultural exporters in Northern and Central California. On the one hand, there is absolutely no question that the presence of an efficient air cargo facility boasting extensive national and international flight connections is an indispensable asset for any region whose businesses aspire to participate in the global economy of the 21st century. On the other hand, SFO's ability to finance any substantive upgrading, updating or expansion of its air cargo capacity may be in doubt. After more than three years as the only major airport in California with a negative credit watch rating,[73] SFO saw its credit outlook upgraded to "stable" in January 2005 by the major bond rating agencies.[74] Unfortunately, this marginal improvement in the airport's credit status has collided with a Federal Reserve Bank policy of gradually increasing basic interest rates.

At a time when the volume of air cargo is expected to swell, that conclusion would understandably cause air cargo carriers to migrate to other airports offering a higher grade of service, greater convenience, and lower rents and fees. In that respect, Anchorage is widely seen to be well-positioned to capture more of the air cargo traffic flowing between the Pacific Far East and the major metropolitan areas of the American Midwest and East Coast. Similarly, air freighters are even expected to over-fly SFO to land at airports in Denver and Salt Lake City, locales that were once considered part of SFO's natural hinterland. To the extent that happens, the frequency of flights to a wide variety of overseas destinations -- and hence the competition between air carriers -- will diminish to the detriment of exporters.

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[72] Haveman and Hummels (2004), p. 56.

[73] As of November 10, 2004, Standard & Poor's assigned SFO a rating of A/Negative. An obligation rated 'A' is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher rated categories (i.e., AAA and AA). However, the obligor's capacity to meet its financial commitment on the obligation is still considered strong. Negative indicates that the rating is more likely to be lowered than raised.

[74] SFO press release dated January 26, 2005.

And then there is the prospect of seeing even more of Northern California's air traffic load shift to Los Angeles International Airport and Ontario. According to one consultant's report, "over one-half of the local air-eligible production" in the Bay Area was trucked to LAX for international flights in 2001.[75] Whether Northern California shippers will be able to find sufficient trucking capacity at reasonable costs to move goods to Southern California airports is problematic. Traffic congestion not only poses all of the risks associated with the delayed shipment of perishable items; it also cuts into the profitability of trucking companies and the earnings of drivers by reducing the number of loads they can expect to carry within a specific time-frame.[76]

As the 2004 PPIC report makes clear, however, there is a growing risk that California's entire trade infrastructure – both airports and seaports – will see valuable cargos avoiding the state. That point was further underscored by new data indicating a recent rise in the volume of containerized cargos from Asia being shipped by sea directly to East and Gulf Coast ports, thus by-passing the West Coast and land-bridge routes.[77] Such evidence reinforces a comment in another report from the Public Policy Institute of California that "it is not clear that there is enough consideration of how the state trade infrastructure – in particular its airports and seaports – fits with the nation's or the state's importing and exporting needs."[78]

If noise and other environmental issues stifle growth at the primary airports, development will occur at secondary airports. Such was the case in Europe recently when DHL canceled plans for a hub at Brussels Airport after the express carrier failed

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[75] An Origin of Movement export data set (Series EA-938) available from the U.S. Census Bureau's Foreign Trade Division indicates that just over one-third of value of air cargo exports generated by companies in the Bay Area leaves the U.S. through SFO.

[76] At a June 2004 trade logistics symposium in Oakland organized by the Bay Area World Trade Center, one San Joaquin Valley agricultural shipper claimed that his company needed its trucks to make two roundtrips per day from the Modesto area to the Port of Oakland in order to justify its investment in maintaining its own trucks. He reported that, owing to traffic congestion in the Bay Area, it was seldom possible for his truckers to make two trips per day. As a result, the company was considering sending its European-bound export shipments by rail to the Port of Houston.

[77] Address by Stephen Petracek of Booz, Allen Hamilton at an international trade forum organized by the Bay Area World Trade Center in Oakland, California, June 11, 2004.

[78] Howard Shatz, "Business Without Borders: The Globalization of the California Economy" (San Francisco: Public Policy Institute of California, 2003), p. 87.

to win approval to operate additional night flights and larger aircraft. DHL has instead chosen Germany's Leipzig/Halle Airport as a European hub.

Here in California, it is not unusual for a community with an under-utilized airport sporting an 11,000-foot runway to harbor hopes of becoming a major air cargo hub. In a state that has seen the full or partial decommissioning of several military airfields since the end of the Cold War, there is no shortage of such aspirations. Not all, however, will realize their ambitions because, while the path to your door may be a world-class runway, that is not nearly enough to attract the air carriers, freight-forwarders, truckers, logistics specialists, and the rest of the complex infrastructure needed to support a modern air cargo operation.

There are two primary determinants of which airports will emerge as major air cargo facilities. The first involves what is effectively the overriding business imperative of the air cargo industry: finding the best way of serving the needs and interests of *importers*. The other determinant is demographic in nature. Very simply, air transport services are drawn to centers of population and industry.

On the transpacific flights that account for the vast majority of international air cargo moving into and out of California, the demand for cargo space is most intense and the shipping rates are accordingly highest on the eastbound routes. By contrast, aircraft returning from North America to the Far East typically confront a serious "back-haul" problem. With a substantially larger volume of goods moving eastward than westward along transpacific air cargo routes, there is a resulting excess capacity on the westbound routes from North America to the Far East. In what is then effectively a buyers-market for westbound air cargo space, the revenues from cargos transported westbound are often described as ranging from "poor" to "disappointing." (Although data on unused air cargo capacity are not available, it is instructive to note that at the nation's busiest seaport, the Port of Los Angeles, over 60 percent of all outbound shipping containers have been empty in recent years.[79]) In short, the air cargo system is geared to serve the needs of those importing goods into the United States. Airports that are not ideally situated by virtue of location or

[79] The Port of Los Angeles reports that, in the 2003 calendar year, 63.74 percent of outbound containers were empty, as opposed to just 2.03 percent of inbound containers. In the 2002 calendar year, 60.12 percent of outbound containers were empty, in contrast to 3.89 percent of the inbound containers.

proximity to surface transportation networks to facilitate the rapid distribution of cargos to end-users in markets throughout the United States would likely not succeed in capturing new air cargo operations. Airports which principally aspire to serve America's export trade are missing a vital point. For the foreseeable future, air cargo services for exported goods will essentially be generated as a by-product of air cargo services designed to move imported goods.

The other primary factor in determining which communities will be rewarded with greater air transport service is demographic. Cities with booming populations and rapidly expanding industrial bases will invariably attract more airline passenger service. California has a surplus of military-surplus airfields, most of which were built far from population centers. Some of them are still located in remote areas of the state and therefore have little prospect of attracting passenger air service. They similarly are apt to have problems generating back-haul cargos for carriers flying imported merchandise into the state. On the other hand, the state also features numerous municipal airports serving metropolitan areas of varying sizes. In a state with a fast-growing and sprawling population, some of these airports will grow along with their communities. And while these airports will most likely see increased passenger service, there will also be an increase in air cargo capacity, if only from the cargo space that would be available aboard passenger aircraft.[80] In general, airports serving large metropolitan areas can be expected to be more successful in luring not merely air carriers but the complex infrastructure needed to support a modern air cargo operation.

Air Cargo and Perishables

Perishables are estimated to comprise between 14 percent and 18 percent of the world's air cargo, according to one leading figure in the air freight industry.[81] They also represent "one of the fastest growing and most important sectors in air cargo."[82]

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[80] As we shall see, not all passenger carriers are created equal when it comes to the provision of air cargo space on passenger aircraft. Chapter 3 of this report will discuss the impact of low-cost airlines on the air cargo industry in some detail.

[81] Christian Helms is a founder and board member of the Cool Chain Association, a non-profit organization dedicated to improving the cool supply chain industry.

[82] Frederik Jacobsen, President and CEO, Tampa Airlines Cargo, during his presentation before The International Air Cargo Association meetings in Bilbao, Spain on September 16, 2004.

Perishable products include a broad range of low to very high value products, including horticultural products as well as certain pharmaceuticals and chemicals. All share the same sensitivity to time, temperature and treatment, the three main foes of perishables. By some estimates, upwards of 30 percent of shipments perish reaching the customer.[83]

From the perspective of the freight-forwarder and the air carrier, perishable food products present at least three distinctive problems. The first is that the trade is generally seasonal. As opposed to businesses that generate a fairly regular flow of cargo, agricultural shippers tend to enter the air freight market during a period that is seldom longer than twenty weeks in any given year. (The California Cherry Advisory Board advertises Bing cherries from California as a "6-Week Vacation From The Ordinary.") Carriers are understandably reluctant to accord priority treatment to shippers who are less than regular, year-round customers. Not surprisingly, agricultural shipments are more apt to be bumped from flights in favor of a carrier's priority customers.

The second is the issue of the special handling generally required of perishable farm products. Like anything needing pampering, both costs and hassle quotients increase, often to the point that many freight-forwarders as well as air carriers are leery of handling perishable shipments.

The third is a relatively poor revenue yield for the amount of space required to transport agricultural products by air. Compared to products associated with the state's high-technology industries, food products tend to require greater volume of space to transport the same amount of weight. A pound of cherries may weight as much as a pound of computer chips, but the latter can be shipped in smaller containers. An aircraft flying below its weight capacity because it is carrying cargo with a relatively low value-to-weight ratio is not earning the carrier its maximum yield.

From the perspective of the grower-shipper or the freight-forwarder, not all airports and air carriers are created equal. Interviews with shippers and freight-forwarders

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[83] Manuel Aragon, September 16, 2004 presentation before The International Air Cargo Association meetings in Bilbao, Spain. Mr. Aragon is president of Teqflor, a Miami-based company specializing in importing and exporting perishable products.

invariably yielded complaints and some genuine "horror stories" about the cargo handling procedures employed by certain airlines or about the risks of transporting goods through specific airports.

Any significant growth in the demand for air cargo services from agricultural exporters will test the resourcefulness of the air cargo industry In California. This will be especially true for those fresh crops and processed food products requiring that a cold-chain be maintained at every stage of shipment. Rising demand for air cargo services will also challenge policymakers at both the state and local level to devote more attention and resources to adapting California's international trade infrastructure to the increasing globalization of the world's food supply.

Nearly all airborne agricultural exports from California now depart through two airports, LAX and SFO. The roadways leading to both airports are among this state's most crowded. And there is absolutely no prospect that traffic congestion will diminish. For agricultural shippers, traffic congestion poses a two-fold problem. The more obvious is that perishable cargos may miss intended flights and be stranded for several hours or even days in less than optimal storage conditions. The less obvious problem is that the more time trucks spend in traffic, the more difficult it is for truck-owners to realize a favorable return-on-investment. In general, though, traffic delays en route to the state's principal international airports unavoidably add to shipping costs which, in turn, can make the party initiating the shipment less competitive in a global market.

The most apparent solution – shifting more international air cargo operations to airports closer to the state's primary agricultural regions – may not be the eminently sensible option it may initially seem. Approximately half of all air freight is carried in the bellies of passenger planes.[84] In the case of perishable food items, the percentage is reportedly even larger because passenger flights to any particular overseas destination are more numerous and frequent than all-cargo flights and are thus more attractive for shippers of time-sensitive products. This dependence on passenger aircraft to move perishable goods suggests that the bulk of the air cargo

[84] We should note that the balance may be shifting in favor of all-cargo flights. According to the Federal Aviation Administration, the amount of international cargo (measured in revenue-ton-kilometers) flown on all-cargo aircraft rose from 49.3 percent in 1995 to 62.6 percent in 2003.

operations needed to service the needs of California's agricultural exporters are likely to remain centered at SFO and LAX until economic forces more powerful than a rising demand from agricultural exporters drive a migration of cargo operations to other California airports.

That does not necessarily imply, though, that other California airports will see few international air cargo flights. There are reasons to expect that the air cargo industry's reliance on passenger aircraft may be growing more tenuous for economic as well as security reasons. Indeed, the incestuous relationship between passenger airlines services and all-cargo operations shows definite signs of waning in Europe. There, public opposition to expanded (and particularly night-time) use of existing airports has been prompting air cargo operators to seek facilities more congenial to air cargo flights.[85]

An Air Cargo Airport for Agriculture?

In the 1980s, Farmington Fresh established a packing house for fresh produce alongside a taxiway at Stockton Metropolitan Airport. The facility was (and still is) well-situated to serve the air transport requirements of San Joaquin Valley growers. The venture proved to be a disappointment, however, in part because serving the interests of California exporters has not been a foremost consideration in determining which airports handle cargo. Serving the interests of importers, though, is a very high priority. And it will continue to be so long as the U.S. maintains a substantial merchandise trade deficit. The air cargo industry is principally geared to transport goods from foreign producers and manufacturers to U.S. end-users and their intermediaries.

If one were to establish one or more airports specifically designated to handle agricultural exports, where in California should that facility be sited? The San Joaquin Valley contains almost half the state's farmland, nearly 70 percent of its cropland, and 75 percent of its irrigated land. Six counties -- Fresno, Tulare, Monterey, Kern,

[85] In the fall of 2004, DHL abandoned plans to build its international hub at Zaventem Airport in Brussels in the face of local opposition to a plan that originally would have involved 34,000 night flights. Instead, DHL is considering Vatry, a cargo-focused airport built by the French government northeast of Paris, and Leipzig in the former East Germany. According to TrafficWorld magazine, DHL's move "will widen the gap in between passenger airline cargo services and the freighter world in Europe, where several airports are focused on wooing cargo operators away from the congested major airports." (November 8, 2004, p. 28.)

Merced and San Joaquin -- account for about half of California's total value of agricultural production.[86] But the Central Coast leads in the production of artichokes, asparagus, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celery, garlic, herbs, lettuce, mushrooms, peppers, and spinach, plus a number of more minor vegetables.[87] Growing regions in Southern California likewise produce a wide range of similar horticultural products.

Even if demand for air cargo services from California's agricultural shippers continues to surge, the level of demand will not, contrary to some hopes and expectations, appreciable alter the current air cargo system. There is no reason to assume, for example, that air carriers will initiate regular cargo service into a San Joaquin Valley airport merely to serve agriculture's shipping needs.

However, there are more powerful economic forces that may prompt airlines to shift some portion of their international air cargo operations to airports other than SFO and LAX. We have already alluded to the logistical liabilities associated with traffic congestion around SFO and LAX. Another factor is that the growing population of inland regions of the state will inevitably prompt airlines to offer more and more flights to airports serving these regions.

Much will also depend on how a fundamental disagreement about the future of aviation will play out between the world's two principal aircraft manufacturers. Airbus believes airlines want to resolve the problem of airport congestion by using much bigger planes such as its enormous four-engine A380 to make more use of finite landing slots. Boeing, however, thinks the bulk of future demand lies in airlines wanting to fly passengers on more non-stop routes from more airports, thereby taking the pressure off the 'hub' airports. With this vision in mind it dropped the idea of developing an all-new successor to its 747 jumbo jet and instead developed the 787 (known as the Dreamliner), a mid-sized plane with two engines tuned either for long or short hops and capable of carrying between 200 and 300 passengers. The

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[86] Nicolai V. Kuminoff , Daniel A. Sumner and George Goldman, "The Measure of California Agriculture," (University of California at Davis Agricultural Issues Center, 2000).

[87] Warren E. Johnston, "Cross Sections of a Diverse Agriculture: Profiles of California's Agricultural Production Regions and Principal Commodities," in Jerry Siebert (ed.), *California Agriculture: Dimensions and Issues* (Berkeley: University of California Giannini Foundation of Agricultural Economics, 2003), pp. 34-35.

first 787 is expected to enter service in 2008. Airbus is meanwhile proceeding with its super-jumbo A380, a plane that will carry 555 passengers on two decks and is expected to enter service with Singapore Airlines in 2006. (By late 2004, Airbus seemed to be hedging its bet by announcing that it, too, would build a medium-sized plane which it designated the A350. It would be a longer-range version of the company's A330.)[88]

Introduction of the 787 and a possible Airbus competitor represents a boon for airports such as Sacramento International Airport (SMF) which could finally see the advent of overseas flights. Although SMF is capable of handling larger aircraft, the 787 and A350 would provide a tighter fit between aircraft capacity and passenger demand. Already, the catchment area served by SMF generates sufficient passenger demand to warrant daily non-stop flights to London and five weekly non-stops to Frankfurt. (Demand for non-stop flights from SMF to the Far East is much weaker, suggesting that Northern California's passenger air traffic with the Orient will continue to be funneled largely through SFO for the foreseeable future.)[89]

The strong likelihood that airports in the San Joaquin Valley and Inland Empire might see the introduction of non-stop passenger service to European destinations within the foreseeable future is particularly intriguing in light of the recent emergence of the European Union as California agriculture's largest foreign market. According to the Agricultural Issues Center at UC Davis, the EU in 2003 became, for the first time in recent history, the number one destination for California's agricultural exports, accounting for about 25 percent of the total. Canada was the second largest market for California exports with 23 percent of the total, and Japan was third with 15 percent.[90]

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[88] On December 21, 2004, Spain's Air Europa became the first customer for Airbus's proposed A350 when it signed an MOU for 10 A350-800s, with options for two more. The aircraft are scheduled to be delivered between 2010 and 2012. The version selected by Air Europa will seat 245 passengers in a three-class configuration and will have a range in excess of 8,600 nautical miles (15,900 km.). Airbus also plans to offer a larger model, the A350-900, which will seat 285 passengers in three classes with a range of more than 7,500 nautical miles.

[89] Data on passenger demand at SMF was provided by Fred Davis, an aviation industry consultant to that airport.

[90] "California's Agricultural Exports in 2003," (forthcoming).

Understanding the economic and practical considerations that constrain the air cargo industry in California is a necessary prelude to appreciating how the industry can best serve the needs of California's agricultural exporters. Unfortunately, even the packer/shippers whose crops are most likely to be air-shipped to foreign markets often have little appreciation of the logistics involved once the shipment leaves the packing shed.[91]

Most of California's airborne export trade goes to the Far East and thus benefits from the significant imbalance between eastbound and westbound trade across the Pacific. With demand for cargo space on aircraft traveling from the Far East to the US significantly greater than demand for cargo space on westbound flights, freight rates are substantially less for cargos being air-shipped from the West Coast to markets in the Far East. Air carriers, after all, have to fly their planes back to the Far East to pick up premium-priced shipments, and attracting westbound shipments for "back-haul" has traditionally been a key concern. In effect, eastbound shipments subsidize westbound shipments across the Pacific.

Whether this imbalance persists has profound implications for all California exporters. Recent diplomatic pressure on China, Japan and other Asian nations to permit their currencies to appreciate in value against the US dollar is likely to have the unintended effect of increased transportation charges for US exporters. In certain cases – especially where exporters are operating on slender margins – an appreciable rise in shipping costs could be enough to offset the export-stimulating impact of a cheaper dollar.

In practice, if not by definition, most air cargo is time-sensitive. Usually, the goods are either highly perishable or must arrive at their destination in accord with a schedule set by the customer. The need to expedite shipments poses challenges for shippers and freight-forwarders that are far more acute than for goods traveling by ship, rail or truck. Airplanes are delicately balanced instruments of flight. Even with identical aircraft, cargo capacity can vary substantially depending on such factors as

[91] In our survey of cherry packers/shippers, we found that many believed that the bulk of their overseas shipments went through LAX "because of the availability of more flights to more destinations." However, the export data indicate that SFO handles the majority of California's fresh cherry exports.

humidity, temperature, winds, altitude of the departure airport, distance to destination, fuel load, etc.

So long as most air freight moves in the bellies of regularly scheduled passenger flights, air cargo operations will be centered primarily upon airports that feature the largest volume of such flights. For international cargos, LAX and SFO are therefore likely to remain the state's dominant international air hubs for the foreseeable future.

In the Los Angeles basin, airport authorities have been trying to lure more of the air cargo carriers serving that region to transfer their operations from LAX to Ontario Airport (ONT). No similar strategy has been embraced in Northern California, even though congestion at SFO has been leading the region's shippers and freight-forwarders to seek out other routes for air-freighting cargo to distant locations.[92]

The emergence of low-cost carriers both domestically and internationally will also have an important impact on air cargo operations in the state by contributing to a shift from shipping cargos in the bellies of passenger aircraft to the greater use of dedicated air-freighters. Low-cost carriers such as Southwest, Jet Blue and Ryan Air utilize operational strategies emphasizing quick turn-around times that tend to discourage the transport of cargo other than passengers' baggage. As the economic pressures generated by such airlines force other carriers to adopt similar practices, fewer flights will be available for handling air cargo. Cargo operations would then be liberated from their dependence on hub airports.

Finally, there is the dire prospect that concern over terrorism may ultimately prompt the Transportation Safety Agency to choose between two unpleasant options – more extensive and thus expensive screening of freight carried on passenger planes or an outright ban on passenger aircraft carrying anything other than the checked baggage of ticketed passengers.[93] That latter prospect is apt to create a broad new set of

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[92] See Sarah L. Bachman, "Globalization in the San Francisco Bay Area" (Los Angeles: Pacific Council on International Policy, January 2003.

[93] Some members of Congress, most notably Rep. Edward Markey of Massachusetts, have been concerned that the 300 tons of high explosives recently unaccounted for in Iraq could pose a dire threat to commercial airlines and air-freighters. According to Rep. Markey, the

incentives for air carriers to transfer more of their all-cargo operations to less congested airports able to accommodate air cargo flights. This, in turn, is likely to spur even more vigorous competition in the Central Valley and other agricultural regions of the state to develop their strengths as air cargo terminals.[94]

How that competition plays out will have a major bearing on how competitive California's agricultural exporters will remain. So, too, will the actions taken by private industry and government leaders to insure that California will continue to have an international air transport infrastructure that well serves the needs of cargo as well as passengers.

It is imperative that California's growers and food processors get ahead of the curve as the nature of the state's aviation links to the global market changes. To an extent that is generally unacknowledged, California's farm export trade is governed by pulls as well as pushes. While there certainly are California companies which have assiduously developed overseas markets for their farm products, it is also true that a large portion of the state's "export" trade should be more accurately described as another country's "import" trade. In other words, a substantial portion of this state's agricultural exports are being "pulled" abroad because foreign buyers have been opting to source farm products from California rather than elsewhere.[95]

In an increasingly competitive environment, the push-pull nature of the state's agricultural export trade is inherently unstable, especially for those products or in those markets where "Grown in California" is not considered a significant asset. Decisions to continue sourcing food products from California will increasingly hinge on the ability of the air cargo operations serving California to move goods on schedule and at reasonable costs. And that, in turn, will depend on the quality of the state's international air transport infrastructure.

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explosives are similar in type to the 16-ounce bomb used to bring down Pan Am 103 over Lockerbie, Scotland in 1989.

[94] Although Stockton Airport features the presence of Farmington Fresh, a large packer/shipper of fresh produce that once had aspirations of becoming a major air cargo conduit, Sacramento's Mather Field would be a principal contender for emerging as Northern California's leading air cargo hub outside the Bay Area.

[95] This topic, and especially its implications for the marketing of California food products and, ultimately, for the future of California agriculture needs more extensive study.

California is the nation's leading agricultural exporter, with $6.5 billion in annual shipments. Nearly 20 percent of California's agricultural production is shipped to foreign markets, much of it through the Port of Oakland; nearly 40 percent of the Port of Oakland's export volume is comprised of agricultural products grown in Central and Northern California. Fruits, vegetables and nuts account for nearly 60 percent of California's agricultural exports. When all categories of grape exports – wine, table grapes, raisins and grape juice – are combined they constitute the largest single category of California agricultural exports, valued at more the $1 billion.

Asia is the state's largest regional market for agriculture, absorbing 40 percent of total California exports by value. The second largest export region is North America, at 29 percent. Canada and Japan are the state's two largest single export markets and together account for a quarter of the state's total agricultural exports. Other major markets include Mexico, South Korea, the United Kingdom, Taiwan, Hong Kong, Germany, the Netherlands and Spain. Asia purchases 50-60 percent of the state's exports of fruits, field crops such as rice, and animal products. North American markets absorb a 70 percent of the state's vegetable exports, and Europe a majority of the state's exports of nuts.

The Demographic Imperative

Serving the import trade is a powerful priority in the international air cargo industry. But so is serving the indigenous needs of important population centers. During the past 10 years, the Central Valley has gained one million new residents. By 2003, its population reached 6.2 million, approximately as many people who live in the State of Washington. Indeed, the Central Valley's population exceeds that of 36 other states. But that is merely prelude to the real story. Over the next five decades, the population of the Central Valley is expected to grow at twice the statewide rate. By 2050, current population projections indicate that the region stretching from Shasta County in the north to Kern County in the south will be the home of 12.92 million people.

As a November 2004 report from the Public Policy Institute of California pointed out, the Central Valley is really four distinct sub-regions.[96] There is the rather thinly-

[96] Hans P. Johnson and Joseph M. Hayes, *The San Joaquin Valley at a Crossroad: Migration and Its Implications* (San Francisco: Public Policy Institute of California, 2004).

populated Upper Sacramento Valley with 645,000 people, the Sacramento metropolitan area with 2 million people, the northern San Joaquin Valley centered on Stockton with 1.4 million people, and the southern San Joaquin Valley with 1.7 million people, largely residing in the cities of Fresno and Bakersfield.

By mid-century, Sacramento County will be by far the most populous county in the Central Valley, with 2.86 million residents. Even now, the Sacramento metropolitan area has one of the strongest regional economies in the state, with historically strong job growth and low unemployment rates. The new residents it is attracting tend to be more skilled and better educated than the new residents moving into other parts of the Central Valley. In future years, the City of Sacramento will form the core of a metropolitan area that will by then encompass nearly five million residents.

In the southern reaches of the Central Valley, Fresno and Kern Counties will also see their current populations double to 1.65 million and 1.55 million, respectively. San Joaquin County's current population is forecast to triple in size by 2050, to 1.71 million.

Population growth on this order will bring many undesirable consequences, but it will, ineluctably, also result in more extensive air transport service for Central Valley residents and businesses. And, owing to technological improvements in aircraft design, there will be non-stop and direct international flights into and out of airports that, by 2050, will be serving a population base equivalent in size to the current populations of Illinois or Pennsylvania.

On the passenger transport side, there is at present a very modest amount of non-stop international air service between Central Valley airports and Mexico. Although Fresno-Yosemite International Airport (FAT) boasts of several daily flights to four Mexican destinations (Mexico City, Cancun, Guadalajara and San Jose Cabo) and one Canadian city (Vancouver, British Columbia), all trips require at least one and sometimes two changes of plane en route – most commonly at LAX. SMF is the only Central Valley airport with daily non-stops to Mexico. SMF will be adding regular non-stop connection to Vancouver in the spring of 2005.

Although demographic trends strongly suggest that international air service in the future will be much more extensive in mid-century, there is ample reason to expect that the wait will not be that long. Indeed, a recent market analysis of the demand for passenger air service in the "catchment area" served by SMF indicates that there is already sufficient demand to warrant daily non-stop flights between SMF and London, and five flights per week between SMF and Frankfurt, Germany.[97] The same analysis, however, indicates that Northern Californians will continue to rely on SFO for non-stop passenger service to the Far East.

Sacramento County airport officials have been aggressively pursuing airlines in the hope of initiating non-stop or at least direct passenger air service to the United Kingdom and Continental Europe. What may if not hasten success but at least make their task easier will be two developments, one certain, the other more problematic. The first is the introduction of the Boeing 787 into the world's airlines fleets beginning in 2006. Especially in its 787-8 and 787-9 configurations that would enable airlines to economically transport 217 to 257 passengers in a three-class format on routes of 8,500 and 8,300 nautical miles, respectively, it is an aircraft that appears ideally suited to provide global reach for non-hub airports such as SMF.

The other pending development is a new air accord with the European Union that would, among other things, permit European air carriers to play a much more active role in flying passengers between Europe and a multiplicity of American municipalities. That would increase the likelihood that SMF will attract at least one carrier willing to introduce regular non-stop service to the state capitol. During its first term, the Bush Administration embraced an "open-skies" stance in negotiating air transport agreements with other nations. Further liberalization of international restrictions on the provision of air transport services will be a boon to airports not now served by non-stop flights to foreign destinations.

These trends are most likely to benefit airports like Sacramento International and Ontario International because they already serve large and growing population areas.

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[97] Information provided by Fred Davis, a former airline executive now retained as a consultant by SMF. The airport's catchment area encompasses nearly all of Northern California except for the areas immediately adjacent to San Francisco, Oakland and San Jose airports.

By contrast, airports like Stockton Metropolitan Airport (SCK), which has struggled over the years to retain even minimal passenger air service, are less likely to benefit.

On the cargo side, the future is more ambiguous. There is no question that more and more international all-cargo flights will be diverted away from LAX and SFO. In southern California, there has been a concerted effort by Los Angeles World Airports (LAWA) officials to encourage more all-cargo carriers to use ONT to alleviate the burden on LAX. There is no similar diversion strategy in Northern California, where airports are much more apt to compete than collaborate. In that context, the most immediate "threat" to SFO's dominance of the international air cargo scene in Northern California is Oakland International Airport (OAK).

Yet the same demographic forces that will result ultimately yield more extensive passenger air service at inland airports work on the cargo side as well. While part of the incentive for redirecting all-cargo flights to inland airports involves the desire to avoid congestion and delays at SFO and LAX, another incentive is simply to provide air-cargo services to rapidly growing centers of commerce in the Central Valley and the Inland Empire. Still, who the beneficiaries will be is an open question.

In Northern California, the primary inland airport is Sacramento International. It is the nation's 42nd and California's sixth largest airport, with 8,778,163 passengers in 2003.[98] It is by far the Central Valley's leading passenger terminal, handling eight times the passenger volume of the runner-up, Fresno Yosemite International Airport (FAT). As stated previously, SMF even now has the passenger base to justify non-stop passenger service to London and Frankfurt several times a week. The introduction of new aircraft and further trade liberalization will hasten the inauguration of such service. Given current demand levels, it is not at all likely that any other Central Valley airport will see similar service within any reasonable time-frame.

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[98] For 2003, the Airports Council International placed SMF behind LAX, SFO, San Diego's Lindbergh Field (SAN), Oakland International (OAK), and Norman Mineta San Jose International (SJC) and just ahead of Orange County's John Wayne Airport (SNA) in terms of the number of passengers handled. Within the San Joaquin Valley, SMF handled more than eight times the passenger volume at Fresno Yosemite (FAT) in 2003, while Bakersfield's Meadows Field Airport (BFL) handled only 180,167. Stockton Metropolitan Airport (SCK) offered no scheduled passenger service in 2003.

The major issue for other Central Valley airports is whether they will see international all-cargo service. At the present time, Sacramento's Mather Field (MHR) and Stockton are the most obvious candidates. MHR is a former U.S. Air Force base that once served as the home of B-52 bombers. There are certain similarities between the two facilities. Both are situated adjacent major transportation thoroughfares and near extensive warehousing and distribution centers. MHR has a certain advantage in being in the Central Valley's largest population center. MHR also has a decided advantage because of the economic development taking place in the Sacramento region more closely parallels the mix of industries found in the Bay Area.

As discussed elsewhere in this report, high-technology industries are particularly heavy users of air freight services, and there is more likely to be much more of these sorts of industry in the Sacramento region than further south in the Central Valley.[99]

For those shipping agricultural produce to distant markets, Stockton does offer two definite advantages. The first is that it is closer to the agricultural epicenter of the Central Valley than is Mather. Perhaps more importantly, Stockton boasts a large cold-storage facility whose doors open directly on a parking area able to accommodate as many as two Boeing 747 cargo planes.[100] To properly service the interests of agricultural shippers, a similar facility would have to be constructed at Mather.

But whether either cargo airport will emerge as an important hub for the Central Valley's agricultural export trade will necessitate sizeable investments by public and private sectors. Here the edge seems to lie with Mather Field, which has mounted a comparatively well-financed effort to attract regular air cargo service, especially from foreign (largely Asian) carriers. By its nature, agricultural exporting is a seasonal business. By itself, it is not likely to generate the air cargo traffic that will attract airlines to provide all-cargo service to airfields proximate to the state's agricultural

[99] The presence of the University of California at Davis and California State University, Sacramento provides the Sacramento area with a substantial edge in both attracting and spawning high-technology companies that elsewhere have been important users of air cargo services.

[100] The facility, owned by Farmington Fresh, was originally built back in the mid-1980s in the hope of servicing a newly opened market for California fruits and vegetables in Japan. The expectations of the time were soon frustrated by the economics of air transport and the availability of ample, cheaper space on aircraft flying to Japan on a more frequent basis from SFO and LAX.

regions. For example, the shipping season for the state's leading farm export – fresh cherries -- is approximately two months long.

The principal findings and conclusions of this chapter may be summarized as follows:

- Even though airborne shipments represent just over five percent of California's agricultural export trade, certain high value-added farm products – most notably fresh cherries, strawberries, asparagus and organically raised fruits and vegetables – have become acutely dependent on air transport to meet overseas demand.

- California's airborne agricultural exports have been increasing at a more rapid pace than its overall farm export trade.

- Air transport will become an increasingly attractive alternative to ocean-shipping for California agricultural exporters. Indeed, shipping rates for airborne cargoes on westbound transpacific routes should become even more competitive as more air cargo capacity is added on transpacific routes to serve a burgeoning eastbound trade in U.S. imports from the Far East.

- LAX has displaced SFO as the primary gateway for California's airborne export trade in recent years, but more and more of the state's international air cargo operations, now concentrated at LAX and SFO, can be expected to migrate to other airports, including airports closer to agricultural production in the Central Valley and Inland Empire.[101]

- The establishment of international air cargo service at airports nearer many of the growing areas producing the high value-added specialty crops most apt to be air-shipped to distant markets will open new opportunities for California growers to access lucrative overseas markets in Europe as well as Asia. However, airport officials and air carriers will have to address the concerns of growers about the possibility that international flights might import pests that could prove harmful to California's agricultural economy.

[101] While a major impetus behind this shift will be the desire to relieve congestion at SFO and LAX, the turned will also be driven by rapid population growth in inland areas of the state and by the advent of a new generation of aircraft which appear to ideally suited to provide international service to medium-sized cities.

Chapter 2

Measuring the Value of California's Airborne Agricultural Export Trade

Determining the values and volumes of exports by their state-of-origin has long posed methodological challenges for researchers.[102] As we shall see, the problems are even more perplexing in the case of agricultural exports. In this section of our report, we examine the difficulties of explicating merchandise export data – and particularly agricultural export data – by the state in which the exported goods were produced. We also review the steps that have been taken to produce data that reasonably describe California's export trade.

Accurately tracking shipments of fresh fruits and vegetables as well as nuts and dried fruits is difficult enough. But what of food products derived from fresh produce? To what extent should processed or manufactured food products be considered part of a state's agricultural export trade? In the case of California and other states which grow perishable fruits and vegetables on a very large scale, companies engaged in the preserving through canning, freezing or other packaging technologies which extend product life have long been considered an integral part of the agricultural economy. So, too, have companies which use farm products as ingredients in manufacturing food products or which produce food preparations derived from farm products.[103] Indeed, food preparations – derived largely from fruit juices -- represent one of California's foremost agricultural exports. For the purposes of this study, we have opted to include these products in our calculations of California's agricultural export trade.

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[102] This is not to say there are few problems in reporting and interpreting other types of agricultural data. See Timothy A. Wise, "Understanding the Farm Problem: Six Common Errors in Presenting Farm Statistics" (Tufts University Global Development and Environment Institute, Working Paper No. 05-02, March 2005.

[103] According to the California Employment Development Department, 155,100 Californians were employed in the food manufacturing sector in 2004. Of these, 35,400 worked for firms involved in fruit and vegetable preserving.

Inevitably, as we shall see, state export totals are "contaminated" with merchandise actually produced in other states. As a result, not all of the reported exports of food products from California's airports involve crops, livestock or other food items are produced here. One reason for this is the highly imperfect manner in which export data are collected. Another reason is that modern agribusiness and food processing operate with less and less regard for formal boundaries. Befitting the increasingly global nature of the world's food business, California has emerged as an important crossroads of agricultural trade, importing produce from other states and from abroad for processing into a remarkably wide range of food products that are then shipped around the world. Even cooperatives such as Sunkist, explicitly formed to market citrus fruit grown by member-farmers in California and Arizona, have begun to engage in the overseas outsourcing of fruit for the global market. As a consequence, any listing of California's Top 250 agricultural exports will include some products that were not grown in California but which were either processed, packaged or shipped from the Golden State.

The Root of the Problem

Although various organizations traffic in data that purportedly classify exports by their state-of-origin, the fact is that there is no way to precisely allocate U.S. exports to the state responsible for the production of the exported merchandise. U.S. export data provide a poor gauge of how much each state exports for the simple reason that the data collection system was never designed to track U.S. exports back to the state in which the exported goods were actually produced. Data collection is an enormously expensive business, and the system for collecting U.S. trade statistics – when not serving an explicit regulatory or revenue-collection function of the federal government – was geared to cast light on the movement of goods over the nation's transportation system. Historically, the only entities outside the federal government who were interested in detailed merchandise trade figures were groups with vested financial interests – banks, traders, transportation planners, and, perhaps most prominently, the transportation industry.

Things changed in the early 1980s with the emergence of a sizeable U.S. trade deficit for the first time in the post-World War II era. The deficit, which yawned ever wider as the decade proceeded, grew into a major political issue at virtually every

level of government throughout the country. America's economy seemed to be under siege from Japan and Western Europe. A hitherto obscure economic statistic, the monthly merchandise trade deficit, became the most closely watched barometer of the nation's plight. And, as it soared during the decade, the American public grew more and more alarmed.

That rising level of anxiety drove elected officials at every level of government to cast around for ways in which they could help restore a trade surplus and return American industry to a competitive footing. Ignoring the advice of most economists that trade deficits arise from macroeconomic forces over which state and local leaders have absolutely no control, governors and legislatures throughout the country initiated state export promotion programs, ultimately in many instances featuring chains of trade offices overseas. At the local level, 'Buy America' policies were adopted to guide public procurement practices.

The interest now taken in international trade inevitably spawned a desire for data on how well (or poorly) each of the states was faring with their newly devised export promotion programs. It was then that governors and state legislatures throughout the country began to lobby aggressively for a statistical barometer by which to judge each state's contribution to the nation's overall export trade.

At that time, though, there was no means for generating the kinds of statistical information most desired by state government leaders. The ideal system would have determined with a high degree of accuracy and timeliness the quantity and value of goods produced in a given state that were eventually exported. The nearest approximation to that was to be found in the Census Bureau's Census of Manufactures, conducted every five years. In most state capitols, the three major drawbacks of using data derived from that source to determine a state's export trade were: (1) a lack of timeliness at a time of fast-paced developments on the world trade scene; (2) the absence of any data on non-manufactured merchandise exports such as agricultural produce or raw materials; and (3) the lack of information about the overseas markets for any given state's export trade.

Initially, state government officials turned to another approximation, this one in the form of data measuring the flow of international trade through the 42 U.S. Customs

Districts into which the U.S. is divided. In California's case, the Security Pacific National Bank was in those years in the practice of publishing an annual booklet that purported to describe California's international trade. What the booklet really depicted was the value of foreign trade that was moving through the three Customs Districts that collectively comprise California. There were obvious limitations to the use of data from the San Francisco, Los Angeles and San Diego Customs Districts as a surrogate for data purporting to describe the role of trade in California's economy. The most evident drawback was that the data did not distinguish exported merchandise by state-of-origin. Nor did the data sort imports by state-of-destination. As America's principal gateway to the Pacific Rim, California's transportation system has always been awash in goods that were neither produced nor consumed within its borders. (Fully forty percent of the nation's container trade moves through the neighboring Ports of Los Angeles and Long Beach alone.) By the same token, exports of goods that were indeed produced in California would be 'lost' to California's export totals if the goods exited the country via an out-of-state Customs District. As a consequence, California's "trade figures" tended to be skewed toward Asia and away from Europe.[104]

Under intense political pressure from governors, state legislators and their congressional representatives, federal government officials sought to adapt the existing methodology for compiling national export data to the needs of the several states. It would prove to be an adaptation that generally satisfied all but those who looked too closely at the resulting data.

Historically, U.S. international trade data have been collected by the Customs Service, now part of the U.S. Department of Homeland Security,[105] and were compiled and distributed by the Census Bureau of the U.S. Department of Commerce. The data are now displayed using the United States' Harmonized Tariff Schedule (HTS) of 10-digit codes to describe the merchandise being shipped. In the case of merchandise exports, the raw data are not generated at the location where the goods being exported were manufactured, grown, mined or processed. Instead,

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[104] See the California State World Trade Commission's 1987 study, "California Export Statistics," for a discussion of the various data series that could then be used to shed some light on the export performance of California-based industry.

[105] The Customs Service is now the Bureau of Customs and Border Protection (CBP).

U.S. export data derive from information supplied at the time of export on a standardized Shippers Export Declaration (SED) form (or its electronic equivalent) which must, by law, be filed in conjunction with any shipment valued at or above a specific level (currently $2,500.00).[106]

The SED (see the accompanying copy) solicits information on the kind of the goods being shipped and on their weight and value, their destination abroad, the mode of transport, and the port of departure. The SED also asks the shipper to identify the "point (or state) of origin." In filling out that particular block, the shipper is given immense discretion – so much so that efforts to determine where the exported merchandise was truly manufactured, grown, mined or processed are often transformed into a fool's errand.

Federal regulations permit the shipper to use any of following three criteria to determine the export shipment's state-of-origin:

> (1) The point from which the merchandise actually starts its journey to the port of export. The state-of-origin might indeed be where the goods were produced. Alternately, it could merely be a state where the goods were warehoused prior to shipment abroad. For example, owing to a lack of secure warehousing in Mexico, goods bound for that country are frequently held at warehouses or distribution facilities along the U.S. side of the border until delivery is actually required to the customer or end-user in Mexico. Since the vast bulk of U.S.-Mexico trade moves through Texas, the Lone Star State is frequently identified as the state-of-origin for an untold volume of products actually produced in other parts of the United States simply because those products were temporarily held in storage in Texas. (This accounts for the dubious claim that Texas – whose gross state product is approximately 56

[106] The Census Bureau is moving to do away with paper SEDs. In a February 17, 2005 posting in the *Federal Register*, the Census Bureau formally proposed to require mandatory filing of export information through the Automated Export System (AES) or through the AESDirect for all shipments where a Shipper's Export Declaration is currently required.

percent of California's[107] – is reportedly the nation's leading exporting state.)[108]

(b) The state of the commodity of the greatest value. Any given shipment may include items produced in more than one state or even in different regions of the country. Rather than obliging the shipper to apportion the shipment among the relevant states, the shipper is permitted to assign the entire value of the shipment to the one state thought to have been responsible for contributing the greatest value to the shipment. The determination of the state-of-origin is thus reduced to guesswork.

(c) The state in which the shipment was consolidated. The fact that shippers are given the leeway to designate as the state-of-origin the state in which the shipment was consolidated accounts for the fact that Louisiana has long been reported to be the nation's foremost agricultural exporter. (For a further discussion of the 'Louisiana Syndrome,' see below.)

Only in 1987 did the Census Bureau's Foreign Trade Division (FTD) begin to publish a breakdown of U.S. merchandise exports by state. The figures were derived from a box on the SED requiring the shipper to identify ***not*** the state in which the goods were produced but rather the state from which the merchandise began its journey to the port of export.

The FTD has been unfailingly candid about the limitations of the so-called state-of-origin figures. Unfortunately, other parties that have trafficked in such data have not always been so forthcoming in warning that the so-called state-of-origin export data do not tell state officials what they really want to know: namely how much of what was produced by the hands and minds of the citizens of my state was exported and to where.

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[107] Source: Bureau of Economic Analysis, http://www.bea.doc.gov/bea/regional/gsp.htm.

[108] For a more detailed explication of this issue, see Jock O'Connell, "State's Trade Going South?" in the June 4, 1999 San Francisco Chronicle. http://www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/1999/06/04/ED76240.DTL

The problem stems from confusion of the meaning of the state-of-origin. To federal government trade statisticians, the term primarily refers to the origin of movement of goods as they commence their journey into international trade. Not all goods are produced specifically for immediate export. In many cases, title to goods will pass through any number of hands (and physical locations) before being shipped abroad. A consignment of California computers sold to a U.S. wholesaler, for example, may languish in a Texas warehouse before being shipped to a retailer in Mexico. In such a case, the export transaction would most likely be attributed to Texas, the state from which the computers began their journey across the border, and not to California, where the computers were manufactured. Yet, to most state government officials, the origin-of-movement data are often (and mistakenly) taken to mean the state in which the goods were produced.

The data problem becomes more attenuated in the case of highly fungible products like coal or grains. Whenever shipments are consolidated, the state-of-origin of movement will generally be defined as the consolidation point. This effect is particularly noticeable for agricultural shipments. Intermediaries located in inland states ship agricultural commodities down the Mississippi River for export from the port of New Orleans. In this case, they would report Louisiana, the state where the port of New Orleans is located, as the state-of-origin of movement.

It is not unusual for significant levels of manufactured exports to be attributed to states that are known to have little manufacturing capability. One reason is that commodities produced by a company in one state may be shipped abroad from a distribution center or warehouse situated in another state. In that case, there is a significant probability that the transaction will be attributed to the latter state. Similarly, reporting rules permit export shipments to be attributed to the state that are arranged by exporters located out-of-state. In both cases, manufactured exports from the non-industrial state are magnified in the OM series. The problem has grown more acute as more and more manufacturers and agricultural shippers have out-sourced their logistics functions to third-parties who typically manage goods movement for a multiplicity of corporate clients.

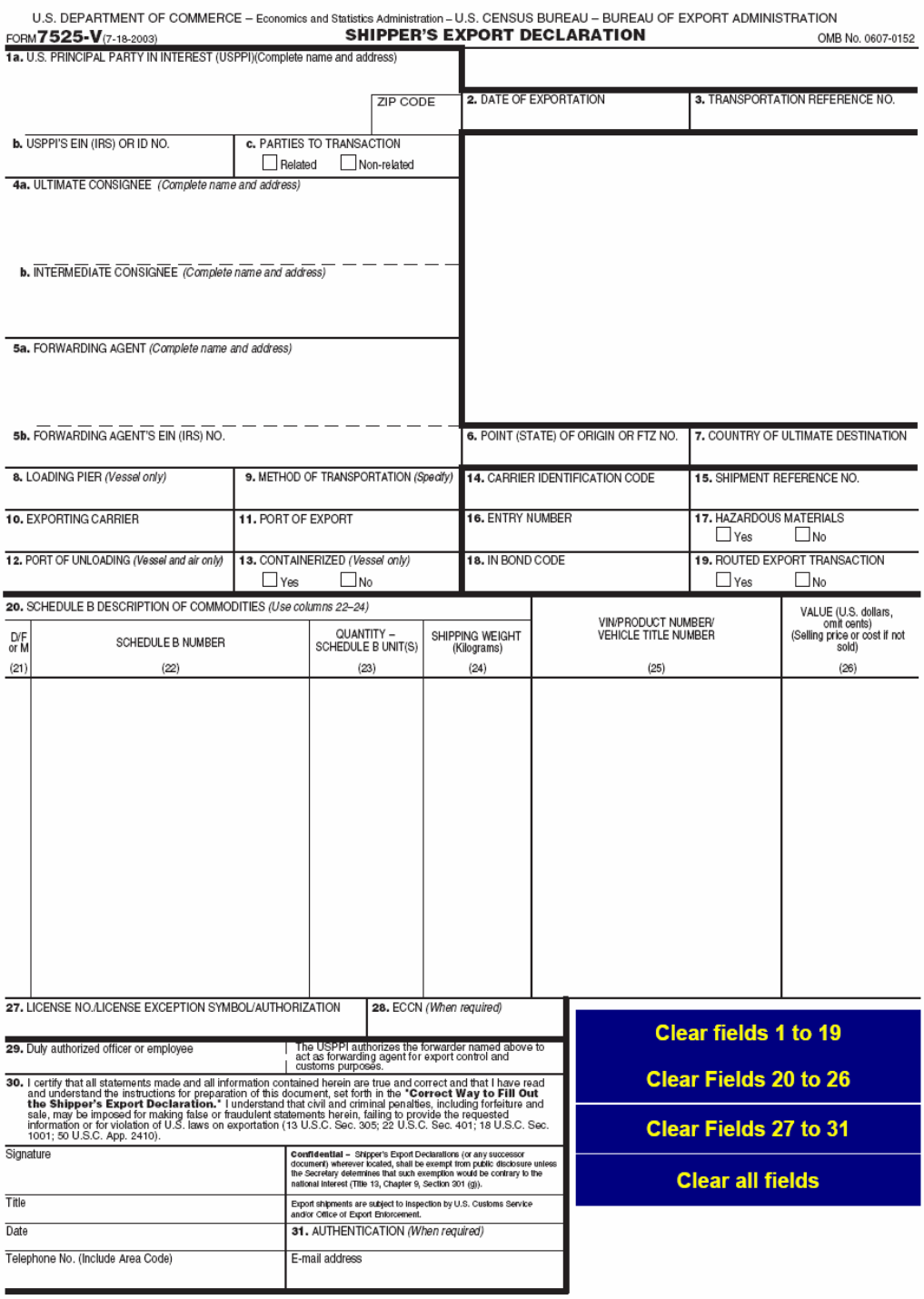
Beginning in 1993, the Census Bureau experimented with an alternate measure of the state-of-origin known as the Exporter Location (EL) Series. These export

statistics were based on the zip code address of the exporter of record – more lately termed the U.S. Principal Party in Interest (defined as the party in the United States that receives the primary benefit monetary or otherwise, from the shipment). Effective with January 2003 export statistics, however, the Exporter Location Series was discontinued.

The EL series always had limitations, especially in identifying individual locations for companies with more than one production facility. Very commonly, the series identified the location of a company's headquarters rather than the location of any of its production facilities as the state-of-origin. A shipment of wheat might be attributed to a company's headquarters in Omaha, even though the wheat was grown in Iowa or Kansas. In fact, an astonishing volume of farm exports were linked to zip codes in Manhattan.

With the rampant consolidations and mergers that characterized the U.S. economy through the 1990s and into the current century, the Exporter Location data series grew increasingly unstable. Significant shifts in export values by state were beginning to show up in the data in late 1999. According to the Census Bureau, the resulting "aberrations destroyed the continuity of the series." For these reasons, Census discontinued the series.

For U.S. exports to Canada, import data compiled by the Canadian government are used. (Because nations have long collected duties and administered quotas on imported goods, procedures for monitoring a country's imports have traditionally been much more rigorous than the methods used to track exports.)



U.S. DEPARTMENT OF COMMERCE – Economics and Statistics Administration – U.S. CENSUS BUREAU – BUREAU OF EXPORT ADMINISTRATION

FORM **7525-V** (7-18-2003)

SHIPPER'S EXPORT DECLARATION

OMB No. 0607-0152

1a. U.S. PRINCIPAL PARTY IN INTEREST (USPPI)(Complete name and address)

ZIP CODE

2. DATE OF EXPORTATION

3. TRANSPORTATION REFERENCE NO.

b. USPPI'S EIN (IRS) OR ID NO.

c. PARTIES TO TRANSACTION ☐ Related ☐ Non-related

4a. ULTIMATE CONSIGNEE *(Complete name and address)*

b. INTERMEDIATE CONSIGNEE *(Complete name and address)*

5a. FORWARDING AGENT *(Complete name and address)*

5b. FORWARDING AGENT'S EIN (IRS) NO.

6. POINT (STATE) OF ORIGIN OR FTZ NO.

7. COUNTRY OF ULTIMATE DESTINATION

8. LOADING PIER *(Vessel only)*

9. METHOD OF TRANSPORTATION *(Specify)*

14. CARRIER IDENTIFICATION CODE

15. SHIPMENT REFERENCE NO.

10. EXPORTING CARRIER

11. PORT OF EXPORT

16. ENTRY NUMBER

17. HAZARDOUS MATERIALS ☐ Yes ☐ No

12. PORT OF UNLOADING *(Vessel and air only)*

13. CONTAINERIZED *(Vessel only)* ☐ Yes ☐ No

18. IN BOND CODE

19. ROUTED EXPORT TRANSACTION ☐ Yes ☐ No

20. SCHEDULE B DESCRIPTION OF COMMODITIES *(Use columns 22–24)*

D/F or M (21)	SCHEDULE B NUMBER (22)	QUANTITY – SCHEDULE B UNIT(S) (23)	SHIPPING WEIGHT (Kilograms) (24)	VIN/PRODUCT NUMBER/ VEHICLE TITLE NUMBER (25)	VALUE (U.S. dollars, omit cents) (Selling price or cost if not sold) (26)

27. LICENSE NO./LICENSE EXCEPTION SYMBOL/AUTHORIZATION

28. ECCN *(When required)*

29. Duly authorized officer or employee

The USPPI authorizes the forwarder named above to act as forwarding agent for export control and customs purposes.

30. I certify that all statements made and all information contained herein are true and correct and that I have read and understand the instructions for preparation of this document, set forth in the **"Correct Way to Fill Out the Shipper's Export Declaration."** I understand that civil and criminal penalties, including forfeiture and sale, may be imposed for making false or fraudulent statements herein, failing to provide the requested information or for violation of U.S. laws on exportation (13 U.S.C. Sec. 305; 22 U.S.C. Sec. 401; 18 U.S.C. Sec. 1001; 50 U.S.C. App. 2410).

Signature

Confidential – Shipper's Export Declarations (or any successor document) wherever located, shall be exempt from public disclosure unless the Secretary determines that such exemption would be contrary to the national interest (Title 13, Chapter 9, Section 301 (g)).

Title

Export shipments are subject to inspection by U.S. Customs Service and/or Office of Export Enforcement.

Date

31. AUTHENTICATION *(When required)*

Telephone No. (Include Area Code)

E-mail address

Clear fields 1 to 19

Clear Fields 20 to 26

Clear Fields 27 to 31

Clear all fields

This form may be printed by private parties provided it conforms to the official form. For sale by the Superintendent of Documents, Government Printing Office, Washington, DC 20402, and local Customs District Directors. The **"Correct Way to Fill Out the Shipper's Export Declaration"** is available from the U.S. Census Bureau, Washington, DC 20233.

Further detracting from the quality of the nation's export statistics is the fact that shipping and freight-forwarding clerks know that SEDs are reviewed by federal officials only to insure completeness, not accuracy. Certainly prior to September 11,

2001, those filling out the SEDs had no incentive to be exacting in their provision of information about the true origin of the goods being exported. Even now, in an era when documents pertaining to the movement of goods through vital airports and seaports are regarded with a new seriousness, there remain numerous reasons to take shortcuts. Of these, perhaps the common is to identify an entire shipment as having originated in whatever state the shipper or freight-forwarder is located. For example, it is entirely permissible under federal guidelines to report California as the state-of-origin for a shipment of cherries grown in the Pacific Northwest, if that shipment was repacked for air shipment from a California airport. As a consequence, state-of-origin export statistics have always enjoyed a dubious status.

Measuring California's Farm Exports

Devising accurate measures of state exports of agricultural commodities has been especially problematic, especially in a state like California which grows and exports a multiplicity of crops.

Over the years, a series of attempts have been made to refine the data collection methodology so as to yield a more accurate picture of California's agricultural export trade. For many years, the only estimates of the state's agricultural export trade were derived from California's known share of the total U.S. production of exported commodities. Thus, if California growers were known to produce one-fourth of the nation's flax, then one-quarter of the nation's flax exports would be attributed to California – regardless of whether any California-grown flax was actually shipped abroad.

That rough-edged methodology works well for those crops like almonds, walnuts, pistachios, raisons, figs and olives where California effectively accounts for the entire national output. For most other crops, though, there are fairly obvious drawbacks associated with this method of counting California's farm exports. Still, it is a methodology that remains in use by the USDA's Economic Research Service (ERS).

ERS export data. As we have seen, data on the value of U.S. agricultural exports by the state in which they were produced are not collected by the U.S. Census Bureau. Instead, ERS estimates state shares of agricultural exports using Custom District-level export data compiled by the U.S. Census Bureau and state-level

agricultural production data supplied by USDA's National Agricultural Statistics Service (NASS). These approximations are adjusted for exports of agricultural products for which NASS does not collect state-level production data. Using these approximations, a state that is the largest producer of an agricultural commodity will also account for the largest share of U.S. exports of that commodity. Countries of destination for each state's exports cannot be determined using this data series.

Most U.S. agricultural commodity exports are produced in inland states. From the farm, a commodity like wheat is typically sold to a local elevator, which in turn may sell it to a larger elevator located at a major transportation hub, which then moves the commodity to a port of export. The transportation hub may not be located in the same state as the producer. Sometimes, even the local elevator is located in another state. Indeed, an agricultural commodity is likely to pass through any number of states before being exported, and the actual state-of-production is easily lost as commodities move from the farmgate to the port.

Further complicating matters, bulk agricultural commodities may be mixed with other lots of the same commodity in storage or transporting at any stage along the way to the port, effectively commingling commodities with differing states of origin.

There are two key sources of data. Export data used by ERS are national-level Foreign Agricultural Trade of the United States (FATUS) data from USDA Foreign Agricultural Service's U.S. Trade Internet System, which are not separable by state. ERS also uses state-level historical production data from NASS to determine state export shares for U.S. crops and livestock. In ERS' state export estimates, each state's share of production of the commodity is simply applied to the total commodity export figure to derive the state's estimated export value.

In addition, these approximations are adjusted for exports of agricultural products for which NASS does not publish annual state-level production data, such as prepared foods. For these products, some production data by state is found every 5th year in the *Census of Agriculture* and the Department of Commerce's *Product Summary, 1997 Economic Census, Manufacturing, Subject Series*. If these data are not available for a given commodity, then generally an average of the state's share of the raw products' production is applied to any "other" products included in that

group's export total (such as wheat's share for pasta). Production and export data are revised annually reflecting updates by NASS and Census.

Besides ERS, three other organizations—the U.S. Census Bureau; PIERS by Global Intelligence Solutions and the Journal of Commerce; and MISER (now WISER) — estimate the state of origin of U.S. exports. Estimates of state exports made by these organizations cover total merchandise trade, including, but not limited to, agriculture. However, these estimates are based on the data available at the port from Shippers Export Declaration Forms. Consequently, for agricultural commodities, because of the limitations mentioned above, these organizations' estimates of state of export origin tend to inflate the relative exports from port states (such as Louisiana) and undercount those of inland states (such as Kansas).

UC Davis farm export data. During the late 1970s and into the 1980s, California Department of Food and Agriculture statisticians sought to devise a more refined methodology that relied more extensively on information provided by the state's growers and shippers and especially the various government-sanctioned organizations responsible for administering marketing orders. In 1997, CDFA entered into an agreement with the Agricultural Issues Center (AIC) at the University of California at Davis to measure the value of the state's agricultural export trade.

AIC employs a more exacting methodology than ERS does in compiling its farm exports estimates. Indeed, AIC employs separate procedures for each of the 50 primary agricultural products of California. Products originated in another state and exported via California ports are not included in AIC's statistics.

In most cases the final AIC report presents the export data at the individual commodity level (see Table 2-1). For example, exports of fresh, canned, and dried apricots are reported under a combined the heading as "apricots", although, for estimation purposes, fresh apricots follow a different methodology than canned and dried apricots. If the California export price was not available for a particular product, AIC used the U.S. export price for that commodity in order to provide a dollar value for exports.

Table 2-1. Agricultural Issues Center (UC Davis) California Commodity Exports, 2001-2003 Nominal Values and Rankings

Rank	Commodity	2001 $'000	2002 $'000	2003 $'000
1	Almonds	685,613	828,988	1,081,181
2	Cotton [1]	607,441	510,743	676,436
3	Wine	474,724	484,968	548,470
4	Table Grapes	394,463	367,314	386,272
5	Oranges [2]	298,162	303,188	343,873
6	Dairy	338,427	300,890	326,246
7	Tomatoes, Processed [3]	211,757	215,248	230,834
8	Rice [2]	168,260	183,277	217,144
9	Beef and Products	154,820	167,710	214,663
10	Walnuts	179,142	183,864	213,898
11	Strawberries [3]	135,990	155,775	197,098
12	Lettuce [1,3]	150,000	159,598	178,066
13	Raisins	144,102	151,933	164,670
14	Pistachios	108,932	130,690	135,307
15	Prunes	149,502	127,942	133,634
16	Peaches/Nectarines	118,727	106,693	125,785
17	Hay	86,290	103,925	104,779
18	Broccoli [3]	90,079	94,334	97,153
19	Lemons [4]	85,142	86,667	78,556
20	Carrots [2,3]	67,986	71,281	75,677
21	Cherries [5]	80,514	62,884	65,369
22	Plums	53,537	54,865	58,502
23	Tomatoes, Fresh	56,604	48,654	54,000
24	Cauliflower	45,507	51,441	53,158
25	Grapefruit [2]	38,258	34,329	48,047
26	Celery	45,982	42,309	42,782
27	Onions [2]	42,233	36,518	42,657
28	Melons [6]	39,330	40,040	39,406
29	Wheat [5]	30,009	26,850	38,377
30	Flowers & Nursery [6]	39,675	36,820	37,823
31	Grape Juice	31,377	28,503	30,432
32	Asparagus	30,972	17,103	28,953
33	Potatoes	26,356	30,166	28,322
34	Garlic	24,773	23,197	22,300
35	Bell & Chili Peppers [6]	18,338	19,546	21,933
36	Apples	29,183	31,093	19,918
37	Apricots	15,597	17,485	15,473
38	Pears [4]	24,030	17,528	14,541
39	Dates	11,474	10,902	13,870
40	Turkey	17,375	5,616	12,281
41	Olives	10,342	11,280	11,102
42	Cottonseed byproducts	7,008	6,864	9,236
43	Kiwi	6,429	7,589	8,759
44	Figs	6,691	7,065	8,029
45	Dry Beans	5,599	10,390	8,014
46	Eggs [3]	8,580	8,513	6,397
47	Chickens	11,317	5,348	5,476
48	Artichokes	3,262	3,105	2,943
49	Mushrooms [2]	3,366	2,882	2,090
50	Avocados	2,052	1,502	1,455
	Total Principal Commodities	**5,415,330**	**5,435,415**	**6,281,387**
	Total Other Products	1,173,376	1,116,482	1,209,097
	Total All Agricultural Exports	**6,588,706**	**6,551,897**	**7,490,484**

Source: Agricultural Issues Center own estimates

[1] Estimation method was re-calibrated and applied to 2002 and 2003 data

[2] 2001-02 figures were revised based on updated port data from the United States Department of Commerce/International Trade Commission

[3] 2001-02 figures were revised based on updated production data from United States Department of Agriculture/National Agricultural Statistics Service

[4] 2001-02 figures were revised based on updated industry data

[5] 2001-02 estimation procedures were re-assessed, based on new information from industry sources

[6] 2001-02 figures were revised based on updated Canadian import data

WISER agricultural export data. The "state-of-origin" export data used in this chapter as well as elsewhere in this report were obtained from the World Institute for Strategic Economic Research (WISER). [109] WISER was established in 2004 to continue the international trade data work of its predecessor, the Massachusetts Institute for Social and Economic Research (MISER). From 1988 through 2004, MISER had been one of the U.S. Census Bureau's Business and Industry Data Centers. Its special focus had been on foreign trade statistics developed by the Census Bureau's Foreign Trade Division from Shippers Export Declarations (SED) filed in conjunction with most export shipments from the U.S.

MISER's particular contribution lay in devising an imputation algorithm to refine the state-of-origin export data that first became available in 1987 following changes in the SED. Over the ensuing years, MISER became the leading provider of U.S. and state-level trade statistics. Software devised by WISER is currently used by some 25 state international trade offices, several World Trade Centers, and a wide variety of data providers and data users throughout the U.S. and abroad. Until its disestablishment in 2004, the California Technology, Trade and Commerce Agency used MISER data in all of its official reports on California's export trade.

Notwithstanding the lengths to which MISER and now WISER have gone to refine state level export data, we readily acknowledge that the WISER data used in this study include some agricultural goods and food products that were not produced by a California farm, ranch or dairy. The WISER data also include categories of food products that can be best labeled as ingredients and preparations, some of which may have been manufactured in laboratories or processing plants. Nonetheless, we submit that the WISER data represent the best available statistical depiction of California's airborne agricultural export trade.

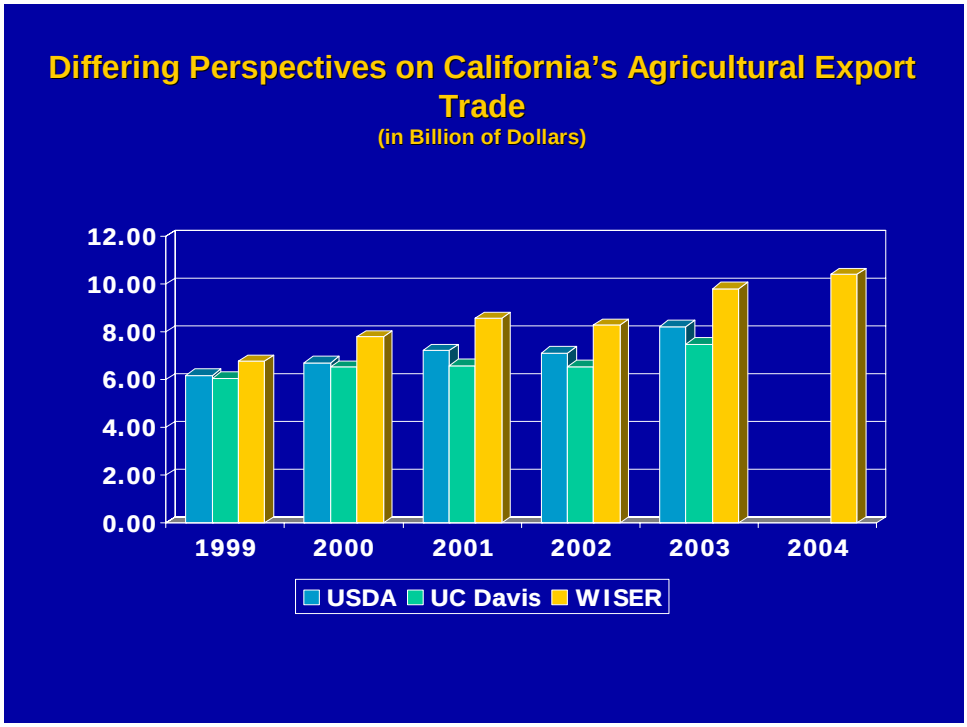
For the purpose of this study, the chief advantage of WISER is that, unlike the AIC figures, the data can be sorted by mode of transportation. As noted earlier in this report, WISER reports that California shipped -- by air -- $659.4 million in agricultural products to foreign markets in 2004. That represents just 6.3 percent of

[109] WISER is located at Holyoke Community College in Holyoke, Massachusetts and is part of the school's new Kittredge Business and Technology Center.

the total value of agricultural exports WISER attributed to the Golden State in that year ($10.4 billion).[110]

To be sure, WISER's totals for California's overall farm exports have been considerably larger than either USDA's or AIC's estimates. (See Figure 2-1.) In 2003, the most recent year for which comparable data are available, WISER pegged the state's overall farm export trade at $9.8 billion in contrast to AIC's $7.5 billion and USDA's $8.2 billion.

Figure 2-1



As WISER readily concedes, the system for collecting U.S. export data – especially when commodities are involved – tends to ensure that gateway states like California will be credited for the export of products that were actually produced in other states. In one revealing example, WISER's data indicate that California's fresh cherry exports to Japan in 2003 were nearly 70 percent higher than reported by the

[110] As we shall see, there are significant methodological issues involved in parsing California's agricultural export trade. For example, WISER/MISER readily concedes that gateway states like California are credited for unknown volumes of agricultural commodities actually produced in other states but shipped abroad via a California seaport, airport or border crossing.

California Cherry Advisory Board.[111] As we shall see, much of the difference can be attributed to the misreporting of fresh cherries grown in Oregon and Washington that were shipped to Japan via California airports.

In a typical year, California's cherry harvest is complete by the end of June. There is normally a brief period in which California cherries are entering the market as the cherry harvest in Washington and Oregon is beginning. Nonetheless, by July 1, commercial cherry shipments are generally coming only from the Pacific Northwest.

An examination of monthly reports on fresh cherry exports in the month of July in recent years reveals that a substantial volume of fresh cherries continues to be shipped abroad from California airports. For example, in 2001, the last commercial shipment of California-grown cherries was recorded on June 22. Consequently, any fresh cherry exports attributed to California in July of that year must have come from another state. Nonetheless, WISER reports that $5.4 million in fresh cherry exports went from California airports in July 2001 as did just over $800,000 that August.

The misidentification arises in most instances because cherry exporters in Washington and Oregon must rely to extent on flights leaving California airfields in order to serve customers in the Far East. Both SFO and LAX feature a substantially larger number of daily flights bound for Japan and other destinations in the Far East. Owing to the highly perishable nature of the crop, shippers and freight-forwarders engage in a spirited dance to find room aboard flights bound for Asian Pacific markets. Indeed, some cherries from Washington and Oregon reach destinations in the Far East via Anchorage and Honolulu airports.

Fresh cherries are typically shipped to airports in refrigerated trucks which deliver wooden pallets laden with cherries packed in either 18-pound or 20-pound boxes. California shippers use 18-pound cartons and typically stack 90 of them on a pallet,

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[111] The California Cherry Advisory Board's 2003 Annual Report indicates that 1,146,029 18-lb. boxes (or 9,376,601 kg.) of all varieties of fresh cherries were shipped to Japan by California growers in 2003. By contrast, WISER reported 11,859,112 kg. of airborne cherry shipments from California to Japan in that year. Another data set that simply records the value and weight of U.S. merchandise exports by Customs District shows 12,393,307 kg. in fresh cherries were air-freighted from the San Francisco and Los Angeles Customs Districts in 2003. Meanwhile, airborne export data supplied by USDA reports 19,602,082 units (whether pounds or kilos is not specified.)

which is then enclosed in a plastic wrapping. Upon arrival at the airport, the handling of the truckload depends on the precise configuration of space available on the specific aircraft leaving for the desired destination.

A chartered 747-400 air-freighter, for example, can hold as many as 100 wooden pallets of cherries, while a chartered DC-10 can accept up to 75 pallets. In most instances, however, cherry shippers and their logistics providers scramble during the relatively brief fresh cherry harvest to find space on virtually every flight leaving for major overseas markets.

It is not altogether uncommon that the contents of the wooden pallets must be broken down and the cartons repacked into containers suited to the space available on specific flights. Whenever that occurs, there is an exceptionally strong likelihood that the clerk filling out the Shippers Export Declaration will indicate that the cherry shipment began its journey into international trade from the spot at which the repackaging occurred – usually an air cargo terminal on or near an international airport. As a consequence, commodities shipped from the Pacific Northwest to the overseas destinations via SFO or LAX are likely to be formally identified as exports of California. That problem is not likely to be resolved until the emerging technologies for tracking individual shipments become sufficiently sophisticated and inexpensive to permit tracking of agricultural shipments from the point-of-production or the packing house to the final destination abroad.

Principal Findings

The WISER data yield several interesting conclusions.

Some overseas markets – Japan above all – loom particularly large in California's airborne agricultural export trade. Indeed, Japan has been the principal overseas market for several of California's top ten airborne specialty crop exports. However, the identity of other primary overseas markets differed widely depending on the commodity in question.

For California's fresh cherry growers, Japan took just over three-quarters of all the state's airborne cherry exports in 2003. Indeed, just four destinations (Japan, Taiwan, Australia and the United Kingdom) accounted for approximately 95 percent of California's airborne exports of fresh cherries that year.

Japan likewise dominated the airborne trade in California's fresh strawberries, taking the lion's share (61.4 percent) of 2003 shipments. Just four countries (Japan along with the U.K., France and Ireland) accounted for approximately 95 percent of California's airborne fresh strawberry exports that same year.

In the case of California's airborne asparagus exports, Japan again was the largest market in 2003, taking in 55.6 percent of the state's airborne export trade. In this case, though, the next largest market was Switzerland, followed at some distance by Taiwan, Italy and Spain. In all, five countries accounted for 92.5 percent of California's airborne asparagus shipments in 2003.

For fresh grapes, a mere two countries (albeit widely-spaced) accounted for 95 percent of California's airborne exports in 2003. They were the United Kingdom and Australia. By itself, the U.K. took in three-quarters of the state's airborne fresh table grape export trade.

Airborne wine exports were similarly concentrated, with Japan alone taking in 90 percent of the trade.

The disproportionate role played by a handful of overseas markets appears to explain much of the volatility in California's airborne agricultural export figures from year to year. Airborne wine shipments, for example, saw a remarkable ten-fold jump in 2002 and then fell by nearly half in 2003 and by more than half again in 2004. [112] Not surprisingly, the spike coincided with abnormally large airborne wine shipments to Japan in late 2002 and early 2003, albeit much less so in the latter year. The most likely reason for the surge in airborne wine exports had nothing to do with a sudden Japanese affinity for California wine or a more aggressive marketing campaign by California vintners. Indeed, overall wine exports by all modes of transportation in 2002 showed only a meager one percent increase over the preceding year. Instead, the jump in airborne shipments to Japan was most probably an unintended consequence of the disruption in normal ocean shipping routes caused by the West Coast dock lock-out in the fall of 2002. To keep production lines operating (as in the case of the NUMMI plant in Fremont, California) or ensure adequate supplies of electronics and other products to U.S. retailers in the run-up to the Christmas shopping season, a host of Japanese companies – most notably, Toyota -- were obliged to charter air-freighters. The abrupt rise in airborne imports through LAX and especially SFO created a serious back-haul problem for air carriers seeking cargos to fill the chartered air-freighters returning to Japan. The Wine Institute reports that California wine shipments to Japan in 2003 totaled $76 million.[113]

[112] Airborne wine exports from California, which totaled $3.5 million in 2001, soared to $35.4 million in 2002, before falling back to $18.5 million in 2003 and then to $7.2 million in 2004.

[113] The deregulation of Japan's wine, beer and spirits retailing market in September 2003 may have contributed to the continuation of a historically abnormal level of airborne wine shipments that year. However, data for all of 2003 and particularly for 2004 would suggest that the use of air cargo services to ship wine from California to Japan is returning to more modest levels. The four years immediately preceding the 2002 surge in airborne shipments saw, on average, just $3.1 million in wine shipped from California to Japan by air.

Chapter 3

The International Air Cargo System

This chapter describes the international air cargo system. Although some of the material contained in this chapter may not seem immediately relevant to California's airborne agricultural export trade,[114] the purpose of this chapter is to illuminate the principal forces currently reshaping the air cargo industry worldwide and to highlight those changes that will most likely come to affect California's agricultural exporters – for better or for worse. (The next chapter will describe California's international aviation links and the challenges that government and industry face in ensuring that the long-term air transport needs of California's agricultural exporters are adequately met.)

The Black Box of Transportation Logistics

For most Californians and even for many exporters, the movement of goods occurs within a figurative black box. We place an envelope in a mailbox and assume it will arrive at its address without having any understanding of what is involved in delivering it to a recipient hundreds if not thousands of miles away. Similarly, in the case of a steel container loaded with electronics hardware or several pallets laden with cartons of fresh fruit, the manufacturer or grower frequently out-sources the business of arranging transportation to an intermediary, most commonly a freight-forwarder but, with increasing regularity, a company like FedEx or UPS or DHL.[115] Yet, regardless of who assumes the role of the intermediary, in the vast majority of international shipments the shipper or exporter has effectively entrusted the details of shipping to another party.[116]

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[114] Although this report is explicitly concerned with air cargo's role in California's agricultural export trade, certain of the findings here may still be relevant to shipping to domestic customers, especially in the $22.8 billion gourmet grocery sector. According to the National Association for the Specialty Food Trade, the U.S. market for specialty foods grew by 24.1 percent from 2001 to 2003 and was expected to increase by a further 10-12 percent in 2004.

[115] Companies such as FedEx, UPS and DHL are commonly known as 'integrators.'

[116] Sometimes known as the "architects of transport," freight-forwarders are agents who use their logistical expertise and their ability to generate large cargo volumes to negotiate the most favorable shipping rates and transportation scheduling for their clients' goods.

By permitting various parties to concentrate on their own areas of specialty, this disintermediation of business functions has proven enormously beneficial. But it has a generally unacknowledged downside. To protect their proprietary interests, parties performing specialized services are typically reluctant to discuss their methods of operations in any useful detail. Freight-forwarders, for example, are notoriously averse to talk about their working relationships with specific air carriers. So as the practice of outsourcing logistical functions grows more common, more and more consumers of logistical services have at best a sketchy view of the actual shipping process. A packer/shipper of fresh produce will know that a particular shipment is bound for Japan because of certain packaging and fumigation requirements. But the specific route that shipment takes and what airlines are used to convey it to its final destination are not matters that strictly concern the packer/shipper so long as the shipments arrives on schedule and in good condition.[117]

An importance consequence of the popular practice of outsourcing transportation logistics functions is to diminish the size and breadth of a constituency that might otherwise have been a more powerful voice commanding the attention of transportation policymakers. Not surprisingly, public policy relating to our international trade infrastructure is sometimes made based on some fundamental misapprehensions about the logistics of international trade. Equally, because business function that have been outsourced are often ignored, companies that are acutely dependent on fluid transportation systems may be left perilously blind to the dynamic forces that are reshaping the logistics of international trade.[118] One purpose of this chapter, then, is to shed light on how goods move through the world's air cargo system.

One common misapprehension shared by the general public and a high percentage of public policymakers is that international trade is an activity largely confined to the nation's seaports and to border crossings with Canada and Mexico. There is no

[117] This is especially likely to be the case when the California packer/shipper is a "passive exporter" who is merely filling an order placed by an overseas buyer who very often will assume responsibility for arranging transportation. In such cases, the involvement of the packer/shipper in California will generally end when he delivers the shipment to a staging area adjacent to a gateway airport.

[118] The emergence of so-called Fourth-Party Logistics Providers (4PLs) indicates that a number of businesses which had earlier outsourced their logistics operations to Third-Party Logistics Providers (3PLs) now perceive the need to pay closer attention to these formerly in-house functions by retaining 4PLs to monitor and assess the services furnished by 3PLs.

question that the heavy lifting when it comes to moving America's exports is done by ships, trucks and trains -- as Figure 3-1 indicates. But as Figure 3-2 indicates, when the nation's export trade is calibrated in dollar terms, the picture changes dramatically. (As we shall see in the next chapter, California's export trade is even more reliant on air transport.)

FIGURE 3-1.

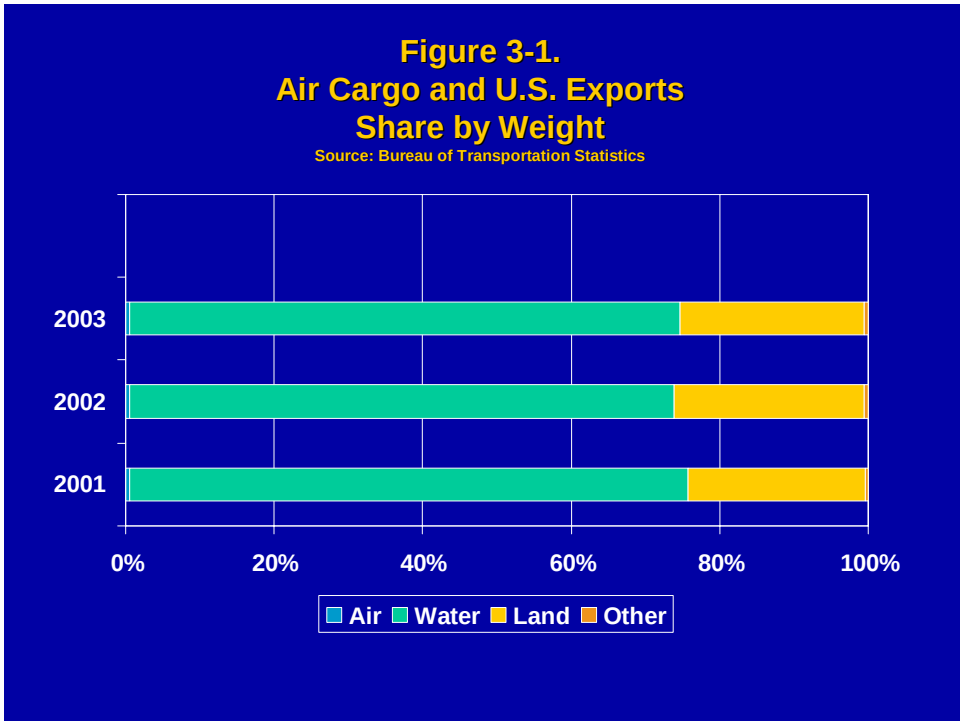
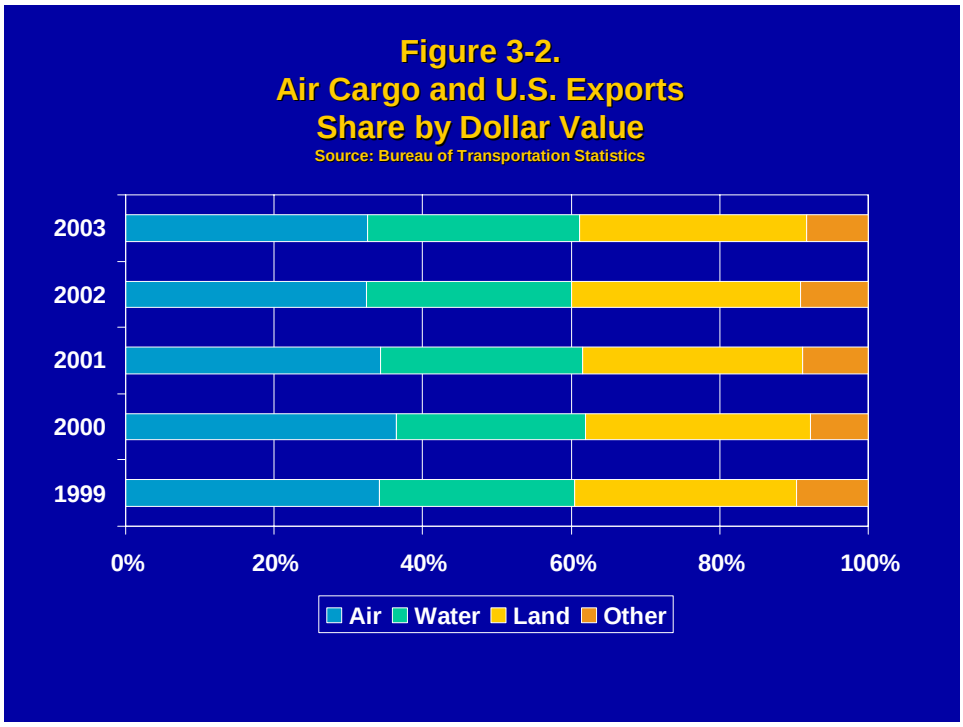


FIGURE 3-2.



The Evolution of Air Cargo Services

Air freight began largely as a sideline to the modern airlines' primary role in transporting passengers and mail. In many respects, the cost structure of much of the modern air cargo trade reflects that incidental origin. In the early days of civil aviation, cargo was simply regarded as a way to earn extra revenue from space not needed for passengers, their luggage or mail (which had become essential to the financing of many early airlines).[119] Even now, cargo space aboard passenger aircraft is often priced accordingly. As a result, rates charged for cargo carried aboard passenger aircraft are typically lower than rates charged for cargo carried aboard air-freighters, where cargo is the sole source of revenue and must therefore pay its own way.

In a most dramatic fashion, the Berlin Airlift (1948-49) demonstrated the effectiveness of air cargo for moving an exceptionally wide range of goods and

[119] See F. Robert van der Linden, *Airlines and Air Mail: The Post Office and the Birth of the Commercial Aviation Industry* (University of Kentucky Press, 2002) and Camille Allaz, *La Grande Aventure de la Poste et du Frêt Aeiens: du 18e siècle à nos jours* (Paris: Presses de l'Institut du Transport Aérien (1998).

helped spur a growing air freight market in the United States and Europe. In 1949, the Flying Tiger Line became the first scheduled air cargo airline in the U.S., offering regular service between the Los Angeles and San Francisco on the West Coast and Boston on the East Coast. By the 1960s, several passenger airlines had even introduced scheduled all-cargo services on dedicated air-freighters. In that era of narrow-bodied aircraft, passenger planes had relatively little capacity for freight and were not especially suitable for carrying heavy or bulky items. So as the demand for air cargo rose during the decades immediately following World War II, scheduled all-cargo services took an increasingly large share of the air cargo market, peaking at around 43 percent in the mid-1970s.[120]

Two major developments during the 1970s severely undermined the vitality of all-cargo flight operations. The first was a five-fold jump in fuel prices related to political unrest in the Middle East and Persian Gulf and to the emergence of the Organization of Petroleum Exporting Countries (OPEC) as a serious force in determining world oil prices. The other was the entry into service of the Boeing 747 "jumbo jet" beginning in 1970.

The precipitous surge in fuel prices affected all airlines. But because fuel costs represented a much larger portion of an air-freighter's total operating costs, the rise in fuel prices hurt the balance sheets of all-cargo operators more than it did passenger airlines.[121] More or less at the same time, the all-cargo airlines had to contend with the enormous increase in the cargo-carrying capacity of passenger aircraft that came with the introduction of the 747 on long-haul routes and eventually the Boeing 767 and Airbus A310 on medium-haul routes.[122] Everything about the new 747 was enormous. The passenger cabin was almost twice the width of the 707's, and the aircraft was 79 feet longer than the 707-300. It also came with

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[120] Rigas Doganis, p, 302.

[121] Until the latest run-up in fuel costs in 2004, labor costs were a bigger expense for airlines than fuel. Labor thus represented a larger share of the operating cost of an all-cargo flight which, of course, had a much smaller crew component than a typical passenger flight. Conversely, fuel represented a bigger proportion of the cost of operating an all-cargo flight.

[122] Another attractive feature of the new aircraft was that they were designed to carry large containers and other Unit Load Devices (ULDs) that made for significantly more efficient cargo handling, not unlike the use of standard 20-foot and 40-foot steel containers in the maritime trade.

a new abundance of cargo capacity in its belly. Indeed, by redefining the cargo capacity differential between what could be carried on passenger aircraft as opposed to all-cargo freighters, the jumbo jet had a profound effect on the cargo distribution system. With a capacity exceeding 15 metric tons, the passenger version of the 747 could carry, by size, up to 90 percent of all cargo offered.[123]

The 747 was also designed to serve as an all-cargo transport. Indeed, that is why it sports its distinctive hump. In order for the aircraft to be used both as a cargo plane and a passenger aircraft, Boeing designed the 747 with the flight deck positioned above the passenger cabin to permit containers shipped on the freighter version to be loaded through the nose, which swung upward on a hinge. The first 747-200 freighter, introduced in 1971, could carry 100 tons (90,000 kg.) of cargo non-stop coast-to-coast or across the Atlantic. Its operating cost was 35 percent less per ton mile than the 707 freighter.[124]

By the late 1970s, more and more cargos were being shifted from narrow-body freighters to the bellies of the new wide-body passenger aircraft. Because the shipping rates charged for cargo carried aboard passenger aircraft undercut the rates charged by operators of air-freighters, several all-cargo airlines went out of business or greatly reduced their operations.

There was a reversal of fate for air-freighters starting in the early 1990s that resulted largely from the surging demand for air cargo space from the export-oriented economies of the Far East. On several major air routes, belly-space capacity on even wide-body passenger aircraft could no longer meet the new demand. In response, airlines began to add both scheduled and chartered all-cargo aircraft. By 2000, the proportion of international air cargo moving on scheduled all-cargo flights had returned to mid-1970s levels.

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[123] Geoff Bridges, past president of The International Air Cargo Association, quoted in Bob Saling, "The Building of an Industry: Freighters and Air Cargo Help Shape the World" (Boeing Commercial Airplanes Feature Releases, 2003).

[124] For more on the evolution of Boeing aircraft, see Clive Irving, *Wide-Body – The Triumph of the 747* (New York: William Morrow and Co., Inc., 1993). Donald M. Pattillo, *Pushing the Envelope: The American Aircraft Industry (*University of Michigan Press, 1998), and Eugene Rodgers, *Flying High: The Story of Boeing and the Rise of the Jetliner Industry* (New York: The Atlantic Monthly Press, 1996).

In the months prior to September 11, 2001, demand for air cargo services had begun to fall off as the electronics and telecommunications industries went into a slide after the boom years of the 1990s.[125] Still, the terrorist attacks certainly did push demand down even further while businesses and governments around the world sought to fathom the unfortunate new world. The period following the World Trade Center and Pentagon attacks produced a sharp decline in passenger air travel worldwide but especially within the United States. Since at least half of all air cargo shipments was being carried in the bellies of scheduled passenger flights, the drop in passenger traffic had a direct and dramatic impact on the air cargo business.

At most major American airports, passenger volumes did not return to pre-9/11 levels until 2003 or 2004. For example, at Atlanta, the world's busiest airport, passenger volumes only began to match the levels seen in 2000 during the first quarter of 2004.[126] The same appears to be the case at Chicago's O'Hare, the world's second busiest passenger airport.[127] That has still not been the case at California's premier airports.

Perhaps reflecting shifts in the market and the emergence of new air routes, passenger volume has fallen off appreciably at LAX and SFO, according to data compiled by Airports Council International.[128] In 2000, LAX and SFO ranked third and ninth, respectively, among the world's busiest crossroads for air travelers. In that year, LAX handled 66.4 million passengers, while SFO handled 41.0 million. By 2003, however, LAX's rank had slipped to fifth place while SFO's standing had plummeted to 22nd.[129] By the end of 2004, SFO international passenger traffic was still about six percent below 2000 levels. International passenger traffic at LAX had likewise not

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[125] In California, the electronics and telecommunications sectors sharply contracted during the winter of 2000-2001, according to California Employment Development Department data.

[126] Source: Hartsfield-Jackson Atlantic International Airport, Operating Statistics for August 2004.

[127] Source: O'Hare International Airport operating statistics.

[128] Airports Council International, see Data Center at www.airports.org.

[129] A major additional reason for the drop in overall passenger traffic at SFO was the departure of Southwest Airlines. By far the largest carrier of passengers within California, Southwest moved its Bay Area hub from SFO across to Oakland International in 2001. As a result, Oakland is today the sixth busiest airport in the Southwest system in terms of daily departures, with 130 daily nonstop departures to 20 cities (as of March 4, 2005).

returned to 2000 levels by 2004.[130] At SFO, international cargo traffic in 2004 was still fully 35 percent below the tonnage recorded in 2000.[131]

In a relatively short time, however, overall demand picked up again in the air cargo industry.[132] One industry forecast released in May 2004 predicted that worldwide air freight (measured by freight ton kilometers flown) will average 5.6 percent annual growth between 2003 and 2008. Expansion of intercontinental markets is expected to be greater, at 6.1 percent average annual growth.[133]

Industry Structure

The air cargo industry features several functional categories of participants who may be engaged in moving a shipment from an exporter to its destination abroad. The most critical of these are: the freight-forwarders or other third-party logistics providers (3PLs), the airports and the air carriers.

A typical shipping scenario begins with the shipper contacting a freight forwarder when there are shipments ready for delivery to the consignee. As a consequence of 9/11, freight-forwarders and other 3PLs are required by law and regulation to be more cautious about accepting cargos from shippers, especially those with whom the freight forwarder may not be familiar. U.S. regulations now distinguish a category of "known shipper" whose shipments are subject to less exacting pre-flight security

[130] According to the LAX website, the airport handed about 6.6 million fewer passengers in 2004 than in 2000. Overall cargo tonnage was up some 5.7 percent over 2000. The airport handled 17,415,749 international passengers in 2000 as opposed to 16,472,911 in 2004. The site does not distinguish domestic from international cargo.

[131] These figures are from SFO's website. In 2000, international passenger traffic totaled 8,036,691 and international cargo 430,478 metric tons. The comparable numbers in 2004 were 7,562,076 international passengers and 278,545 metric tons of international cargo.

[132] "Growth and challenge: A snapshot of the U.S. cargo airline industry." *Air Line Pilot*, March 2004. The magazine's commentary noted that "Nearly every segment of the U.S. airline industry has suffered catastrophic losses and painful reductions in both the number of customers and profits for nearly 3 years. The terrorist attacks of Sept. 11, 2001, were final blows to an already declining U.S. economy, airlines were already losing their business and leisure passengers, large numbers of airline employees were being put on the street, and aircraft manufacturers and parts suppliers were beginning to feel the brunt of carriers' loss of revenue. One segment of the airline industry, however, has managed to survive and even grow slightly during this period—cargo airlines and cargo divisions of passenger airlines."

[133] Brian Clancy and David Hobbin. "After The Storm: The MergeGlobal 2004-2008 World Air Freight Forecast," *Air Cargo World*, May 2004.

measures.[134] Once the freight-forwarder agrees to arrange the shipment for the shipper, the freight forwarder then evaluates the flight connections offered by those air carriers serving the desired route and determines which carrier offers the best overall deal for the shipper. The freight-forwarder then books space for the cargo. Once an air carrier has confirmed the booking, the freight forwarder often but no always arranges for the cargo to be picked up from the shipper and brought to the airport. After the required documentation is completed, the cargo is checked-in at the airport terminal. Terminal operators or ground handlers are responsible for loading cargo into the air carrier (airplane) for transport. When the air carrier arrives at the destination airport, the cargo is unloaded and taken to the terminal, where the freight forwarder receives it from the ground handlers. The cargo is then sorted and delivered to the consignee(s). The accompanying chart sketches the generic flow of air cargo.

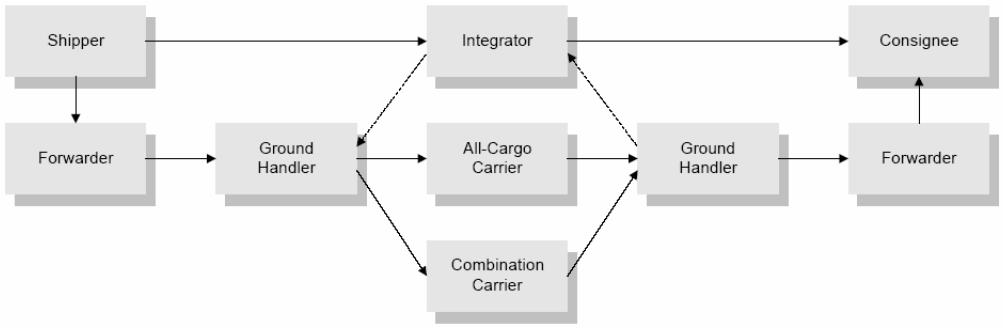
Cargo can be checked-in to the terminal loose or palletized. Loose cargo is a shipment that has not been combined with any other shipments. Palletized cargo is a combination of many shipments to be shipped as a ULD (Unit Load Device). A ULD can be a closed container or an open pallet where shipments are wrapped and tied with nets to form a solid block. The size of palletized cargo varies according to the aircraft type and the location of the pallet in the aircraft.

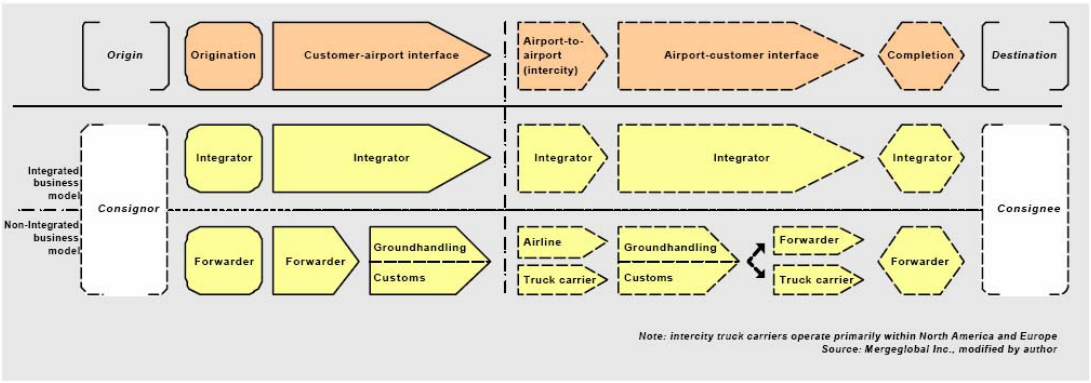
Checking-in loose cargo is generally inefficient, requiring additional work at the terminal as well as additional space for built-up areas. As there are many departure flights per hour during the peak period, building up full pallets in time for each flight's departure may be a challenging task due to space and staffing constraints.

In most cases involving the shipment of fresh farm produce, fruits and vegetables are sent from the growers to packing houses, where the produce is prepared for

[134] Immediately following 9/11, the Transportation Security Administration moved to enhance security of air cargo transported on passenger air carriers. Cargo not originating from approved shippers or forwarders who were regular customers and familiar to the carrier was prohibited on passenger planes. The Known Shipper Program - now TSA's primary cargo security program - has been subsequently strengthened. TSA continues to prohibit all cargo from unknown shippers aboard passenger air carriers. Cargo not from a known shipper cannot be accepted by a passenger carrier and must be diverted to an all-cargo aircraft or another form of transport. Although TSA's mandate from Congress was to upgrade security of cargo transported on passenger flights, TSA is working with the air transport industry to establish a system to screen, inspect or otherwise ensure the security of cargo transported in all-cargo aircraft.

shipment to market. The packing house may be owned by one or more growers or may be an entirely independent business. It is typically the proprietor of the packing house who serves as the shipper/exporter.





Few shippers, though, handle the often complicated logistical arrangements associated with transporting goods abroad. Indeed, many shippers have only a passing familiarity with logistics.[135] Instead, they tend to rely upon freight-forwarders or consolidators whose role is somewhat akin to that of a travel agent booking an airline flight. Freight-forwarders do not ordinarily operate airlines. Instead, they are wholesale purchasers of airline capacity. Specifically, the freight-forwarder is expected to obtain the best possible freight charges for the shipper but

[135] This was certainly our impression when researching this report. For a second, more broadly-based opinion, see S. Kurvers' Master's Thesis, "Airport Conversion: An analysis of the conversion process from military airport to civil cargo airport," (October 2002), Faculty of Aerospace Engineering, Delft University of Technology and Faculty of Economics, Erasmus University Rotterdam, p. 31.

also to minimize the risks involved in transporting valuable merchandise to a foreign destination. Indeed, it is largely to reduce the possibility that goods will arrive in poor condition that air freight – even with its significantly higher costs -- is preferred over other modes of transport. As a result, freight-forwarders will be expected to select carriers and routes that best minimize such risks, even if the chosen carrier is more expensive or the route slightly less direct.[136]

Because of the large volume of business they can generate for air carriers, freight-forwarders have long enjoyed considerable leverage in bargaining for favorable rates. The larger the freight-forwarder, the greater the leverage that freight-forwarder usually has. Furthermore, the freight-forwarder's expertise can be brought to bear in selecting carriers and routes that are most apt to guarantee that the shipment arrives on time and in optimal condition.

Although freight-forwarders normally arrange transport on regularly scheduled passenger and all-cargo aircraft, they do at times resort to the use of chartered aircraft to supplement scheduled services. Typically, that option is used during periods of peak demand or a transport crisis. For example, when West Coast ports were closed for 10 days in September and October 2002 by a lockout of longshoremen, many transpacific ocean shipments were diverted to air. During and after the lockout, one company, Expeditors International, organized 104 charter flights out of Asia. During the same period a year earlier, the same company had orchestrated just four charters.[137]

Air carriers can be divided into three distinct groups. The first group is the so-called combination airlines such as United, American, British Airlines, Lufthansa, Japanese Airlines, Delta, and Northwest which normally focus on transporting passengers but also carry cargo in the lower-deck or "belly" of the aircraft. Some but not all of these

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[136] Freight-forwarders and other frequent shippers are acutely aware that not all air carriers and certainly not all airports are created equal. Some carriers enjoy excellent reputations for handling of precious or perishable cargos, while others are regarded as less reliable. Similarly, certain airports are notorious for their cavalier handling of cargos, not to mention their pilferage rates.

[137] *Journal of Commerce*, July 7, 2004.

airlines also operate all-cargo aircraft or air-freighters.[138] A few also operate combi aircraft – usually wide-bodied planes in which part of the aft portion of the main deck is partitioned off and used to carry freight. Combination carriers account for approximately one-half of all air cargo transported worldwide.[139]

A second group of air carriers includes companies which solely operate air-freighters, either on a scheduled or charter basis. Prominent in this group are Cargolux, Evergreen International Airlines, and Polar (a wholly owned subsidiary of Atlas Air Worldwide Holdings, Inc.). They may also lease cargo aircraft to combination carriers needing to bolster load capacity on certain routes. Historically, both the combination carriers and the all-cargo carriers solely provided airport-to-airport transportation. That proved to be a gap in service the third group of carriers – the so-called integrators – deftly exploited. The most prominent of the integrators are the express carriers FedEx, UPS and DHL. Each company operates its own fleet of all-cargo aircraft, but they also provide door-to-door delivery services. The express segment of the air cargo industry now claims 11 percent of the international air cargo market.[140]

Since 1975, the express business has grown into a global enterprise. UPS began its European operations in 1976, expanding to Asia in 1988 and Latin America in 1989. FedEx began its service to Asia and Europe in 1984, and DHL expanded to Latin America, Africa, the Middle East, and China by 1986. While these three companies are not the only ones providing domestic or international express service, they are the largest in the world.

Freight-forwarders still dominate international air freight markets, accounting for more than 80 percent of tonnage as recently as 2001.[141] Yet the integrators are

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[138] Among the major carriers, United Airlines does not operate air-freighters, although it has said that it would consider doing so on transpacific routes once it emerges from bankruptcy.

[139] Randolph Hall, "Alternative Access and Locations for Air Cargo" (Los Angeles: METRANS Research Center, 2002).

[140] Boeing Air Cargo World Forecast 2004-2005, p. 4.

[141] Brian Clancy and David Hoppin, "Converging on Air Freight: The MergeGlobal 2001 World Air Freight Forecast," *Air Cargo World*, May 2001. The authors also observed that: "the vertically-integrated express carriers have a natural advantage in moving documents and small packages that are "conveyable" - that is, packages that can be fed through the conveyor belts at the sorting hub. Non-integrated freight forwarders have the advantage in moving

making dramatic inroads as they expand their international networks and move up the weight spectrum to capture heavier consignments.

At the end of 2003, there were 890 airlines worldwide that offered scheduled service either internationally or domestically. Of those, 808 offered scheduled passenger service, while 84 operated scheduled air-freighter service. (Eighty carriers offered both passenger and all-cargo flights.)[142] These distinctions are increasingly being blurred. Some passenger carriers (e.g. Lufthansa, SAS and Singapore Airlines) have spun off their cargo divisions into independent companies which, in addition to operating the airlines air-freighters often contract with the main carrier for belly space. Some industry analysts expect that, to survive, more of the traditional air cargo operations will have to aggressively emulate the more extensive value-added model of the integrators.[143]

Until the mid-1970s, European and American airlines dominated the world's air freight business. Between them, European and American carriers held nearly 74 percent of the worldwide air cargo market in 1972. Since then, airlines such as Japan Airlines, Singapore Airlines, Korean Air and Cathay Pacific dramatically increased their market share. By the end of the 20th century, the center of gravity had moved decisively toward the Pacific. Today, more than 80 percent of the world's air freight is international, and more than 70 percent of total air cargo traffic worldwide is carried by non-U.S. airlines.[144]

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larger consignments, from unitized small packages (multiple small packages loaded together onto a pallet) up to heavy or outsize pieces that could not pass through the integrated carriers' sorting systems." They hasten to add, though, that the "dividing line between integrator and forwarder traffic is hazy, however, and hotly contested."

[142] 2003 Annual Report of the International Civil Aviation Organization (September 2004). It should be noted that there is an additional player in the international air cargo market, contract freight operators. These are essentially leasing companies which operate all-cargo aircraft primarily on behalf of other airlines. A fixed fee covers the aircraft, crew, maintenance and insurance. Such arrangements are known as ACMI leases or wet-leases.

[143] This is the view, for example, of Rigas Dogatis. See his *Flying Off Course: The Economics of International Airlines, 3rd Edition* (New York: Routledge, 2002), p. 334. "Air freight is about providing a delivery service and about supply chain management."

[144] *Boeing Air Cargo World Forecast 2004-2005*, p. 8.

The Impact of Regulation/Deregulation

As recently as 1975, only four U.S. carriers – Pan American (PanAm), Trans World Airlines (TWA), Northwest, and Braniff – were authorized to fly overseas.[145] The gateway airports for scheduled overseas service were JFK for transatlantic destinations; LAX and SFO for transpacific flights; and Miami International for Central and South American flights.[146] That restrictive regime began to crumble in 1978, when U.S. airlines were deregulated. Following deregulation, several other U.S. carriers such as American, United, and Delta obtained authority to fly international routes. Gradually, American, United, Braniff, and Delta also brought international flights to other hubs, thus expanding the number of America's aviation gateways for passengers as well as freight. (As of January 2004, there are some 115 U.S. airports designated to handle international flights.[147])

Deregulation within the U.S. ultimately had an effect on international regulation of air transport. Until 1979, the International Air Transport Association (IATA) set fares and rates, subject to government approval. In that year, the Civil Aeronautics Board (CAB) withdrew blanket antitrust protection from IATA. International fare-setting continued to be subject to case-by-case approval of the CAB and, later, the U.S. Department of Transportation (USDOT). As competition among U.S. carriers increased, however, the USDOT loosened its oversight of international pricing, thereby effectively deregulating first charter flights and ultimately air freight operations. Today, foreign governments rarely attempt to thwart U.S. carrier pricing initiatives, and pricing regulation in U.S. international markets is largely a thing of the past.[148]

The frequency, load capacity and specific destinations of international flights remain subject to extensive regulation, however. In general, international air cargo services

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[145] U.S. Department of Transportation, *The Changing Face of Transportation*, p. 4-12.

[146] These were in addition to air travel between the U.S. and its immediate neighbors, Mexico and Canada. Mexicana Airlines' first scheduled international flight was between Mexico City and Brownsville, Texas and was piloted by Charles Lindbergh. Air Canada established service between Vancouver and Seattle as early as 1937.

[147] On January 5, 2004, the Department of Homeland Security designated 115 airports as airports of entry in conjunction with the department's US-VISIT program.

[148] U.S. Department of Transportation, *The Changing Face of* Transportation (2000), p. 4-11.

have been regulated by the same bilateral air service agreements as passenger air services. Historically, the United States has negotiated air service rights for U.S. airlines on a bilateral basis. The agreements reached between the United States and each foreign country typically outline services and business practices that will govern operations by airlines of each country. Such agreements normally include provisions regarding the cities that can be served by carriers of each country, the number of flights that they can operate for both passenger and cargo scheduled services, as well as charter services, and various business rules that will govern the services of each country's carriers.

The United States has bilateral aviation agreements with 97 countries. Of those, 59 are "open skies" agreements. Under these pacts, airlines of both countries enjoy the right to operate air services from any point in one country to any point in the other, as well as to and from third countries.

Given the inter-connected services provided through airline alliances, the U.S. has been aiming to negotiate more aviation agreements that encompass services involving more than one foreign trading partner. The first such multilateral open skies agreement was signed in 2001 with Brunei, Chile, New Zealand, and Singapore. There have been hopes that a similar accord could be reached with the European Union, but negotiations have remained stymied through 2004.[149] Still, an agreement appears eventual and its terms would likely lead to a vast expansion of international passenger and air cargo service to a wider array of U.S. airports.

For example, U.S. negotiators have proposed to give carriers in all EU member states - including the 10 new states - open access to all points in the United States for service from any point within the EU. European airlines also would be permitted to set up hubs to operate freight and passenger flights from an American city to Latin America and other regions of the world. Enactment of that proposal would ensure

[149] A major sticking point in the US-EU negotiations is whether European airlines would be permitted to pick up passengers or cargo in one U.S. city and then fly on to another American destination. This right (known as cabotage) is being sought by European carriers, who question the potential profitability of simple point-to-point cargo routes. Instead, they are demanding the option, especially for cargo flights, of flying on to at least one additional U.S. destination. However, U.S. law would have to be changed to allow for such cabotage rights, and U.S. Transportation Secretary Norman Mineta has indicated he is not prepared to take the proposal to Congress.

that those American cities that are rapidly growing out of their second-tier status would not necessarily have to rely exclusively on U.S. carriers to introduce regular air service between their airports and international destinations.

Japan and China account for more than 50 percent of the transpacific air cargo tonnage, which is approximately twice as large as the volume of air cargo traffic between Europe and North America. Japan remains the largest market in Asia, but its market share continues to decline, dropping from 33.9 percent in 1983 to 32.0 percent in 1993 and 25.8 percent in 2003. Japan's decline can be attributed in part to China's continuing strong growth, with its market presence increasing from a 2.1 percent share in 1983 to an 11.7 percent share in 1993 and a 25.2 percent share in 2003. The recent China-U.S. bilateral agreement further ensures continuing strong growth for China's air cargo market.

In 1999, the U.S. and China concluded a bilateral air services agreement which permitted each country's carriers to increase their weekly flights in the U.S.-China market from 27 to 54, and each side was allowed to designate one additional airline --- for a total of four --- to serve the market. In July 2004, the two countries signed an expanded agreement that will allow five additional airlines from each country to serve the U.S.-China market. The United States may name one additional all-cargo airline, while China may name either a passenger or cargo airline, to start service by the end of 2004. The other four new-entrant airlines may be either passenger or cargo carriers, with one new carrier entering the market in each of the years 2005, 2006, 2008 and 2010. United Airlines, Northwest Airlines, Federal Express and United Parcel Service currently serve China.

The agreement also will allow an additional 195 weekly flights for each side (111 by all-cargo carriers and 84 by passenger airlines) resulting in a total of 249 weekly flights at the end of a six-year phase-in period. A total of 14 of these flights will be available for new U.S. passenger services in late 2004.

The two sides also agreed to allow each country's carriers to serve any city in the other country. Currently, Chinese carriers are limited to 12 U.S. cities, and U.S. passenger carriers may fly to only five Chinese cities. The agreement also will permit

unlimited code-sharing between U.S. and Chinese airlines, thus expanding on the current agreement, which allows code-sharing only to a limited number of cities.

The agreement also provides that when carriers establish cargo hubs in the other country, they will be afforded a high degree of operating flexibility, and expands charter opportunities beyond those provided by the existing agreement. The two sides will resume talks in 2006 to review the aviation relationship and make further progress on liberalizing the agreement.

The Characteristics of Air Cargo

Air cargo has long been the preferred mode of transportation for a wide range of merchandise where the cost of shipping is less important than expedited delivery.[150] Not surprisingly, the air cargo trade often involves emergency freight, which may include everything from medicines to machine parts or components needed to keep a manufacturing line in operation. During the fall 2002 lock-down of West Coast ports, for example, officials at the NUMMI automotive plant in Fremont, California were obliged to airfreight key automobile components from Japan by air.[151] Similarly, the Sony Corporation more recently chartered Russian Antonov-124 cargo planes to fly the latest version of Sony's hugely popular Play-Station 2 video games console to Europe after an oil tanker had run aground in the Suez Canal on November 8, 2004 and halted canal traffic for the first time since 1875.[152] In general, however, air shipments typically involve items with high value-to-weight ratios, the very kinds of

[150] In order to move the 504,000 bottles of Beaujolais Nouveau from France to Japan in time for the traditional third Thursday in November release date, FedEx operated seven charters, including five MD-11s. Six of the flights moved from the Lyon-Saint-Exupery Airport to Tokyo, and one charter went from Stansted Airport in the U.K. to Sapporo, Japan. *Material Handling Management* (November 2004).

[151] The New United Motor Manufacturing, Inc. (NUMMI) is a joint venture of the General Motors Corporation and Toyota Motor Corporation. The *San Francisco Chronicle* reported that NUMMI was flying in about eight cargo containers worth of parts daily via San Francisco International Airport, enough for a day's production of 900 cars. The plant's truck line remained closed, however. See Vanessa Hua, "Auto plant takes to the air; Alternative to locked-out ports is extremely expensive," *San Francisco Chronicle*, October 8, 2002.

[152] *The New York Times*, "Japan: Air Freight Rescue for Playstation," December 8, 2004. See also "Manufacturers Cope with Costs of Strained Global Supply Chains" in the *Wall Street Journal*, December 8, 2004. The *WSJ* article observes: "Some companies are turning to more expensive but more reliable modes of transport, like air freight, which is faster and less probe to delays than ocean shipping."

products that are the hallmark of the world's more dynamic industrial economies. Prominent among these high value-to-weight ratio cargos are the products of California's electronics, telecommunications and other advanced technology companies.[153] In the case of exceptionally valuable but non-perishable cargos like jewels, furs, art work, precious metals, air shipment is commonly preferred because it minimizes the length of time the goods are in transit and therefore at maximum risk.

In the case of perishable items – whether fruits, vegetables or today's newspaper – the purpose of air transport is obviously to deliver the shipment to market before its commercial life expires. A foreign grocery chain can be expected to pay premium prices for fresh fruit or vegetables only if the produce arrives in good condition (i.e., retaining its attractive physical and nutritional characteristics) and during a period of time in which local consumers are themselves willing to pay premium prices. That window is often relatively brief for agricultural produce. In some instances, the sole point of using air-freight is to reap the financial rewards of being first to market with a popular fruit or vegetable before prices are driven down once cheaper modes of transport are able to deliver much larger volumes of that same commodity. In other cases, where the produce has a particularly brief shelf-life or cannot tolerate an ocean voyage, there are no practical alternatives to air freight.[154] California shippers of fresh cherries, for example, have become heavily dependent on air freight to move their shipments to overseas markets. Likewise, organic produce, whose prized status would be vitiated by the chemicals often used to retard deterioration during a lengthy sojourn at sea, are also prime candidates for air shipment.

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[153] Boeing Aircraft's 2004/2005 World Air Cargo Forecast (p. 9) notes: "Previous research of trade patterns suggested that commodities with value greater than US$16 per kilogram would potentially be transported by air. Following this result, a potential airborne cargo market can be determined from the tonnage of traded goods (regardless of mode) with value that exceeds US $16." *Boeing Air Cargo Forecast 2004-2005.*

[154] Seafood is often flown to markets thousands of miles from fishing grounds. For an informative description of how UPS transports thousands of Atlantic lobsters each week via its hub in Louisville, Kentucky, see John McPhee, "Out in the Sort: Lobsters, bats, and Betleys in the UPS hub," *The New Yorker*, April 18, 2005.

Shipping Rates

There are shipping rates (also commonly known as tariffs), and then there are rates. Officially, international air cargo shipping rates are negotiated under the auspices of the International Air Transport Association (IATA), an organization that brings together approximately 270 airlines whose flights comprise more than 95 percent of all international scheduled air traffic. In practice, however, "control of cargo tariffs is largely non-existent or ineffectual."[155] Even though IATA Tariff Coordination Conferences still fix cargo tariffs on flight routes, those tariffs bear little resemblance to actual market rates. Their main function is to help define the rates airlines assess each other for transshipments involving more than one carrier.

Airlines do not always honor rate agreements. Press reports in March 2004 indicated that an unexpected capacity shortage pushed airfreight rates up 30 to 40 percent.[156] In many cases, forwarders and shippers were told they had to pay premium rates to ensure their cargo would move on the flight on which it had been booked. Shippers whose traffic increased often had to pay top dollar for additional space. More recently, carriers have imposed fuel surcharges to help recoup the run-up in fuel prices during 2004.

Several considerations go into setting air cargo rates. For example, freight density is critical to the economics of the industry. Cargo payload on any aircraft is ultimately limited by weight but also by volumetric capacity. Since tariffs are based on weight, an airline can maximize freight revenue by carrying low volume cargos. By contrast, low density shipments may fill the available cargo space without fully utilizing weight limits. Ideally, an airline seeks to achieve a cargo balance that makes maximum utilization of both volume and weight constraints. However, surcharges are often levied on low density cargos to compensate for under-utilization of weight capacity.[157]

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[155] Doganis (2002), p. 304.

[156] *Journal of Commerce*, July 19, 2004.

[157] To determine how typical air cargo shipping rates might be monitored, we queried a leading authority in the air freight industry. Here is his reply: "Ag exports do represent a growing volume in air cargo, however the rate structures are not regulated and are confidential. Not to say that USDA could not obtain those rates but it is a different environment than ocean. I can't imagine too many (read any) Indirect or Direct Air Carriers that would volunteer their customer rate structures to an inquiring party, government or not given the competitive nature of the industry. And the rate structures are varied by shipper

Another important factor influencing air cargo rates is the direction of the flight. Unlike passenger travel, there are very seldom any roundtrip freight shipments. One consequence of this is that imbalances can occur on certain routes, with the volume of goods moving in one direction exceeding – sometimes by very substantial margins – the volume of goods moving in the opposite direction. This has been typical in recent years of airborne trade between the Far East and the U.S. even though air carriers have sought to attract cargos on westbound routes by offering lower cargo rates.[158] The problem of imbalances or the lack is more onerous for all-cargo operations than for passenger airlines because the former's only source of revenue is from cargo. Carriers are accordingly reluctant to schedule air-freighter service to destinations where there is little prospect of sufficient "back-haul."[159] The air carrier's obvious preference is to earn as much revenue as possible on each flight.

The Economic Significance of Air Cargo

Most members of the general public and even many public policymakers -- no doubt impressed by the sprawling size of maritime facilities like the neighboring Ports of Los Angeles and Long Beach or the Port of Oakland America's seaports with their towering cranes hovering over ships carrying thousands of steel containers -- instinctively assume that the bulk of the nation's international trade passes through

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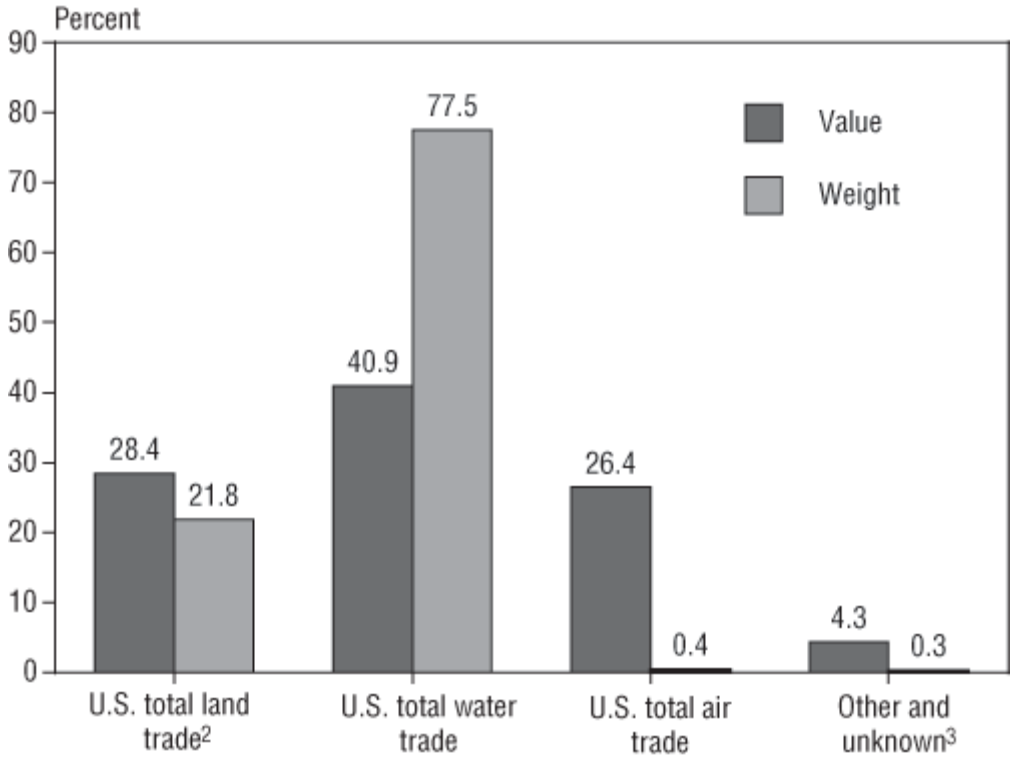
based on a number of criteria. Their source of data may be within the government strangely enough. The Direct and Indirect Air Carriers are required to provide select information to Census as well as Customs and Border Protection for the purpose of targeting shipments for security reasons. I understand that Census is the owner of much of the data and may well be averse to sharing, but you asked for an efficient and economical manner to secure the information and that may be the avenue to secure it."

[158] "Aircraft flying into LAX from Asia and the South Pacific are crammed with cargo but carry precious little on the backhaul. Transportation rates reflect this imbalance. Shipping lines keep raising their eastbound trans-Pacific rates. Westbound, they charge less per container for the 10,000-mile voyage to Asia than for a 1,000-mile trip from Miami to Puerto Rico. Airlines are grabbing every extra dollar they can squeeze from inbound customers. They not only are raising steeply their regular cargo rates but are telling forwarders that unless they pay express or premium rates – three times the already high tariffs - they cannot guarantee cargo will move on designated flights. Outbound U.S. freight tariffs are far lower, yet many aircraft still fly out half empty. " Julian Keeling, a Los Angeles-based air cargo wholesaler wrote in a commentary in the *Journal of Commerce* on June 14, 2004.

[159] Some cargo carriers maneuver around this problem by elaborate routing patterns. For example, a carrier might fly freight from A to B, where it picks up goods to be flown to C, where it picks up goods to be flown back to A. See John D. Kasarda and Jonathan Green, "Air Cargo: Engine For Economic Development," a paper delivered at the International Air Cargo Association Air Cargo Forum in Bilbao, Spain on September 15, 2004. They observe that: "Many carriers operate less than profitable backhauls or scramble to find routes allowing a second or third stop to make routes profitable." (p. 7)

our seaports. And that is literally true. When measured by weight, over three-quarters of America's foreign merchandise trade is waterborne.[160] By contrast, as Table 3-1 reveals, a mere 0.4 percent of that trade moved by air in 2003.

Table 3-1
Modal Shares of U.S. Merchandise Trade Handled by Land, Water, and Air Gateways by Value and Weight[1]: 2003



[1] BTS estimated the export weight for truck, rail, pipeline, and other and unknown based on value-to-weight ratios from the import data. This estimation procedure was used because U.S. exporters are not required to report the export weight for land modes. Weight for water and air exports and imports are from U.S. Department of Commerce, U.S. Census Bureau.

[2] Includes truck, rail, pipeline, and miscellaneous surface modes.

[3] Includes purchased vehicles such as aircraft or boats moving from manufacturer to customer where the vehicle itself is the shipment, pedestrians carrying freight, and miscellaneous.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on: Value data -- total trade, from U.S. International Trade Commission, USITC Interactive Tariff and Trade Dataweb, available at http://dataweb.usitc.gov/, as of September 15, 2004; weight data -- Foreign Trade Division, U.S. Exports of Merchandise, CD-ROM and U.S. Imports of Merchandise, CD-ROM, December 2003. Truck, rail, pipeline, other and unknown data—USDOT, BTS, Transborder Surface Freight Data 2004; and special calculation, October 2004.

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[160] Bureau of Transportation Statistics, U.S. Department of Transportation, "Pocket Guide to Transportation 2004," p. 37. For 2002, the precise percentage of waterborne trade was 77.8 percent.

Yet when measured by the dollar value of the goods being transported, the story is quite different. In that case, a bit more than forty percent of the nation's two-way merchandise trade was waterborne in 2003, while more than one-quarter moved by air. Further, as the data in Table 3-2 indicate, U.S. airborne trade has been increasing at a faster pace since 1990 than waterborne trade. On a worldwide basis, air cargo now accounts for fully 40 percent of the value of cross-border merchandise trade.[161]

Table 3-2.
Value of U.S. Merchandise Trade by Land, Water, and Air Gateways: 1990-2003[162]

(Current $, billions)

Year	Total U.S. international merchandise trade	U.S. total land trade	U.S. total water trade	U.S. total air trade	Other and unknown
1990	889	204	434	201	50
1991	910	210	435	209	56
1992	981	232	463	226	60
1993	1,046	258	477	255	56
1994	1,176	312	517	293	54
1995	1,328	338	573	355	62
1996	1,420	377	591	382	70
1997	1,560	426	626	433	76
1998	1,594	452	614	442	86
1999	1,720	501	632	496	92
2000	2,000	576	740	593	91
2001	1,870	547	718	519	86
2002	1,857	541	729	498	89
2003	1,983	563	811	523	86
Percent change, 1990-2003	123.1	176.2	86.8	159.9	73.4
Average annual growth rate, 1990-2003	6.4	8.1	4.9	7.6	4.3

[161] John Kasarda and Jonathan Green "Air Cargo: Engine for Economic Development," a paper prepared for the International Air Cargo Association Air Cargo Forum in Bilbao. Spain on September 15, 2004. The authors are with the Center for Air Commerce of the Kenan-Flagler Business School at the University of North Carolina at Chapel Hill.

[162] Source: U.S. Department of Transportation, Bureau of Transportation Statistics, from U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, U.S. Exports of Merchandise CD and U.S. Imports of Merchandise CD, various annual December CDs. Other and Unknown includes purchased vehicles such as aircraft or boats moving from manufacturer

Even more striking is that, when measured by value, more of the nation's merchandise export trade is carried by aircraft than on the ships. As Table 3-3 indicates, airborne exports accounted for 32.6 percent of the nation's merchandise export trade in 2003, with waterborne trade (28.5 percent) and overland trade (26.9) with somewhat more modest shares. (As noted elsewhere, aircraft have carried more than half of California's merchandise export trade since at least 1987 -- when state-of-origin export data first became available.[163])

A glance at Table 3-4 (Page 100) reveals not merely the importance of the nation's airports as international trade gateways but also the extent to which the nation's seaports are conduits for imported goods. Still, it is not uncommon to see such statistical testaments to air cargo's critical importance to the nation's export trade overlooked by policymakers who are apt to measure foreign trade not by dollar value but by the volume of Twenty-Foot Equivalent (TEU) shipping containers handled by the nation's seaports, railroads and trucking lines.

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to customer where the vehicle itself is the shipment, pedestrians carrying freight, and miscellaneous.

[163] 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.

Table 3-3.

Value of U.S. International Merchandise Trade by Mode of Transportation: 2003[164]

(Millions of current U.S. dollars)

	Exports	*Modal %*	*Imports*	*Modal %*	*Total trade*	*Total modal %*
Water	206,205	28.5	604,881	48.0	811,086	40.9
Air	**235,602**	**32.6**	**284,741**	**22.6**	**523,343**	**26.4**
Truck	194,786	26.9	209,249	16.6	404,035	20.4
Rail	26,041	3.6	69,683	5.5	95,724	4.8
Pipeline	915	0.1	31,451	2.5	32,366	1.6
Other, unknown, and miscellaneous	60,194	8.3	56,390	4.5	116,584	5.9
Total	**723,743**	**100.0**	**1,259,396**	**100.0**	**1,983,139**	**100.0**

[164] Numbers may not add to totals due to rounding. Water—Excludes intransit data (merchandise shipped from one foreign country to another via a U.S. water port). Imports—Excludes imports valued at less than $1,250. Import value is based on U.S. general imports, customs value basis. Exports—Excludes exports valued at less than $2,500. Export value is FAS (free alongside ship) and represents the value of exports at the port of export, including the transaction price and inland freight, insurance, and other charges. Sources: Compiled by U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS), May 2004. Water and air data—U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, *U.S. Exports of Merchandise*, CD-ROM and *U.S. Imports of Merchandise*, CD-ROM, December 2003. Total, truck, rail, pipeline, other and unknown data—USDOT, BTS, Transborder Surface Freight Data 2004.

Table 3-4.

Top 20 U.S. Foreign Trade Freight Gateways by Value of Shipments: 2003[165]

(Billions of current dollars)

Rank	Gateway	Exports	Imports	Total
1	Los Angeles, CA (w)	16.9	105.2	122.1
2	JFK International, NY (a)	46.6	65.3	111.9
3	Detroit, MI (l)	54.5	47.3	101.9
4	New York, NY and NJ (w)	24.3	76.9	101.2
5	Long Beach, CA (w)	17.2	78.7	95.9
6	Laredo, TX (l)	32.4	46.4	78.8
7	Los Angeles Internatl. Airport, CA (a)	32.6	31.2	63.8
8	Port Huron, MI (l)	22.7	39.6	62.3
9	Buffalo-Niagara Falls, NY (l)	27.4	32.0	59.4
10	Chicago, IL (a)	20.6	33.7	54.3
11	Houston, TX (w)	21.4	28.5	49.9
12	San Francisco Internatl. Airport, CA (a)	20.6	26.1	46.6
13	Charleston, SC (w)	13.4	26.0	39.4
14	El Paso, TX (l)	16.7	22.5	39.2
15	Norfolk, VA (w)	11.0	18.5	29.5
16	New Orleans, LA (a)	13.7	13.7	27.4
17	Tacoma, WA (w)	5.2	21.1	26.3
18	Baltimore, MD (w)	5.7	20.3	26.0
19	Oakland, CA (w)	7.8	17.4	25.1
20	Dallas-Fort Worth, TX (a)	11.4	12.2	23.6

Key: a = air; l = land port/border crossing; w = water port.

[165] Sources: U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS). Air-U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, special tabulation, August 2004. Water-USDOT, Maritime Administration, Office of Statistical and Economic Analysis, personal communication, August 2004. Land-USDOT, BTS, Transborder Surface Freight Data, August 2004. Notes: Trade excludes imports of less than $1,250 and exports of less than $2,500. Air: Includes a low level (generally less than 2%-3% of the total value) of small user-fee airports located in the same region. Air gateways not identified by airport name (e.g., Chicago, IL) include major airport(s) in that area and small regional airports. Due to Census Bureau confidentiality regulations, courier operations are included in airport totals for only JFK, Los Angeles, Chicago, and New Orleans. Numbers may not add to totals due to rounding.

Air cargo has also become an increasingly important source of revenue for the air transport industry. In 2001, British Airways estimated that close to 60 percent of its freight revenue on passenger flights went to cover freight-related costs. The other 40 percent could be used to cover the other costs of operating a passenger flight which would have flown regardless of whether there was any cargo aboard.[166]

Between 1980 and 2001, freight revenues for U.S. international air cargo carried on both air-freighters and aboard passenger aircraft swelled from $1 billion to over $6 billion (in current dollars). For U.S. carriers, international freight revenues rose at a faster clip (9.5 percent per year on average) than did their domestic freight revenues, which grew at an average of 8.4 percent per year. After struggling the aftermath of 9/11, the air cargo industry has been recovering. The International Air Transport Association reported a 10.8 percent year-on-year increase in scheduled international traffic for October 2004 that took year-to-date traffic growth to 16.9 percent compared to first 10 months of 2003. International cargo traffic posted similar gains of 12.4 percent for October 2004 compared to October 2003 and 14.0 percent for the first 10 months of 2004 compared to the same period for 2003.[167]

Air freight's economic impact is amply felt on the ground as well, especially in those metropolitan areas and states served by major air cargo terminals. Just as cities once prospered by virtue of their location on important waterways or overland trade routes, no modern metropolis can flourish without efficient air links to transport people and goods around the globe. The significance of air transport to the technology sector and to the maintenance of agile manufacturing processes and supply chains is further reflected in research findings at the Institute of Public Policy at George Mason University that, on average, metropolitan regions with hub air

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[166] Rigas Doganis, p. 319. Doganis questions the accounting practice of regarding freight revenues as a by-product of passenger service. He notes that the International Air Transport Association's Cost Committee has recommended that the profitability of air cargo on passenger and combi aircraft can be truly assessed only after all operating costs have been allocated between cargo and passengers. If this were done, he concludes, "the carriage of belly-hold freight becomes marginal or unprofitable." (p. 320)

[167] The IATA report came with caveats, however. "Despite a negative economic environment and continued uncertainty in the price of oil, international traffic is growing at breakneck speed. Unfortunately traffic growth and profitability do not always walk hand in hand and we still expect industry losses in excess of US$4 billion for this year," Giovanni Bisignani, IATA's Director General and CEO, said in the November 30, 2004 IATA press release announcing the traffic figures.

cargo operations generate significantly more high-tech jobs than regions without hubs. In their assessment of over 300 American cities, Kenneth Button and Roger Stough concluded that the presence of a hub airport accounted for almost two-thirds of the variation in high-tech employment levels.[168] As the University of California at San Diego's Steven P. Erie writes, "Growing evidence indicates that what local governments do provide trade infrastructure fundamentally matters to their global competitiveness."[169]

At the Airport: An Often Frantic Dance

Most air freight today moves in a variety of unit load devices (ULDs), which range from half-pallets to intermodal containers which can only be accommodated on wide-body freighters. (See Appendix for diagrams and specification of the more widely used ULDs.)

The shipment of goods by air, especially if the goods are perishable commodities like cherries, involves an intricate and often frantic dance that is usually orchestrated by the freight-forwarder or integrator. The fundamental objective is to ensure that the merchandise is delivered to the overseas customer on schedule, in good condition, and at an acceptable cost. In the calculus of air cargo, meeting delivery schedules[170] and preserving the freshness and appearance of fresh produce normally takes precedence over cost considerations – up to a point, of course.

Freight-forwarders weigh several factors when arranging airborne shipments of fresh produce. In the case of fresh cherries, for example, the process of getting the fruit to distant markets in top-quality condition is, for obvious reasons, a fast-paced one. Cold chains must be maintained throughout transit, especially while sufficient cargo space is being found on flights departing for distant markets. To a large extent, this effort requires very close coordination with air carriers, if for no other reason than the inherent precariousness of flight.

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168 See their *The Benefits of Being a Hub Airport City: Convenient Travel and High Tech Job Growth* (Fairfax, Virginia: George Mason University Institute of Public Policy, 1998).

169 Steven P. Erie, *Globalizing L.A.: Trade, Infrastructure, and Regional Development* (Stanford University Press, 2004), p. 12.

170 The air-freighting of California cherries to Japan is scheduled to ensure that particularly large shipments arrive in Japan on Thursday and Fridays for weekend shoppers.

Every aircraft has a certified carrying capacity that is a function of its design. Yet, for each of its flights, the maximum takeoff weight may vary enormously. Temperature, humidity, wind speed, runway conditions, airport altitude, weather condition en route to destination, and a host of other factors determine the allowable takeoff weight. For example, at a high-altitude airport even a small rise in temperature can reduce the aircraft's takeoff weight limit by thousands of pounds, sometimes necessitating the bumping of passengers, cargo or both. Similarly, weather conditions en route can also dictate the nature of the aircraft's payload. Strong winds en route or poor weather at a flight's destination city may require an air carrier to allocate more of the maximum allowable weight to reserve fuel for a circuitous flight plan — leaving less allowable weight for both passengers and cargo. All the while, the plane's center of gravity must also be maintained within certain parameters.

Managing all of this is a complex chore, the final details of which are often worked out only in the minutes before scheduled departure of a passenger flight. At American Airlines, for example, the work is performed by load planners who begin detailed work on each flight about 90 minutes prior to its scheduled departure.[171]

> "Flight dispatchers — using a program that factors in information on weather, passengers, and cargo — determine the flight's fuel requirements. The planners then assign luggage, mail, and freight to specific cargo holds and fuel to fuel tanks in order to keep the aircraft's center of gravity in the optimal position and enhance performance….When the flight plan is done, fuelers and baggage handlers are told how to load the airplane. Everything gets finalized during the 10 minutes prior to departure. As the flight is taxiing to the runway, the pilots receive the final center-of-gravity information — based on the exact passenger count and the cargo and fuel on the aircraft — from the load planners. This information enables the pilots to set proper trim settings for the aircraft's stabilizer and wing flaps for takeoff."

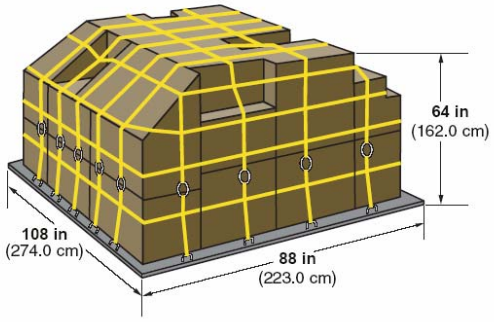
Decisions affecting the aircraft's maximum take-off weight and load distribution on a passenger flight have a direct impact on cargo shipments because the weight and volume allowable for cargo can sometimes change abruptly. Since airlines are

[171] This description of aircraft load management is taken from "Vantage Point: Weight and Balance," an article in the September 15, 2004, issue of *American Way* magazine by Gerard J. Arpey, the Chairman & CEO of American Airlines.

generally less inclined to disappoint travelers, it is the cargo that is more likely bumped. For perishables, this could prove disastrous. According to Robert V. Dahl, project director of Air Cargo Management Group, a Seattle-based aviation consulting firm: "Airlines can afford to sell excess belly space at low prices, but the quality of such freight service is mixed. Freight gets bumped if passenger loads are high or if weather conditions mandate higher fuel loads. Also, passenger airlines prefer to fly during the day, while freight wants to move overnight. Thus, shippers and freight forwarders prefer to move their goods on freighters when they are available."[172] Still, because of the frequency of flights to a multiplicity of destinations, passenger flights remain highly attractive for shipments of perishables.

Air Cargo Shipping Containers

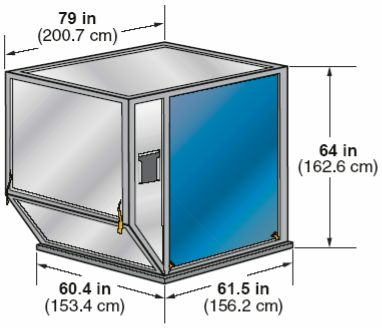
Cargos shipped aboard aircraft may be palletized or enclosed in a variety of different sizes and types of containers or Unit Load Devices (ULDs). Some of the more common ULDs are depicted below.



Common designation: Half pallet

IATA ULD code: PLA half pallet with net
Also known as: PLB, FLA, P9A, P9B, P9P, P9R, and P9S
Rate class: Type 6
Description: Half pallet is contoured for lower and main deck.
Suitable for: 747 and 777 lower deck; 707F, 727F, and 737F main deck with contoured load
Maximum gross weight: 6,999 lb (3,175 kg)
Tare weight: 200 lb (91 kg)
AS1825 volume: 250 ft^3 (7.1 m^3)

172 "Freighters – Choices, Choices, Choices," *Air Cargo World*, November 2000.



Common designation: LD-3

IATA ULD code: AKE contoured container

Also known as: AKE, AVA, AVB, AVC, AVK, DVA, DVE, DVP, XKS, XKG, and forkable AKN, AVN, DKN, DVN, and XKN

Rate class: Type 8

Description: Half-width lower deck container with one angled side. Door is either canvas or solid.

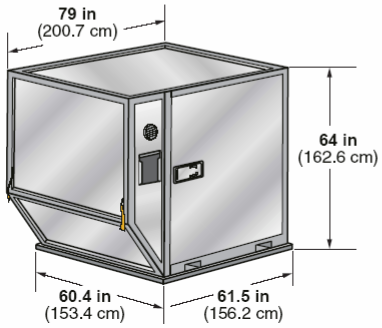
Suitable for: A300, A310, A330, A340, 747, 767, 777, DC-10, MD-11, and L-1011

Door opening: 58 x 61 in (147 x 155 cm)

Maximum gross weight: 3,500 lb (1,588 cm)

Tare weight: 181 lb (82 kg)

AS1825 volume: 159 ft^3 (4.5 m^3)



Common designation: LD-3 Reefer

IATA ULD code: RKN contoured cool container

Also known as: RVN

Rate class: Type 8

Description: Half-width lower deck insulated container with one angled end. Door is solid. Most examples are forkable.

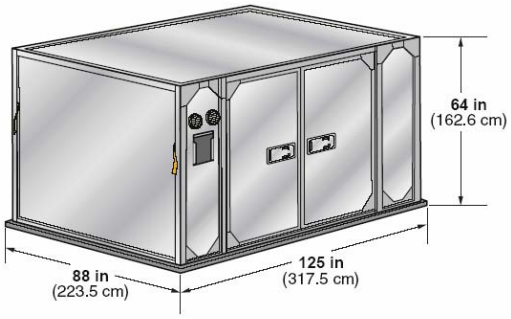
Suitable for: A300, A310, A330, A340, 747, 767, 777, DC-10, MD-11, and L-1011

Door opening: 54 x 55 in (137 x 140 cm)

Maximum gross weight: 3,500 lb (1,588 cm)

Tare weight: 463 lb (210 kg)

AS1825 volume: 159 ft^3 (4.5 m^3) **plus internal volume (as is)**



Common designation: LD-9 Reefer

IATA ULD code: RAP cool container on P1P base

Rate class: Type 5

Description: Insulated container with solid door

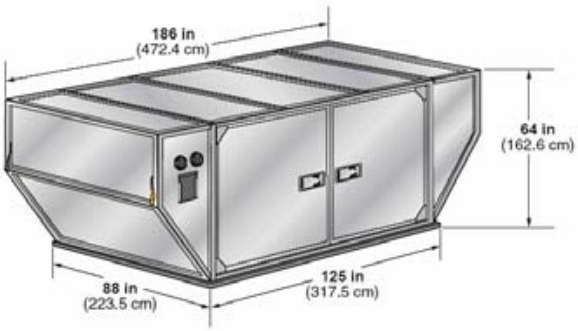
Suitable for: A300, A310, A330, A340, 747, 767, DC-10, MD-11, and L-1011

Door opening: 85 x 58 in (216 x 147 cm)

Maximum gross weight: Lower deck, 10,198 lb (4,626 kg); **main deck, 13,227 lb** (6,000 kg)

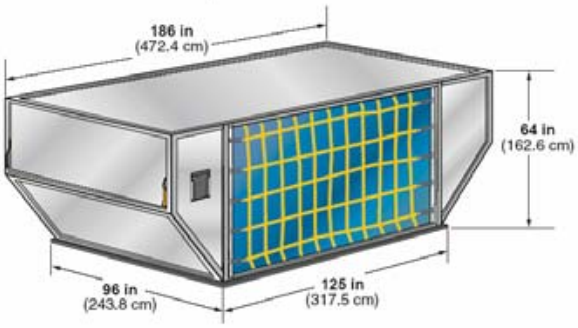
Tare weight: 882 lb (400 kg)

Internal volume: 339 ft^3 (9.6 m^3)



Common designation: LD-29

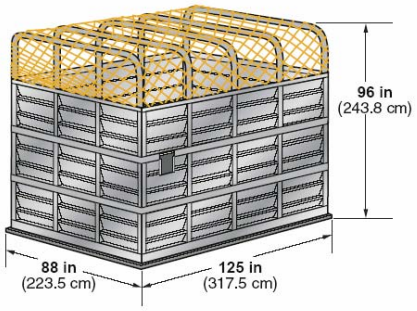
IATA ULD code: RAU contoured cool container on P1P base.
Rate class: Type 5
Description: Full-width lower deck container angled at both ends. Refrigerated version of AAU has solid door.
Suitable for: 747
Door opening: 118 x 60 in (300 x 152 cm)
Maximum gross weight: 13,300 lb (6,033 kg)
Tare weight: 992 lb (450 kg)
Internal volume: 392 ft³ (11.1 m³)



Common designation: LD-39

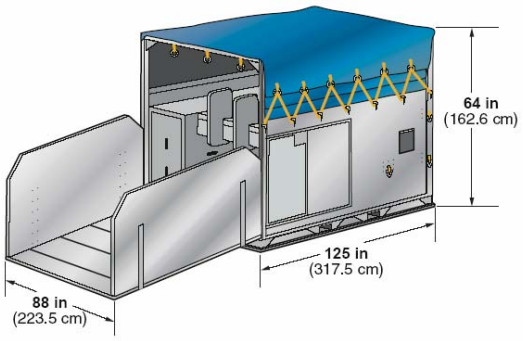
IATA ULD code: AMU contoured container on P6P base
Rate class: Type 2BG
Description: Full-width lower deck container angled at both ends. Door is canvas with built-in net door straps.
Suitable for: 747
Door opening: 120 x 60 in (305 x 152 cm)
Maximum gross weight: 11,100 lb (5,035 kg)
Tare weight: 639 lb (290 kg)
AS1825 volume: 560 ft³ (15.9 m³)

There are even ULDs designed specifically to accommodate livestock.



Common designation: Type A pen

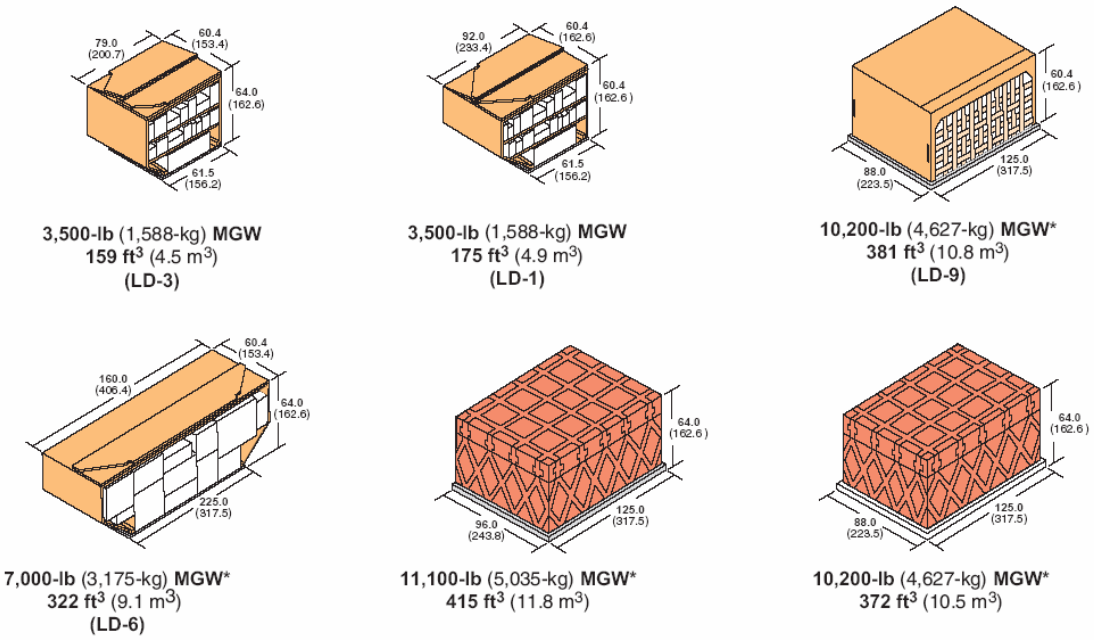
IATA ULD code: KMA sheep and goat pens on P1P base with net
Rate class: Type 3
Description: Double- and triple-deck sheep and goat pens
Suitable for: 747F and MD-11F lower deck positions subject to airline regulations.
Tare weight: Triple deck, 1,344 lb (610 kg);
double deck, 937 lb (425 kg)
AS1825 volume: 560 ft³ (15.9 m³)



Common designation: LD-9 stall

IATA ULD code: HMA horse box on P6P pallet base
Rate class: Type 2
Description: P6P base with IATA-specified horse box stalls attached. Available with canvas top or solid roof. Some further modified versions available with position for escort.
Suitable for: Main deck 747F, 767F, DC-10F, and MD-11F
Maximum gross weight: 7,716 lb (3,500 kg)
Tare weight: 2,888 lb (1,310 kg)
AS1825 volume: 560 ft³ (15.9 m³)

The types of containers carried on a 747-400 freighter include:



Source: These illustrations are from the Boeing *Freighter Reference Guide 2003*.

Cargo Airports in the United States

In the FAA's National Plan of Integrated Airport Systems (NPIAS) there are a number of classifications for airports with scheduled passenger service. Commercial Service Airports are defined as those airports receiving scheduled passenger service and having 2,500 or more annual enplanements. In 2001, there were 546 commercial service airports. Primary airports are defined as those commercial service airports having 10,001 or more enplanements. In 2001, the FAA classified 31 airports as large hubs, 35 were classified as medium hubs, 71 were small hubs and 282 were non-hubs.[173]

Of the nation's 100 largest airports in terms of air freight handled, ten are located in California. Of those, three are in the San Francisco Bay Area – San Francisco International (SFO), Oakland International (OAK) and Mineta San Jose International (SJC). Four are in Southern California – Los Angeles International (LAX), Ontario International (ONT), San Diego's Lindbergh Field (SAN), Long Beach Airport (LGB),

[173] Airports Council International, "The Economic Impact of U.S. Airports" (2002), p,5.

and Burbank's Bob Hope (BUR). And two are in the San Joaquin Valley Sacramento International (SMF) and Sacramento's Mather Field (MHR).

The 30 largest freight airports in the United States, measured by total metric tonnage, are shown in Table 3-5. The largest airport (Memphis) and the sixth largest airport (Louisville), owe their size to hub operations of FedEx and UPS. Neither airport is located in a highly populated region. Nor are they international gateways. They were selected by UPS and FedEx as hubs because of their central location relative to U.S. population, minimal snowfall, and attractive labor environments.

Table 3-5.

North America's top 30 cargo airports in 2003. *(in tonnes)*

World Rank	Airport	Traffic	% change
1	Memphis (MEM)	3,390,515	0.0
4	Anchorage (ANC)	2,097,488	2.7
6	Los Angeles (LAX)	1 806,164	2.7
8	Miami (MIA)	1,637,278	0.8
9	New York (JFK)	1,633,026	2.9
11	Louisville (SDF)	1,617,907	6.2
12	Chicago O'Hare (ORD)	1,604,755	23.7
20	Indianapolis (IND)	890,615	2.8
21	Newark (EWR)	868,164	1.0
22	Atlanta (ATL)	797,419	8.6
25	Dallas/Ft. Worth (DFW)	667,527	–0.3
28	Oakland (OAK)	619,802	–4.7
31	San Francisco (SFO)	573,448	–3.8
34	Ontario, Calif. (ONT)	529,184	6.6
35	Philadelphia (PHL)	524,771	–3.0
37	Honolulu (HNL)	416,363	–0.4
39	Cincinnati (CVG)	393,468	11.4
40	Houston (IAH)	384,487	16.6
43	Boston (BOS)	363,082	–6.4
45	Seattle/Tacoma (SEA)	353,410	–5.7
50	Dayton (DAY)	327,362	–16.1
51	Denver (DEN)	325,218	–2.4
53	Minneapolis/St. Paul (MSP)	317,226	–0.9
56	Phoenix (PHX)	308,144	–3.6
59	Washington Dulles (IAD)	285,271	–12.2
60	Toledo (TOL)	281,063	–4.0
69	Portland (PDX)	238,632	–2.9
72	Baltimore/Washington (BWI)	233,373	–6.5
75	Detroit (DTW)	220,236	–4.8
76	Salt Lake City (SLC)	216,871	0.3

Source: Airports Council International

The third largest freight airport (LAX), the fourth (Miami) and the fifth (JFK) are all major international gateways, principally serving Asia, Europe and South America,

respectively. Their size is not so much due to FedEx and UPS traffic as it is due to international airlines – especially passenger airlines that also carry freight. The third largest airport – Anchorage – owes its prominence largely to its ability to serve as a refueling and transshipment stop for Asian/North American traffic.

Because about half of all air freight has moved in the bellies of passenger airliners, air cargo operations and especially the activities of freight-forwarders and other consolidators have been concentrated at the largest passenger hubs. Only with the emergence and subsequent rapid growth of the integrators did the link between air cargo and passenger airports start to grow more attenuated. Indeed, FedEx and UPS deliberately established their hubs away from the nation's primary passenger airports in order to avoid the congestion and delays from which those airports famously suffered.

Strategies by some regional economic development planning agencies to divert air cargo operations from passenger terminals like LAX or Chicago's O'Hare are usually portrayed as efforts to entice airlines to shift more all-cargo flights to less impacted airports. Unfortunately, this tends to oversimplify the challenge. Offers of cheaper landing fees or modern air cargo handling terminals may be seductive as far as airlines are concerned, but findings ways of convincing freight-forwarders to invest in new facilities some distance from a region's busiest airport may be an even more onerous challenge.

Impact of New Aircraft Technology

Over the past three decades, U.S. airlines have persistently extended their reach. New technology made it possible to economically serve additional airports with smaller planes, which could fly longer and more frequently to more distant locations. Over the past three decades, airlines have shifted from using a few large airplanes for international flights to using numerous smaller planes. Boeing, in its *Current Market Outlook*, notes the importance of the change in aircraft type: "Twenty years ago, the performance, capacities, and economics of airplanes then available dictated the business strategies of transatlantic carriers. They could either operate single-aisle Boeing 707s and DC-8s with fewer than 200 seats or fly widebody 747s and DC-10s with more than 300 seats. With lower seat-mile costs and newer technology,

the widebodies predominated, forcing airlines to a business strategy of fewer, high-capacity flights linking only a few transatlantic gateways."[174]

Today, an ongoing shift to smaller, highly fuel-efficient and long-range airplanes is fundamentally transforming transoceanic air travel. Introduced in the 1980s, the B767 and A310 have permitted airlines to adopt more flexible business strategies and to offer consumers greater choice. One result is that airlines are now able to fly passengers and cargo to more international destinations. They save time and money because their travel is more direct, and they have a greater choice of convenient departure times because today's traffic is divided among a greater number of smaller capacity jets.[175]

The increase in aircraft range has likewise popularized non-stop flights between Europe and the Pacific basin. Boeing predicts that the Pacific market will continue to grow as political restrictions are eased and more use is made of smaller capacity A340 and B777 jetliners that can fly as far as, or significantly farther than, the B747-400.[176]

The increased range of today's jet aircraft have lessened the significance of the nation's historic international air gateways. Not long ago, New York's JFK dominated service to Europe, just as Miami was the only major gateway to Latin America, and SFO and LAX to the Far East. As an illustration of how technology has enabled carriers to leap-frog the old gateways, Evergreen International Airlines, an all-cargo airline that operates ten 747 freighters, will in June 2005 inaugurate a five-day a week freighter service between the Columbus, Ohio and Nagoya, Japan.[177] Perhaps more astonishing is the non-stop service Singapore Airlines provides between

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[174] Boeing, *Current Market Outlook 2004.* See Executive Summary.

[175] Air-freighters are often fly-by-night operations – literally. According to journalist Barry Lopez, freighter pilots sometimes "wear bat wings instead of eagle wings" and refer to themselves as "flying the backside of the clock." "On the Wings of Commerce – Air Freighters," *Harper's*, October 1995.

[176] Boeing, *World Air Cargo Forecast 2004/2005*.

[177] The announcement follows a decision by the U.S. Department of Transportation to award Evergreen authority to provide scheduled all-cargo service between the United States and Nagoya. Columbus will serve as a gateway to more than 60 destinations in the United States and Canada. Source: Corporate press release dated December 16, 2004.

Newark and Singapore. Inaugurated in June 2004, the service uses an Airbus 340-500 to cover the 16,600 kilometers (c. 10,000 miles) between the two cities in 18.5 hours.

The Future

There may be substantial changes on the horizon, however. Each of the following issues either currently affects or has the potential to create significant impact on the air cargo industry.

• **Security.** Government-mandated security regulations pose the gravest potential for adversely affecting the viability of the air cargo industry. Within the air cargo industry, there is no question that the *status quo* ante is no longer viable and that tighter inspection regimes are inevitable. "The cargo portion of the airline industry is exposed and vulnerable to attack, warned Duane Woerth, president of the Airline Pilots Association in a commentary in the March 2004 issue of the organization's magazine. "If it becomes the next target of terrorism, and a cargo airliner is used either as a weapon, or to make a statement of some sort, the repercussions will affect the entire airline industry."[178]

At the very least, new regulations could lengthen transit times. At worse, security concerns could prompt an out-right ban on the carrying of freight from passenger aircraft. (Although such a measure is regarded as highly unlikely, no one in the industry doubts that Congress could be driven to adopt drastic measures should a passenger plane be brought down by an explosive thought to have been loaded as freight.)

One pressing issue is that of determining how rigorously and thoroughly air cargo should be inspected. Some members of Congress have been urging intensive inspection of all air cargo shipments whether they are being moved on passenger or air-freighters. Industry officials fear the government would almost certainly impose draconian pre-flight inspection requirements should there be some terrorist incident involving air shipments.

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[178] Captain Duane Woerth, "It's Not 'Just Cargo' Anymore," *Air Line Pilot*, March 2004.

A related concern is hijacking. In November 2004, the Department of Homeland Security warned state and local authorities that al-Qaeda might be plotting to fly cargo planes from overseas into U.S. targets. DHS offices conceded there was no specific threat or timetable for attack but still the warning was being taken seriously.[179] More than 2,000 cargo flights land in the United States every day. Yet, while passengers and their luggage are searched before boarding commercial airliners, only about one percent of air cargo is subjected to a random physical search, according to the Coalition of Airline Pilots Association, which represents 21,000 air-crew members, including cargo pilots. On November 10, 2004, the Transportation Security Administration proposed a new set of inspection requirements for air cargo that stopped well short of the 100 percent inspection demanded by critics like Massachusetts Congressman Dan Markey. [180]

• **Service fragmentation.** The "hubbing" versus "point-to-point" dilemma typically arises in the context of transporting passengers. From a passenger's perspective, making flight connections through busy hubs like Chicago's O'Hare or Dallas-Fort Worth frequently involves a hassle. On the other hand, flying through a hub is often the only way for passengers in smaller cities to reach a wide range of destinations. By contrast, most air cargo is indifferent to the number of stops en route to final destination so long as delivery schedules are met. Hubbing then becomes a more acceptable alternative to cargo customers when significant handling, volume, and rate efficiencies can be realized. However, when the goods being transported are perishable food products, non-stop or at least direct flights are clearly preferable to routings through hubs.

• **Low-cost carriers.** The demands of passenger focus and operational efficiency (e.g., quick airplane turnarounds) reduce the priority of cargo. However, some low-cost carriers realize significant revenues by emphasizing express shipments. In general, though, the increasing popularity (and economic viability) of low-fare passenger carriers such as Southwest and Jet Blue has been putting extraordinary

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179 "U.S. Plans to Toughen Rules For Cargo Shipping Industry," *The New York Times*, November 19, 2004.

180 The TSA proposal was published in the *Federal Register* on November 10, 2004. Rep. Markey has repeatedly pointed out that explosives contained in a parcel weighing no more than 16 ounces have the capacity of bringing down an airliner.

pressure on the legacy carriers. (In January 2005, Delta effectively broke ranks with the other legacy carriers when it announced a new fare structure to permit it compete more directly with the low-cost carriers.) It is an industry axiom that a plane sitting on the ground is not earning the airline any revenue. And that insight has inspired the success of the low-fare carriers, whose operations emphasize minimal turn-around times between flights. But it is a business model that also leaves little time for the loading and unloading of cargo unrelated to passenger needs. The rise of the low-fare carriers has thus engendered speculation within the industry that more and more cargo will be shifted from the bellies of passenger aircraft into the holds of air-freighters as the legacy carriers are obliged to emulate the fast turnaround practices of the low-fare carriers.

Such a development would have profound implications for the air cargo industry. At present, about half of all air cargo is carried in the bellies of passenger aircraft. Air cargo operations thus tend to be concentrated at a handful of major international airports precisely because those airports offer the largest number of non-stop or direct passenger flights to the widest range of destinations overseas. Should the link between cargo and passenger flights grow more attenuated, there are substantial incentives for air cargo operations to shift to other airports that may offer more space at lower costs.

To illustrate the point, we used passenger and cargo data from LAX in 2002 to devise an index based on a ratio between the numbers of passengers enplaned by a specific carrier to the freight tonnage handled by that same carrier. The most prominent of the budget airlines, Southwest, carried 3.4 million passengers but just 19,544 tons of freight through LAX in 2002, thus scoring 175 on our index. Of the six legacy carriers, USAir scored 73; American Airlines, 49; Continental, 48; United, 42; Delta, 33; and Northwest, 17.

Other forces reshaping the air cargo industry include: higher fuel costs, technological changes, trade liberalization, and the advent of integrated carriers like FedEx, UPS, and DHL. Unlike the airport-to-airport cargo services traditionally offered by passenger airlines and all-cargo carriers, the integrators offer a more complete door-to-door service to shippers. The attractiveness of the integrator's service is that all of the functions involved in getting a shipment from the shipper to its destination are

handled by a single party. Not surprisingly, industry analysts expect that the passenger airlines and the all-cargo airlines will survive only by offering the more complete service package now being offered by the integrators. According to a recent commentary in *Logistics Today*: "The airline industry shares the perception that it is not competing at the same level as the integrators to deliver reliable, time definite service with superior information integration and visibility."[181] Whether airlines will respond to the challenge by expanding the scope of their delivery services or by forging tighter links with freight-forwarders and other 3PLs remains to be seen.

On the technology front, the introduction of latest generation of commercial aircraft poses some interesting opportunities as well as risks for the air freight industry. The European consortium Airbus is building the world's largest passenger aircraft, the A380, which is due to enter service with Singapore Airlines in the first quarter of 2006. It is an immense plane with a seating capacity of 555 in three classes. Passengers will be seated on two decks. (In its all-cargo configuration the A380 will carry a 150 ton payload, accommodating 71 large cargo pallets or containers on its three decks. That is over 30 percent more than its nearest competitor. With a full cargo load, the A380 air-freighter will have sufficient range up to 5,620 nautical miles.)

The A380 reflects the belief at Airbus that larger aircraft represent the answer to increasing congested major airports. It tacitly assumes that airlines will remain closely tethered to hub-and-spoke operations.

Boeing's Air Cargo Forecast. Boeing disagrees. The U.S. aircraft builder is banking on the belief that airlines will want to fly more passengers directly between more city-pairs and are therefore in the market for medium-sized aircraft with exceptional range. Boeing's next generation aircraft is the two-engine 787, nicknamed 'The Dreamliner.' Two versions of the plane, the 787-8 and the 787-9, will carry 217-257 passengers in three-class configurations on routes of 8,500 and 8,300 nautical miles

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[181] "Putting Air Freight on Solid Ground," *Logistics Today* (November 2004).

(15,700 and 15,400 kilometers), respectively.[182] In addition to bringing big-jet ranges to mid-size airplanes, the 787-8 and 787-9 will provide airlines with planes that will use 20 percent less fuel for comparable missions than any other wide-body airplane. It will also travel at speeds similar to today's fastest wide bodies, Mach 0.85. Airlines will enjoy 40- to 60-percent more cargo revenue capacity. Indeed, the 787-9 is designed to accommodate 6 full-sized pallets plus 6 LD3 containers.[183]

The 787-8 and 787-9 appear to be eminently suitable for non-stop flights between several California metropolitan areas and overseas destinations. Major destinations in Europe, the Far East and Latin America lie well within the range of both planes. (The further implications of this class of aircraft for California's agricultural exporters will be explored in the next chapter.)

Boeing Aircraft's 2004-2005 cargo forecast anticipates strong, long-term growth in the air cargo industry. After the dramatic 5.8 percent drop in 2001, induced by a simultaneous slowing of the world's largest economic groupings, collapse of the "technology bubble," and terrorist attacks, traffic increased more than 7 percent in 2002. In spite of the challenges of a major Middle East conflict as well as the severe acute respiratory syndrome (SARS) crisis, the market showed surprising strength in 2003 with annual growth of nearly 4 percent. Also encouraging is the unusual market strength indicated by a further 10.7 percent increase in worldwide traffic for the first five months of 2004, compared with the same period in 2003.

World air cargo traffic will expand at an average annual rate of 6.2 percent for the next two decades, tripling over current traffic levels. Asian air cargo markets will continue to lead the world air cargo industry in average annual growth rates, with the domestic Chinese and intra-Asian markets expanding 10.6 percent and 8.5

[182] A third 787 family member, the 787-3 will accommodate nearly 289 passengers in a two-class configuration and is designed for shorter routes of 3,500 nautical miles (6,500 km).

[183] In December 2004, Airbus hedged its bet when its two principal shareholders, EADS and BAE Systems, gave the go-ahead for the company to begin making "firm commercial offers" to potential launch customers for a new plane, the A350. The new model is actually based on the existing A330. It is not scheduled to enter service until the first half of 2010, two years after Boeing's 787, with which it will compete. The A350 is to be offered in two versions. One will seat 245 passengers in a three-class configuration and will have a range in excess of 8,600 nm (15,900 km). The other model will seat 285 passengers in three classes and will have a range of more than 7,500 nm.

percent per year, respectively. As in the past, more mature North American and European markets reflect slower and thus lower than average traffic growth rates, with the exception of those linked to Asia and Southwest Asia.

This trend will continue over the next 20 years as well, with capacity increasing parallel to the tripling traffic levels, but with fleet size not quite doubling from 1,766 in 2003 to 3,456 in 2023. Medium-widebody and large cargo aircraft will lead fleet additions, growing from an overall share of 44 percent to 60 percent as traffic continues to build on long-haul, international trade lanes.

The distinction between express and general air cargo continues to blur as traditional providers expand their time-definite offerings, as air cargo firms consolidate, and as postal authorities make inroads as full-fledged logistics providers. Ultimately, the air cargo customer benefits from improvements, increased service options, and lower prices as market pressure brings competing products into the market.

International express has grown at more than twice the rate of total worldwide air cargo traffic, averaging 16.4 percent annually over the last decade (as measured in revenue ton-kilometers [RTK]). Since 1998, however, while still impressive, annual growth has been somewhat lower at 9.1 percent. This parallels the express industry's strong double-digit U.S. domestic growth during the 1970s and 1980s, followed later by slower growth.

As a proportion of total international air cargo traffic, international express expanded from 4.1 percent in 1992 to nearly 11 percent in 2003, a reflection of higher than average annual growth. Average international express shipment size grew from 2.7kg (6.0 lb) in 1992 to 4.0kg (10.7 lb) in 2003, further bolstering the overall express component of international air freight traffic.

The international market will outpace domestic growth, exceeding 83.7 percent of total RTKs by year-end 2023. U.S. carrier share of the world market, currently assessed at 29.8 percent, will decline to 23.4 percent by 2023.

The greatest air freight market growth is expected in those markets linked to Asia.

Boeing expects the size of the worldwide freighter fleet to nearly double over the next 20 years, from 1,766 to 3,456 airplanes. Freighters as a share of the total airplane fleet will fall from 11 percent to 10 percent, owing to an increase in the size of the average freighter. Taking 1,260 retirements into account, 2,950 airplanes will be added to the freighter fleet by 2023. Widebody freighters, currently 44 percent of the fleet, will supply over half of these additions and will conclude the period with a majority 60 percent share of the fleet. The number of widebody airplanes will nearly triple. The shift toward widebody freighters will result in a fleet-wide increase in average freighter airplane payload. Operators often prefer medium wide-bodies as a replacement for retiring medium standard-body freighters. Thus, the share of standard-body freighters will decrease from 56 percent to 40 percent over the next two decades. By 2023, freighters of all sizes will provide more than half of the world's total air cargo capacity, a slight increase from today.

World air cargo comprises freight (scheduled, charter, and express) and mail, with scheduled freight and express being the largest components. More than 70 percent of total traffic is carried by non-U.S. airlines, which have a historic growth rate of scheduled freight that outpaces U.S. carrier growth. Overall U.S. carrier traffic has seen continuing marginal share decline in recent years, as a result of the maturing of their domestic express market.

Conceptually, the demand for air freight depends on the economic activity in the importing region or country, conditioned by transportation costs, exchange rates, and relative prices.

As emerging economies develop, the non-U.S. airline market share of air cargo traffic will continue to expand. As we approach 2023, non-U.S. airline market share will reach 77 percent of total air cargo RTKs, up from slightly more than 70 percent recorded in 2003. Non-U.S. airlines will continue to dominate long-haul international routes, representing nearly 70 percent of the world's traffic by 2023 from slightly over 65 percent in 2003. Traffic carried by U.S. airlines will also grow during the forecast period as U.S.-domiciled express carriers increase international service. The dominance of U.S. carrier domestic traffic as a share of the world's total will fall from 13.4 percent to 8.9 percent by 2023, reflecting slower growth rates and the emergence of domestic markets like China.

Air cargo markets linked to Asia, especially the Pac 12, will lead all other international geographic markets in average annual growth during the period of 2003 through 2023. Intra-Asia will grow the fastest of Asian markets, averaging 8.5 percent growth per year, while the Asia–North America and Europe–Asia markets will expand at average annual rates of 7.2 percent and 6.7 percent, respectively. Domestic China will be the fastest growing contiguous market in the world, averaging 10.6 percent growth per year for the forecast period.

The mature markets of North America and intra-Europe will grow below the world average rate, with 20-year annual growth rates of 4.1 percent for North America and 5.3 percent for Europe. The North America–Latin America market is forecast to grow 5.9 percent per year. Also projected to lag behind the world average growth rate are trade lanes linking Europe to Latin America (at 6.0 percent growth), North America (at 5.6 percent growth), Africa (at 5.2 percent growth), and the Middle East (at 4.7 percent growth). Europe–Southwest Asia (at 6.4 percent growth) will slightly exceed the world average.

Market shares will continue to change as a result of varying regional growth rates. While growing 10.6 percent per year over the next 20 years, domestic China will still possess a relatively small market share, given its current size and the market's relatively short average trip distance. *Overall, the share of world air trade connected to Asian markets, including the domestic markets of China and Japan and all international markets, will increase from 47.6 percent in 2003 to 59.4 percent in 2023.*

Airbus Global Market Forecast 2003. Global summary. Air cargo has been less affected by the current crisis than passenger traffic. However, reductions of passenger schedules have led to significant changes in the composition of the active freighter fleet and in the utilization of aircraft, with an increased usage of larger aircraft, higher load factors and intensive utilization of the feeder fleet.

Airbus forecasters believe that the increased efficiency achieved by operators of dedicated freighters will be maintained in the future, leading to an ever higher contribution by dedicated freighters to air cargo transport. Recovery of airfreight

traffic is well under way and its long-term prospects are strong, with an average yearly growth of 5.75 percent leading to a tripling of freight tons-kilometers (FTKs) by 2022. This traffic will be carried by a fleet of 3,283 dedicated freighters, from a base of 1,499 active units in 2002.

The ongoing recovery from the recent crisis demonstrates that the underlying factors for strong growth are still at work, among them the development of trade between Asia and Europe or North America and the need to carry quickly and safely more and more high-value goods. The fastest growing airfreight markets are those linking the Asia-Pacific region to Europe and North America.

Seven of the Top Ten flows serve this region, six of which will enjoy traffic growth higher than the world average. These Asia-Pacific markets are expected to represent nearly 31 percent of global airfreight in twenty years' time, compared with less than 27 percent in 2002.

Belly traffic will not keep pace with overall demand. Transport of goods in the remaining volume of passenger aircraft is attractive in terms of costs, but is dependent on the availability of passenger flights and on passenger load factors. Airbus forecasters believe that this will persist in the future, with the advantages of dedicated flights (time-definite supply, safety and security of cargo, controlled flight conditions), continuing to offset the lower marginal cost of belly transport.

Thus, in 2002, the forecasters estimated that the 64 billion FTKs carried as passenger aircraft belly freight represented only 41 percent of the total FTKs generated. As passenger traffic, and thus available belly volume, are expected to grow more slowly than freight traffic, the share of belly traffic will reduce further, decreasing to a third of total FTKs by 2022.

In contrast, airfreight carried on dedicated freighters is expected to grow at an average annual rate of 6.3 percent per year.

Unlike passenger airlines under pressure to improve service levels by increasing frequencies, freight operators generally have little incentive to increase frequencies

beyond once-daily service and are more likely to respond to growing traffic by increasing aircraft size and thereby achieving lower unit operating costs. Overall, the capacity of the average freighter will increase from 50.4 tons in 2002 to 60.0 tons in 2022.

Recent years have seen a significant increase in the number of large freighters used, from 286 in 2000 to 339 in 2002. Airbus forecasters believe that this trend will continue and that the number of large freighters in service will increase at an average 5 percent per year. Indeed, the bulk of new airfreight capacity will come from the large freighter segment, where 372 newly-built aircraft as well as 326 conversions will be needed by 2022.

This demand will be driven mostly by growth in long-range services, but also by the need to replace a number of early 747Fs due to be retired during the second half of the forecast period. The base fleet in operation during 2002 excluded some 51 large freighters which were parked or almost not utilized; most of them were 747-100s, -200s or 747 combis which are not expected to rejoin the active fleet. This segment is expected to see the highest capacity growth, with a yearly average increase of 5.4 percent over the forecast period.

MERGEGLOBAL Forecast. MergeGlobal is an Arlington, Virginia-based consulting firm that focuses on developing competitive strategy for firms in the freight transportation and logistics industries.[184] Its latest forecast states that intercontinental belly capacity will grow an average of only 2.7 percent per year between 2003 and 2008, reflecting continuing concerns about terrorism and sluggish business travel. Consequently, freighter capacity will grow by 6.3 percent per year, while fleet size will grow at a slower rate as operators up-gauge aircraft in order to reduce unit costs. Generally, the larger the aircraft, the more units will be added. The largest number of additional freighters will be required in the greater than 80-ton category - exclusive domain of the Boeing 747-400 until the first Airbus A380 freighter arrives in 2008. One interesting exception is the expected growth in the 25-40 ton category, where converted A300-600s will operate in shorter intercontinental markets such as Europe-Middle East. Worldwide, regional freighter capacity will grow

[184] The MergeGlobal forecast appeared in the April 2004 issue of *Air Cargo World*.

at 3 percent per year, due largely to competition from time-definite trucking within North America and Europe.

One of the most interesting issues facing the industry is how freighter operators will manage the collision between two long-term trends: falling yields and rising costs. Yields are falling because shippers continue to squeeze spending on logistics and thus transportation. Customers really are demanding "more for less" every year. Yet costs are rising inexorably, even though competitive pressures are forcing airlines around the world to become steadily more efficient. The problem is that full freighters are an inherently more expensive form of capacity than the belly compartments of passenger aircraft, which generate around half of the world's intercontinental cargo airlift. To meet forecast demand growth, freighter aircraft must generate a rising share of total airlift capacity - and thus the industry's cost structure must rise inexorably.

Air freight demand is geographically concentrated, as is the underlying economic activity. In 2003, more than 96 percent of world freight ton kilometers moved to, from, or within the three pillars of the world economy: Asia-Pacific, Europe and North America. Even more significant, 59 percent of world FTKs moved to, from, or within the United States alone.

Rolls-Royce Forecast. Rolls-Royce, along with General Electric, is one of the principal manufacturers of modern jet engines. The company expects that the air cargo market will continue to expand more rapidly than the passenger market. As a result, the proportion of capacity offered by passenger aircraft belly holds will gradually shrink. To fill the capacity gap, Rolls Royce forecasters believe the dedicated freighter fleet will double over the next 20 years. This fleet growth, which is conservative compared with growth over the last decade, takes account of significant freighter productivity improvements in terms of ATKs/aircraft. This improvement includes both the increased utilization available from newer aircraft fleets, plus an increase in average aircraft capacity. The large (i.e., over 65 ton) segment is expected to triple in size, with the largest aircraft types seeing significant demand for new production freighter versions.

As evidenced by the ongoing restructuring of airlines' freighter networks around key

hubs, historical trends in aircraft size increases are likely to continue, perhaps in contrast to developments in some passenger markets, but in line with events in the shipping industry. The unit cost advantages of larger aircraft have also played an important part in generating growth by diverting surface freight onto airlines. Feeder services into cargo hubs are often 'flown' by trucks, although the integrators do make great use of smaller types, including conversions of corporate jets. The air cargo market has already seen great liberalization and could be truly liberalized well ahead of passenger services. This will reinforce the large cargo hubs set up by leading carriers. However, although many new routes have been offered as a result of liberalization, and frequencies increased, many long-haul markets offer less-than-daily service. The longer door-to-door elapsed times of most air cargo mean that at least a twice weekly service is necessary to offer a competitive advantage. For most time-dependent cargo, a five per week schedule (i.e. weekdays) is sufficient. The world fleet of all-cargo Boeing 747s is approaching 300 airframes, up 10 percent just in the last two years.

Other assessments of the future of air cargo. Paul Page, editor of *Air Cargo World*, recently admonished air cargo operators to take heed of developments in the passenger airline industry.[185] Worldwide, he observed, air forwarders still get most of their space from combination carriers. But if current trends persist, the gap between belly cargoes and all-cargo services is apt to increase. The shift from accommodating cargos in the bellies of passenger aircraft to more dedicated air-freighters has profound implications for the air cargo industry, agricultural shippers, and state transportation planners. So long as the bulk of cargos were shipped aboard passenger planes, air cargo activities were obliged to focus on major passenger hubs like LAX and SFO. With cargos increasingly moving to air-freighters, airlines are free to consider developing air cargo facilities at airports that are less congested and where rents, landing fees and other costs are most likely much lower.

Such prospects further open the door for a growth in direct all-cargo air service between overseas airports and California airports that are nearer the state's principal agricultural regions. That subject is explored in detail in the next chapter of this report.

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[185] Paul Page, "Editor's Note: Networks," *Air Cargo World*, July 2004.

On the downside – most decidedly – most major forecasts of the air cargo industry's future have not fully reckoned with the considerable run-up in fuel costs in recent months and the likelihood that much higher fuel costs will be a permanent factor in airline operations. Rising costs together with an intense competition for passengers that has resulted in lower ticket prices and therefore lower revenues have placed combination carriers like United, Delta and American in a precarious position. These legacy carriers have been looking to increase their more profitable international services, which should normally be good news for shippers. Yet, as an April 2004 report in the *Journal of Commerce* observed, airlines now "are more concerned with survival than about expanding cargo services" and are consequently "reluctant to invest in cargo projects that don't offer a quick return."[186]

Until the U.S. air transport sector sorts itself out by eliminating one or more of the less competitive major carriers, it is not likely that U.S. airlines will be in a position to expand their share of the international air cargo market. It is therefore likely that foreign carriers will come to play an even more dominant role in providing the lift for air cargos moving into and out of an increasing number of U.S. gateways. Indeed, there is even some speculation that foreign carriers, with balance sheets that are generally healthier than their U.S. peers, could be permitted to, in effect, rescue certain U.S. carriers by acquiring an equity stake larger than currently permitted under U.S. law.[187]

[186] Ian Putzger, "Cargo may be jettisoned," *The Journal of Commerce*, April 11, 2005.

[187] In a March 4, 2005 article ("EU transport chief to offer US 'open skies' olive branch"), the *Financial Times* reported that Jacques Barrot, the European Union Commissioner for Transport, would seek to persuade U.S. officials to give European airlines the right to buy their struggling American counterparts.

Chapter 4

The Air Cargo System in California

This chapter describes the air cargo system in California and how it relates to the needs of the state's agricultural exporters. Of particular interest here will be how the current system for air-freighting goods is changing in response to shifting patterns of trade, technological advancements in aircraft capabilities, rising fuel costs, economic competition, public opposition to expanded flight operations at most of the state's major airports, heightened security concerns, and changing business practices within the airline industry. The chapter will then conclude with an appraisal of how these changes are likely to specifically affect the interests of California's agricultural exporters.

Air Transport and California's Economy: An Overview

As recently as 1998, a report published by the Institute of Transportation Studies at UC Berkeley observed that: "Little is known about the role of air cargo in California's goods movement."[188] In the ensuing years, fortunately, a good deal more research effort has gone into the topic as more local economic development organizations and regional transportation planning agencies have come to appreciate more acutely than ever the economic significance of air cargo services.

Nevertheless, air cargo's role in California *agricultural* economy remains a subject whose surface has been barely scratched. Indeed, in an otherwise comprehensive 2003 assessment of the state's aviation assets, the California Department of Transportation devoted more attention to crop-dusting services and the use of

[188] 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. Almost on the heels of the Tsao report, UC Berkeley's Institute of Transportation Studies published another report on the challenges facing California's air transport infrastructure. See Mark M. Hansen, Geoffrey D. Gosling. And Colin Rice. "The California Aviation System: Current Status and Recent Trends," December 1998.

private aircraft to ferry agribusiness executives around the state than to air cargo's role in transporting food products to market.[189]

Such an oversight is not entirely surprising. Few Californians are aware of the vital role air cargo services play in the Golden State's overall export trade. Even among the state's policymakers, discussions of California's international trade infrastructure almost invariably revolve around the condition of our major seaports or our border-crossings with Mexico. Yet, as the data in Table 4-1 attest, when measured by dollar value, more of California's merchandise exports are transported by air than by sea and land *combined*.

Table 4-1.
California Merchandise Exports by Mode of Transportation
1997-2004
(In Millions of Dollars)

	Total Exports	By Air	%	By Sea	%	By Land	%
1997	$99,161	$61,266	61.8%	$17,899	18.1%	$19,996	20.2%
1998	$95,768	$57,533	60.1%	$16,032	16.7%	$22,203	23.2%
1999	$97,920	$61,522	62.8%	$14,217	14.5%	$22,181	22.7%
2000	$119,640	$77,859	65.1%	$16,810	14.1%	$24,971	20.9%
2001	$106,777	$64,879	60.8%	$19,350	18.1%	$22,548	21.1%
2002	$92,214	$52,726	57.2%	$17,234	18.7%	$22,254	24.1%
2003	$93,955	$50,375	53.6%	$19,878	21.1%	$23,742	25.3%
2004	$109,968	$60,171	54.7%	$21,319	19.4%	$28,477	25.9%

Source: WISER

In 2004, for example, 54.7 percent of California's total export trade traveled by air, while 25.9 percent was shipped overland to Mexico and Canada. By contrast, seaborne shipments accounted for just 19.4 percent of the total value of California's 2004 export trade. Even those figures represent retreats from previous higher levels of airborne commerce. As recently as 2000 (the heyday of the telecom boom), 65.1 percent of the state's merchandise exports were shipped by air.

[189] *Aviation in California: Benefits to Our Economy and Way of Life*, California Department of Transportation, Department of Aeronautics (June 2003).

Air cargo typically consists predominantly of high-value or time-sensitive goods, most notably telecommunications hardware, electronic equipment, perishable commodities, emergency shipments, overnight packages and documents. By one University of California estimate, air cargo is, on average, at least 37 times as valuable as goods transported by truck.[190] 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.[191]

Air transport has become absolutely essential to the management of far-flung global supply chains as well as just-in-time delivery and inventory control strategies. The high value-added products associated with California's advanced technology industries are routinely exported by air. Remarkably, upwards of eighty percent of the value of all merchandise exports from the San Francisco Customs District,[192] which includes Silicon Valley, departed by air in the years preceding prior to the sharp downturn in the electronics sector during the winter of 2000-2001.

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[190] 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.

[191] 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.

[192] The San Francisco Customs District encompasses all of Northern California as well as adjacent portions of Nevada. In 2000, before the 9/11 crisis and when the California economy was still thriving, air cargo's share of the district's $53.8 billion merchandise export trade was an astonishing 79.2 percent.

Owing to a worldwide economic slowdown, the bursting of the telecom bubble, and the after-effects of the terrorist attacks of September 11, 2001, air freight's share of the dollar value of merchandise exports leaving via California plunged to a low of 52.1 percent in 2002 before beginning to recover. Even so, 72.3 percent of the dollar value of all merchandise exports leaving the San Francisco Customs District still went by air in 2003. Airborne exports accounted for about 48.2 percent of the total value of merchandise exports out of the Los Angeles Customs District that same year.[193]

California's major international airports also serve the nation as a whole, handling nearly one-fourth of America's total airborne trade.[194] Los Angeles International Airport (LAX) and San Francisco International Airport (SFO) rank second and third, respectively, after New York's John F. Kennedy International Airport (JFK) as the nation's principal international gateways for airborne merchandise trade. In 2002, Los Angeles International and San Francisco International combined to handle 22.1 percent of the nation's airborne international trade.[195] Interestingly, California's airports appear to handle cargos with a significantly higher value per kilogram than other airports. Cargo moving through SFO, in particular, has reportedly had a value-to-weight ratio more than twice that of most other major airports.[196]

A June 2003 report from the California Department of Transportation's Division of Aeronautics enumerated the manifold benefits of aviation and air cargo services to California's.[197] The report calculated that aviation accounted for nearly 9 percent of the state's job rolls and its economic output. For example, in 2001 aviation was

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[193] U.S. Census Bureau, "U.S. Exports of Merchandise: Statistical Month – December 2003," (DVD Format).

[194] For a detailed discussion of the entrepôt role of California's airports, see John D. Haveman and David Hummels, "California's Global Gateways: Trends and Issues," Public Policy Institute of California, 2004, especially pp. 19-34.

[195] "U.S. International Trade and Freight Transportation Trends 2003," Bureau of Transportation Statistics, U.S. Department of Transportation, p. 41. These levels represent declines from previous years, as the Asian economic crisis of the late 1990s, along with the general economic slowdown and the effects of September 11, adversely affected air cargo operations across the nation.

[196] Jon D. Haveman and David Hummels, *California's Global Gateways: Trends and Issues* (San Francisco: Public Policy Institute of California, April 2004) p. 5.

[197] The report was prepared with the aid of Economics Research Associates (ERA) and JD Franz Research, Incorporated.

responsible for an estimated $111 billion of California's $1.3 trillion Gross State Product as well as approximately 1.7 million of the state's 19.5 million jobs.

The Caltrans report further noted that almost half of all domestic visitors from outside California travel by air in 2001, generating some $14.5 billion in tourist spending. 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. Caltrans reported that total tax revenue generated as a result of aviation in FY 2002 was slightly over $250.2 million.

California's Commercial Airports

Caltrans' Division of Aeronautics currently identifies some 254 public use airports throughout the state.[198] These range from major international gateways like Los Angles International and San Francisco International to limited-use landing strips. Of the state's public use airports, 29 are defined as Commercial Service airports providing scheduled passenger service.[199]

The Federal Aviation Administration defines a Large Hub airport as one that enplanes one percent or more of total U.S. passengers. The state's three Large Hub airports – LAX, SFO and San Diego's Lindbergh Field (SAN) – fit into that category. Collectively, they provided scheduled passenger service for over eight percent of the national total passenger enplanements in 2001.

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Medium Hub airports enplane between 0.25 percent and one percent of total U.S. passenger enplanements. California boasts of six Medium Hub airports: Norman Y. Mineta San Jose International (SJC), Oakland International (OAK), Sacramento International (SMF), John Wayne (SNA) in Orange County, Ontario International (ONT), and Bob Hope (BUR), formerly Burbank Airport. In 2001, these six airports accounted for more than 3.7 percent of the nation's total passenger enplanements.

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[198] Caltrans, Division of Aeronautics, "Aviation in California: Fact Sheet," October 2004.

[199] The Federal Aviation Administration regards an airport to be a Commercial Service airport when it receives scheduled air carrier passenger service and has 2,500 or more enplaned passengers annually. Primary Commercial Service airports handle at least 10,000 enplanements per year.

Small Hub airports enplane 0.05 percent to 0.25 percent of the total U.S. passenger enplanements. The state features four Small Hubs: Fresno Yosemite International (FAT), Long Beach Municipal (LGB), Palm Springs International (PSP, and Santa Barbara Municipal (SBA). To be sure, scheduled passenger service represents a small portion of operations at these Small Hubs. Up to 90 percent of their activity involves general aviation. Still, in 2001, the four airports accounted for 1.7 million annual enplanements or two percent of the state's total of 80.7 million annual enplanements.

Non-Hub airports enplane less than 0.05 percent of all commercial passenger enplanements but more than 10,000 annually. In addition to commercial travel, Non-Hub airports contribute significantly to the state's air transport system by providing facilities to accommodate fast growing corporate and business aviation segments. The 15 Non-Hub airports in California are: Arcata, Chico Municipal, Imperial County, Inyokern (Indian Wells), Jack McNamara (Crescent City), McClellan–Palomar (Carlsbad), Meadows Field (Bakersfield) Modesto City–County, Monterey Peninsula, Oxnard, Redding Municipal, San Luis Obispo, Santa Maria, Stockton Metropolitan, and Visalia Municipal.[200]

Primary Commercial Service airports provide the essential transportation infrastructure not only for scheduled passenger service but for all-cargo operations. At the same time, the state has been seeing the transition of several military airfields to civilian use, primarily as dedicated air cargo airports. These include: Mather Field (Sacramento County), March Global Port (Riverside County), and the Southern California Logistics Airport (San Bernardino County). Mather serves DHL and UPS. In December 2004, DHL announced it would establish its western regional hub at March.

As for air cargo, fifteen California airports reported handling at least 1000 metric tons of freight in 2003. (See Table 4-2, Page 130.) Six of these airports ranked among the nation's 50 largest conduits for air cargo.

[200] Because of the ongoing financial problems of many air carriers and due to the resulting turbulence in the aviation industry, smaller airports may occasionally see a marked shift in the service provided by air carriers. In some instances, such as Stockton Metropolitan, there may be periods in which no scheduled passenger service is available even though the airport is eminently equipped to accommodate carriers.

Table 4-2 – California's Primary Airports for Air Cargo
Ranked by Metric Tons of Cargo Handled in 2003

Airport	National Rank	Tons Handled	Change from 2002
LAX	3	1,833,300	+2.8%
OAK	12	597,383	-5.9%
SFO	13	573,523	-3.8%
ONT	15	518,710	+4.5%
SAN	38	135,547	-6.6%
SJC	47	108,622	-22.5%
SMF	60	71,230	+.08%
MHR	64	54,533	-2.7%
LGB	66	50,873	-4.7%
BUR	73	44,654	+12.3%
SCK	81	33,607	+74.0%
SNA	110	12,050	-12.2%
FAT	124	5,176	-64.5%
SBA	127	2,825	-0.2%
SBP	134	1,265	+12.2%

MHR=Mather Field; LGB=Long Beach; BUR=Bob Hope Airport (Burbank); SCK=Stockton; SNA=Santa Ana; FAT=Fresno Yosemite; SBA=Santa Barbara; SBP=San Luis Obispo.

Source: Airports Council International

During the 1990s, the volume of air cargo handled by airports throughout California swelled. According to a 1998 study funded by Caltrans, even out of the ten surveyed airports experienced a growth rate higher than 50 percent in the five years between 1991 and 1996.[201] Four out of the seven saw total air cargo tonnage more than double during the period. The ten airports had a combined growth rate of higher than 50 percent in those 5 years.

The *Worldwide Airport Traffic Report* published by the Airports Council International provides air cargo data for 12 California airports. Table 4-3 presents the total weight of air cargo enplaned or deplaned at these airports in 1990, 1996 and 2000 as well as the percentage changes seen during the two periods. Growth of air cargo at the airports in operation in 1996 has been very fast. Eight of these airports experienced growth higher than 50 percent over the six-year period from 1990 to 1996. Four of

[201] Jacob Tsao, Mark Hansen, Geoffrey Gosling, "The Role of Air Cargo in California's Goods Movement" (University of California at Berkeley, Center for Transportation Studies, 1998.

these eight experienced more than a doubling of their total air cargo tonnage, with growth at John Wayne, Oakland, Sacramento and Fresno airports of 952 percent, 189 percent, 122 and 116 percent, respectively. The average annual growth rate for Orange County Airport during the six years was almost 50 percent, albeit from a very low initial level.

Table 4-3
Total Weights of Cargo Enplaned or Deplaned at Top Twelve California Cargo Airports
(Metric Tonnes)

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

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

Table 4-4
Total Weights of Cargo Enplaned or Deplaned at Airports in California Regions
(Metric Tonnes)

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

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

During the four-year period from 1996 to 2000, however, the growth rate in air cargo slowed. Those airports that had seen the strongest growth during the early 1990s typically saw their growth slacken or their air cargo activity even decline in the decade's concluding years, while growth rates at Los Angeles International, San Francisco International, and San Diego remained fairly stable. Table 4-4 shows the same data aggregated at the regional level. Air cargo growth in all four regions exceeded 50 percent during the first six years, while air cargo in the two smaller regions grew faster than in the two larger regions. During the period from 1996 to 2000, the average annual growth rates in Southern California and the Bay Area dropped significantly compared to their previous levels. The San Diego area continued its fairly strong growth, while cargo activity in the Sacramento area grew at an average annual rate of 37 percent.

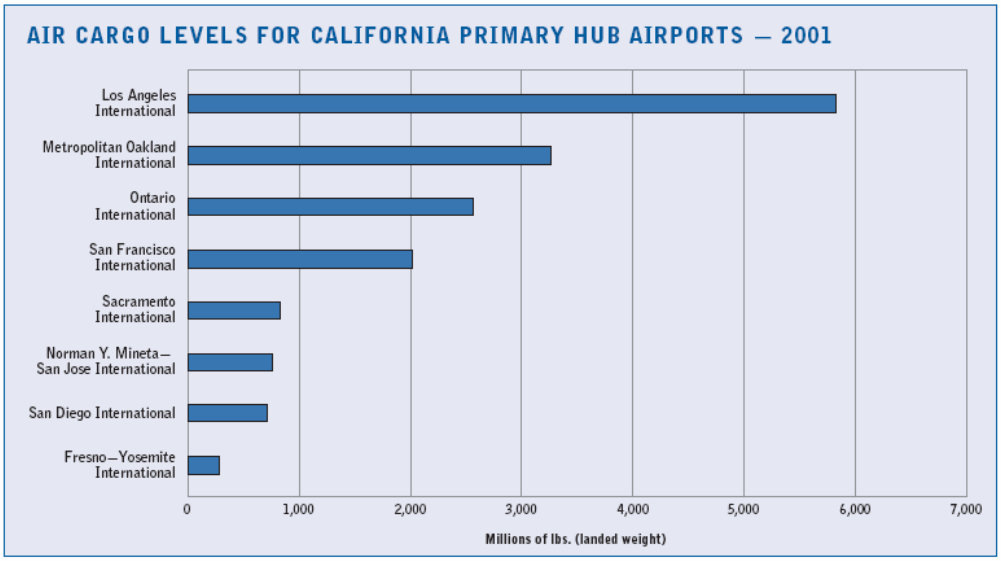
By early 2001, the state and national economies had begun to slow as the "dot com" sector deflated. So demand for air cargo services was already waning before the terrorist attacks in September 2001. The industry suffered not merely from a closure of the nation's airspace for several days after the attacks but from a more prolonged downturn in passenger air travel which resulted in a substantial drop in overall air cargo capacities. Still, air cargo was not as dramatically affected as passenger travel by the events of September 11. According to a study by the Southern California Association of Governments (SCAG), passenger air travel in Southern California dropped 47 percent following September 11th compared to a 10 percent decline in air cargo volume.[202]

[202] Southern California Association of Governments, *Regional Aviation Economic Analysis.* (2004).

California Air Cargo Tonnage (Domestic and International) 1996-2003

According to Caltrans (See Charts 4-1 and 4-2), Los Angeles International and Oakland International were responsible for 56 percent of the state's air cargo (domestic as well as international) in 2001.

Chart 4-1



Source: Caltrans Division of Aeronatutics

Chart 4-2

Airport	1996*	1997*	1998	1999	2000	2001	2002	2003
Bob Hope (Burbank-Glendale-Pasadena)	39,623	40,048	40,032	45,190	41,231	36,308	43,825	49,232
Fresno-Yosemite Int'l	15,346	16,576	17,377	18,325	21,428	18,378	16,151	14,656
John Wayne Airport, Orange Co.	No Data	19,977	18,072	18,287	18,133	16,074	13,519	16,107
Long Beach (Daugherty)	No Data	No Data	39,405	45,065	52,044	58,357	58,607	55,850
Los Angeles Int'l	No Data	2,064,528	2,051,873	2,166,035	2,266,266	1,956,578	1,957,351	2,004,485
Metropolitan Oakland Int'l	676,857	744,267	770,421	739,839	775,130	665,252	715,764	683,354
Ontario Int'l	436,959	461,982	454,881	488,774	504,726	462,006	549,460	587,300
Sacramento Int'l	20,012	83,846	78,523	66,860	67,872	63,939	77,886	78,534
Sacramento Mather	72,568	39,468	60,822	101,707	173,447	122,041	60,248	60,125
San Diego Int'l	102,883	124,309	130,012	140,562	153,370	148,408	167,344	146,328
San Francisco Int'l	786,562	857,914	847,443	929,010	957,123	698,565	653,184	630,792
San Jose Int'l, Norman Y. Mineta	100,835	121,310	132,009	143,376	161,967	158,582	154,792	119,419
Stockton Metropolitan	NA	NA	NA	NA	NA	NA	NA	33,607
Annual State Totals	**2,251,645**	**4,574,225**	**4,640,870**	**4,903,030**	**5,192,737**	**4,404,488**	**4,468,131**	**4,479,788**

Source: Caltrans

California's Principal International Gateways

California's two premier international gateways for both passengers and cargo are Los Angeles International and San Francisco International. Both have a rich history in providing transoceanic air service to the Orient as well as to destinations in Europe. However, in recent years, their once paramount role as entrepôts 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. Still, 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.

In 2004, LAX and SFO handled 93.2 percent of all airborne merchandise exports from California. The only other California airport with significant export traffic was Oakland International, which handled 6.5 percent of the state's airborne export trade in 2004. All of the other airports in the state collectively handled less than 0.3 percent of the state's airborne export trade that year.

There has been some change in the percentage of exports moving through these three airports, however. In 2000, SFO's share of the state's airborne merchandise export trade was slight larger than LAX's share – 47.5 percent and 47.3 percent, respectively. Oakland's share that year was 4.6 percent.

As the accompanying table indicates, SFO's share of the trade has diminished considerably in recent years.

Los Angeles International Airport was the nation's second busiest international air-freight gateway when ranked by the dollar value of shipments handled in 2003, trailing only New York's JFK International Airport.[203] LAX also ranked seventh among all of the nation's land, sea, and air freight gateways. In 2003, approximately 12 percent of the value of all U.S. international air freight moved through LAX (See

[203] It should be noted that LAX trailed JFK by some distance. In 2002, JFK handled $112 billion in air freight shipments as opposed to $64 billion at LAX. See Bureau of Transportation Statistics, *America's Freight Transportation Gateways Connecting Our Nation to Places and Markets Abroad*, 2004. In particular, see Table 2. Top 50 U.S. Freight Gateways, Ranked by Value of Shipments, 2003.

Table 4-5). By weight, LAX ranked fourth among all air gateways, with seven percent of U.S. international air freight moving through it. (Only JFK, Memphis, and Anchorage handled more cargo by weight in 2003. Memphis, of course, is the primary Federal Express hub, while Anchorage's Ted Stevens International Airport has emerged as an increasingly important transshipment point for freight moving between the Far East and the Central and Eastern portions of the United States.)

LAX is owned and operated by Los Angeles World Airports (LAWA). Cargo facilities operated by airlines and cargo shippers and integrators occupy two million square feet of building space on about 200 acres of land. (The total land area of LAX is 3,500 acres.) A significant number of off-airport freight-forwarding facilities are also located close to the airport. LAX is popular with shippers and freight-forwarders primarily because of the large number of passenger air carriers providing spot or contracted cargo transport. Approximately 46 percent of LAX cargo is carried in the bellies of passenger aircraft.[204]

Like SFO, LAX is a major U.S. hub for trade with Pacific Rim countries. The most important destination and origin markets for goods moving through LAX are Mexico, United Kingdom and Taiwan, and South Korea, Taiwan, and Japan, respectively (see Table 4-7, Page 138). Together, they account for nearly 50 percent of the total tonnage transported.[205] In terms of merchandise transported on nonstop international flight segments, Seoul, South Korea was the leading origin point for imports, while London emerged as the top destination for exports (See Table 4-8, Page 138).

Between 1999 and 2003, the tonnage of international air freight passing through LAX rose six percent (See Table 4-6, Page 137). Imports grew by seven percent, while exports rose by three percent (See Chart 4-3, Page 136). By value, air cargo shipments through LAX declined five percent, with exports falling by nine percent and imports by slightly less than one percent. According to the U.S. Bureau of Transportation Statistics, some of the major commodities exported through LAX are

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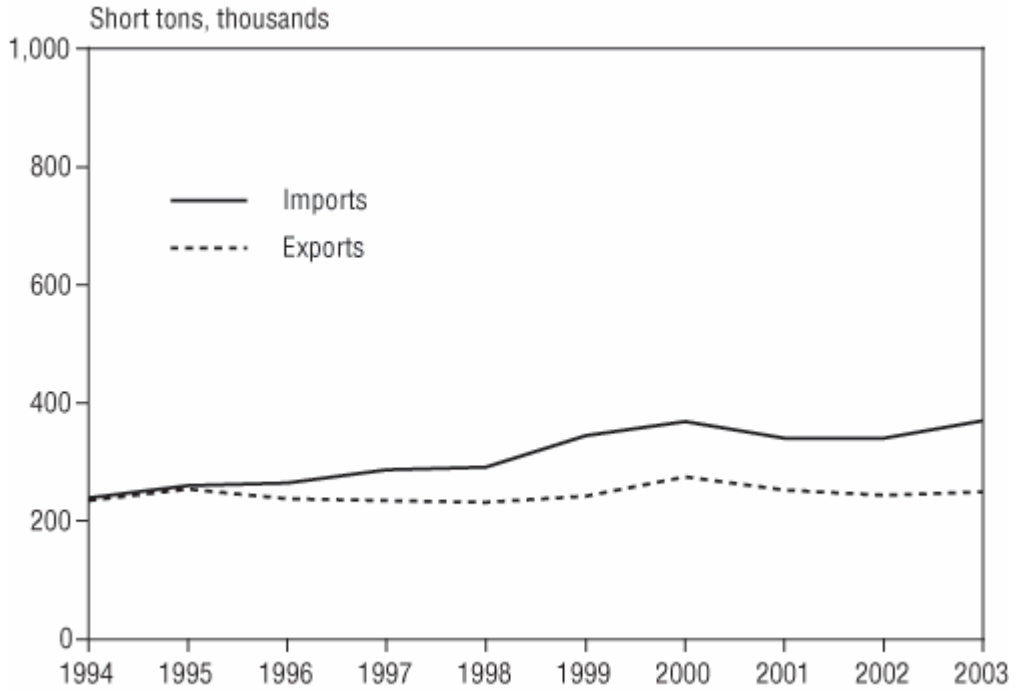
[204] Southern California Association of Governments, "Goods Movement Program Whitepaper: A Survey of Regional Initiatives and a Discussion of Program Objectives" (January 2002), p. 9.

[205] This calculation is derived *Form 41 International Market Data* from Office of Airline Information, Bureau of Transportation Statistics. According to the Bureau of Transportation Statistics, origin-destination airport-pair data by value are not available from the merchandise trade data.

vegetables, fruits and nuts; clothing; computer equipment; and medical instruments, while the leading imports are apparel, computer equipment, audio and video media, and office machinery.

Chart 4-3

Air Freight Imports and Exports via LAX, CA: 1994 - 2003



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-5

Value and Weight of U.S. International Merchandise Freight, Role of LAX, 2003

Overall and Air Mode ($ millions)	Total	Exports	Imports
Total U.S. trade by all modes (land, sea, air)	1,983,139	723,743	1,259,396
Total U.S. trade by air	523,343	235,602	287,741
Value of International Air Freight by Los Angeles International (LAX), CA			
Total air trade through LAX, CA ($ millions)	63,838	32,590	31,248
Percent of total U.S. air freight value	12.2	13.8	10.9
Weight of International Air Freight			
Total international air freight through U.S. gateways (short tons)	8,391,870	3,370,539	5,021,331
Total U.S. air freight via LAX, CA (short tons)	618,812	249,342	369,470
Percent of total U.S. air freight weight	7.4	7.4	7.4

SOURCE: U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS), based on data from multiple sources, September 2004. Merchandise Trade – U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, U.S. Exports and Imports of Merchandise, CD-ROM. Air Freight Tonnage – U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-6

Total Air Freight Exports and Imports via LAX, CA: 1999 – 2003

(Short tons, thousands)

	1999	2000	2001	2002	2003
Imports	345	369	340	340	369
Exports	242	274	253	243	249
Total	587	643	593	583	619

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-7
Top 3 Destination and Origin Countries for International Air Freight via LAX, CA: 2003

Rank	Export destination	Tons
1	Mexico	39
2	United Kingdom	32
3	Taiwan	27

Rank	Import origin	Tons
1	South Korea	91
2	Taiwan	50
3	Japan	40

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-8
Top 3 Destination and Origin Cities for International Air Freight via LAX, CA: 2003

Rank	Export destination	Tons
1	London, United Kingdom	32
2	Taipei, Taiwan	27
3	Seoul, South Korea	26

Rank	Import origin city	Tons
1	Seoul, South Korea	91
2	Taipei, Taiwan	50
3	Tokyo, Japan	34

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

A large number of domestic and international carriers operate out of LAX. The top three air carriers moved 25 percent of the weight of air imports and 18 percent of the weight of air exports handled at LAX in 2003. Korean Air Lines carried most of

the imports, while the Mexican cargo carrier, Aerotransportes Mas De Carga, transported most of the exports out of LAX (Table 4-9).

Table 4-9
Top 3 Air Carriers for Exports and Imports via LAX, CA: 2003
(Short tons, thousands)

Rank	Export carrier	Tons
1	Aerotransportes Mas De Carga	16
2	Lufthansa German Airlines	16
3	Eva Airways Corporation	13
Rank	**Import carrier**	**Tons**
1	Korean Air Lines Co., Ltd.	45
2	Eva Airways Corporation	27
3	Atlas Air, Inc.	21

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

FedEx has its largest Southern California hub operation at LAX, where it accounts for somewhat over 20 percent of the freight handled at LAX. UPS operates its west coast hub at Ontario, where it accounts for nearly 80 percent of the airport's freight traffic. Despite this high percentage, traffic volumes for the UPS Ontario hub and the FedEx hub at LAX are similar. Both carriers provide limited service out of the other four major airports.

Table 4-10 (page 140) displays the top 10 cargo carriers at LAX by tonnage in 2002, the latest year for which the airport has made figures available.

Table 4-10

LAX
TOP TEN CARRIERS
January 2002 Through December 2002

	Measurement	% of Market
Air Freight (tons)		
1 Federal Express	410,631	21.85%
2 United Airlines	118,714	6.32%
3 Korean Air	107,149	5.70%
4 American Airlines	79,342	4.22%
5 Delta Air Lines	65,285	3.47%
6 Singapore Airlines	63,338	3.37%
7 Northwest Airlines	59,620	3.17%
8 Eva Airways Corporation	58,431	3.11%
9 China Airlines	54,847	2.92%
10 Gemini Air Cargo	46,876	2.49%
Subtotal	**1,064,234**	**56.64%**
All Other	814,670	43.36%
TOTAL	**1,878,904**	**100.00%**

The list is dominated by passenger carriers, with just three all-freight carriers (FedEx, Eva, and Gemini) appearing in the top 10. Major domestic passenger airlines – United, American, Northwest and Delta – rank second, fourth, fifth and seventh. Three major foreign passenger carriers also rank high: Korea Air (3), Asiana (8) and Singapore (10). Collectively, the top 10 all-freight carriers only account for 33% of the total freight volume at the airport (the remainder being predominantly passenger airlines).

The Southern California Association of Government's Regional Transportation Plan (2002) forecasts that cargo volume at LAX will increase to 2.98 million tons by 2025, up from 2.06 million tons in 1997.[206]

San Francisco International Airport was the fourth busiest international air cargo gateway in the United States in 2003, when ranked by the dollar value of shipments

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

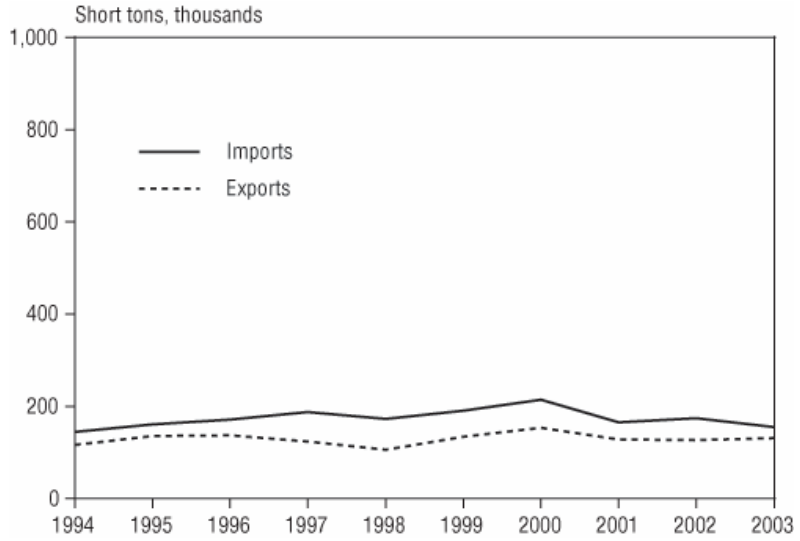
handled there. It also ranked twelfth among all the nation's air, land, and sea freight gateways. In 2003, nearly 9 percent of all U.S. international merchandise air freight by value moved through SFO (See Table 4-11). By weight, SFO stood sixth among air gateways, with over 3 percent of U.S. international air merchandise tonnage moving through it.

As with LAX, SFO is a major hub for trade with Pacific Rim countries. The major origin and destination countries on non-stop international flight segments to and from SFO are Japan, South Korea, and Taiwan, while the major origin and destination cities were Taipei, Seoul, and Tokyo (See Tables 4-12 and 4-13). The major categories of exports from SFO include, not surprisingly, high technology products like computers, semiconductors and semiconductor equipment, electronic equipment and parts, medical equipment, telecommunication equipment, and pharmaceuticals. Comparable information about the composition of imports is not available. SFO is also a key departure point for California agricultural exports, although it has been losing more and more of that market to LAX in recent years.

In 2003, SFO handled over $47 billion worth of international air freight. A sharp downturn in the technology sector affected air trade passing through SFO. Between 1999 and 2003, the value of international freight handled at SFO declined 35.4 percent (See Table 4-14, Page 144). Exports fell by 36 percent, and imports dropped by 34 percent (Chart 4-4). Among the country's top 25 international freight gateways, SFO had the worst decline in the value of its trade.[207] Although much of this can be attributed to the economic travails of Silicon Valley, some critics cite the airport's failure to aggressively address the requirements of air cargo carriers as a contributing cause of SFO's diminished role in the international air cargo trade.

[207] During the same period the tonnage of freight moving through SFO declined by 12 percent.

Chart 4-4
Air Freight Exports and Imports via SFO, CA: 1994-2003



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-11
Value and Weight of U.S. International Merchandise Freight, 2003

Overall and Air Mode ($ millions)	Total	Exports	Imports
Total U.S. trade by all modes (land, sea, air)	1,983,139	723,743	1,259,396
Total U.S. trade by air	523,343	235,602	287,741
Value of International Air Freight by San Francisco International Airport (SFO), CA			
Total air trade through SFO, CA ($ millions)	46,625	20,570	26,055
Percent of total U.S. air freight value	8.9	8.7	9.1
Weight of International Air Freight			
Total international air freight through U.S. gateways (short tons)	8,391,870	3,370,539	5,021,331
Total U.S. air freight via SFO, CA (short tons)	286,095	131,300	154,795
Percent of total U.S. air freight weight	3.4	3.9	3.1

SOURCE: U.S. Department of Transportation (USDOT), Bureau of Transportation Statistics (BTS), based on data from multiple sources, September 2004. Merchandise Trade – U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, U.S. Exports and Imports of Merchandise, CD-ROM. Air Freight Tonnage – U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-12
Top 3 Destination and Origin Countries for International Air Freight via SFO, CA: 2003

(Short tons, thousands)

Rank	Export destination	Tons
1	Taiwan	36
2	South Korea	25
3	Japan	20

Rank	Import origin	Tons
1	Japan	58
2	South Korea	22
3	Taiwan	21

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-13
Top 3 Destination and Origin Cities for International Air Freight via SFO, CA: 2003

(Short tons, thousands)

Rank	Export destination	Tons
1	Taipei, Taiwan	35
2	Seoul, South Korea	25
3	Tokyo, Japan	18

Rank	Import origin	Tons
1	Tokyo, Japan	56
2	Seoul, South Korea	22
3	Taipei, Taiwan	21

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Table 4-14
Total Air Freight Exports and Imports via SFO, CA: 1999 - 2003

(Short tons, thousands)

	1999	2000	2001	2002	2003
Imports	190	214	166	174	155
Exports	134	154	128	126	131
Total	324	368	293	300	286

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Several major domestic and international air carriers operate through SFO. United Airlines is the largest carrier of international merchandise exports as well as imports through SFO (Table 4-15). The top three air carriers (United Air Lines, Nippon Cargo Airlines, and Korean Air Lines) together, accounted for 45 percent of the imports and 39 percent of the exports in 2003. San Francisco airport has recently added new cargo facilities, which will play an important role if the technology sector recovers and the merchandise trade through SFO rebounds.

Table 4-15
Top 3 Air Carriers for Exports and Imports via SFO, CA: 2003

(Short tons, thousands)

Rank	Export carrier	Tons
1	United Air Lines, Inc.	19
2	Asiana Airlines, Inc.	16
3	China Airlines, Ltd.	16

Rank	Import carrier	Tons
1	United Air Lines, Inc.	28
2	Nippon Cargo Airlines	25
3	Korean Air Lines Co., Ltd.	17

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Form 41 Traffic - Segment Data, various years, as of Sept. 16, 2004.

Other Key Airports

In addition to SFO and LAX, seven other airports in California reported handling international cargo in 2002. However, their combined tonnages amount to less than one percent of California's airborne foreign trade. These airports were: Oakland International, Mineta San Jose International, Ontario International, Sacramento International, San Bernardino International, San Diego International, and Southern California Logistics Airport. The role of some of these facilities in transporting freight internationally will, however, likely change markedly in coming years.

Two airports, Ontario and Oakland, have exceptionally strong potential to emerge as major international trade gateways. Both have a long way to go, however, before even approaching the status of LAX or SFO. In 2004, for example, Ontario processed some 108,881 international passengers, while the international passenger count at LAX was 16,468,590.[208]

Oakland's advantage is that it serves the state's second largest metropolitan area and that it has more expansion capacity and fewer weather-related delays than SFO. In 2002, Oakland International handled $2.9 billion in U.S. exports but only $121 million in imports passed through Oakland International Airport.[209] As with LAX and SFO, exports through Oakland are dominated by electronic integrated circuits, which account for more than one-half of the total. The remainder consists of small amounts of computer and office equipment, measuring and controlling devices, medical instruments and supplies, and aircraft and parts. Trade through OAK is primarily with Japan, Hong Kong, and Taiwan. Oakland will ineluctably gain a greater share of the international air cargo market as airlines, especially Asian-based all-cargo operations find SFO's cargo handling facilities less and less satisfactory.

Ontario International Airport (ONT) currently handles only a small fraction of the international air cargo tonnage that passes through LAX. [210] In 2003, ONT handled 10,281 tons of international cargo as opposed to the 963,469 tons handled at LAX. Still, ONT will see a growing role in international goods movement, if only because

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208 Los Angeles World Airports websites.

209 Haveman and Hummels, p. 6.

210 Integrated carriers account for nearly 98 percent of the freight tonnage at Ontario.

UPS has begun offering direct service to China each weekday from ONT.[211] It is currently the originating point for four of the six direct weekly UPS flights flown to China. UPS opened its West Coast Air Hub in Ontario in 1992 with 2,100 employees. As of September 2004, it employs about 4,500 people at the Ontario hub and handles about 70 percent of the airport's air cargo.[212] Like Oakland International, ONT is well-situated to serve a huge population center. Given its proximity to major surface facilities — the I-10 Freeway to the north, the I-15 to the east, and the Pomona Freeway to the south — as well as ample space available for the expansion of facilities, the Southern California Association of Government's Regional Transportation Plan forecasts an increase of nearly 380 percent in Ontario's cargo traffic by 2025.[213]

The competition to attract air cargo services will scarcely end there. As in other parts of the world, California will see intense competition among so-called secondary airports to capture more and more air cargo traffic. This phenomenon has already been evident in other parts of the U.S. For example, there has been fierce competition among East Coast airports seeking to become regional air cargo hubs. Philadelphia International Airport is now regarded as a leading contender to grow as a cargo gateway in the northeastern quarter of the country.[214] By some accounts, this trend toward regional gateway development began when the international

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[211] Los Angeles County Economic Development Corporation, "International Trade Trends & Impacts: The Southern California Region 2003 Results and 2004 Outlook," May 2004, p. 6.

[212] Phil Pitchford, "Stakes Run High As Airports Compete," *Riverside Press Democrat*, September 20, 2004. Pitchford quotes Oscar Sepulveda, a UPS spokesman in Ontario, on the employment figures.

[213] The forecast specifically calls for an increase in the volume of cargo traffic at ONT to 2.25 million tons by 2025, a 379 percent increase over the Tegional Transportation Plan's baseline planning year of 1997.

[214] Another example that whets the aspirations of the proprietors of decommissioned military airfields throughout the country is DHL's new Wilmington, Ohio hub. In the fall of 2004, ground was broken on a $300 million project at Wilmington, Ohio, for DHL's expanded air and ground hub. The DHL expansion at the Wilmington Air Park is divided into 42 construction projects, including a new Network Operations Control center and a new computer facility. DHL strengthened its foothold in the North American market in 2003 when it acquired Airborne Express as well as Airborne's Wilmington facility. DHL will continue to operate a separate, backup operation at its former North American hub at the Cincinnati/Northern Kentucky International Airport, where its new $230-million sorting center opened last year. Approximately 1.2 million sq. ft. of additional space for sorting packages and 36 acres of aircraft ramp pavement are planned at Wilmington. By late 2005, the Wilmington airport, a former USAF Strategic Air Command base, is expected to increase capacity to handling 1.7 million shipments a day.

freight forwarder Panalpina established a gateway at Huntsville International Airport in Alabama. The inland Port of Huntsville now combines the airport, an international inter-modal center and an industrial park serving the Tennessee Valley region and, by truck, the entire southeast U.S. region. Panalpina continued the trend toward regional gateways by opening facilities at Bradley International Airport near Hartford, Connecticut in 2002. Atlanta's Hartsfield International and even New Orleans' Louis Armstrong International are also trying to make inroads into Miami International's long stronghold as America's dominant air cargo gateway to Latin America.

It is worth noting, though, that even some of those leading the development of regional air gateways expect that growth in air cargo traffic will continue primarily at those airports served by both passenger airlines and air cargo carriers. All-cargo airports can be profitable under certain circumstances, but it is often more attractive financially and logistically for cargo carriers and passenger carriers to share the same airport.[215]

The history of Kinston, North Carolina's Global TransPark offers one important cautionary tale. Opened in 1999, the facility was originally intended to become an air cargo hub that would include manufacturers and other industrial users. Perhaps because the facility's development was championed by John Kasarda, the highly regarded director of the Kenan Institute of Private Enterprise at the University of North Carolina, the project attracted considerable grant money from the state. Today, though, the facility is foundering, having lost more than $7.6 million in the past two years. Worse, it has almost no prospect of paying off a state loan of approximately $30 million by a July 1, 2005 deadline. State lawmakers, already disenchanted with the project, may then pull the plug. According to one analysis, critics of the project have pointed to the lack of any real concentration of industry in the primarily agricultural region of eastern North Carolina where the airport is located.[216]

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[215] James Ott, "Future Cargo Hubs: Primary airports are expanding; secondary ones are looking like gateways," *Aviation Week & Space Technology*, November 15, 2004.

[216] Ed McKenna, "Global TransPark Crowded with Debt," *Traffic World*, January 24, 2005.

Here in California, Palmdale, March Global Port, San Bernardino International, Stockton Metropolitan, Mather Field, and Victorville[217] have all been proposed as major freight airports. Yet with nearly half of all air freight traffic through LAX carried aboard passenger airlines – many of them foreign-flagged – it would be exceedingly difficult to convince freight-forwarders and other logistics providers to relocate their operations to more remote airfields. Palmdale enjoys the advantage of being operated by Los Angeles World Airways, which also runs LAX. March Global Port has recently been designated as a regional hub by DHL.[218] San Bernardino International had hoped to become the regional hub for DHL, but lost that contest to March. Victorville, which bills itself as the Southern California Logistics Airport, touts its proximity to Union Pacific Railroad (UPRR) and the Burlington Northern Santa Fe Railway (BNSF) trunk lines. Indeed, its promotional literature devotes considerable attention to its potential as to become "the eastern arm of the Alameda Corridor, which links the ports of Los Angeles and Long Beach with several inland intermodal container transfer facilities." [219]

Air Cargo in Southern California

The Southern California Association of Government's Regional Transportation Plan (RTP) forecasts that 9.5 million tons of air cargo will be handled by the region's airports in the year 2025.[220] That would represent a 265 percent increase in volume over the 2.6 million tons of cargo handled by the region's airports in 1997. To meet this anticipated future demand, the RTP calls for both an expansion of existing commercial service airports and 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 (now March Global Port), and Palmdale Regional

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[217] "Southern California Logistics Airport Development OK'd; Ground for the new intermodal rail facility will be broken within two years," *California Trade Report*, November 22, 2004.

[218] In April 2005, the Federal Aviation Administration threatened to disqualify March Global Port from receiving millions of dollars in future funding. At issue was a rule blocking private airplanes from using military-owned airfields. Until it is resolved, the FAA said it will no longer consider grant applications from the civilian reuse authority at March. See Kimberly Trone, "March Airport Funding at Risk," *The [Riverside, CA] Press-Enterprise*, April 27, 2005.

[219] The literature does not address why anyone would pay premium prices to ship cargo thousands of miles by air only to see it complete its journey on a slow-moving train.

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

Airport. SCAG's regional aviation strategy aims 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.

To diversify the air cargo load, SCAG has long promoted the development of a regional airport system. That system would include a new global cargo port at March could handle 1.1 million pounds annually, making it third in the region after Los Angeles and Ontario airports. Development of March as an international air cargo facility would be beneficial to agricultural exporters throughout much of Southern California who must now truck produce across the L.A. Basin to reach LAX.

Under the RTP, LAX would stay largely stable with 2.34 million tons of cargo anticipated by 2030, up from slightly more than 2 million tons this year. Airports at Ontario, Palmdale and the former Norton and George military bases in San Bernardino and Victorville respectively would handle a combined 6 million tons annually of a projected 8.2 million total tons.

There are some evident flaws, however. After examining the detailed master plan guiding the $11 billion renovation of LAX that would permit millions of additional airline passengers a year, one Los Angeles newspaper observed that the plan "fails to provide more freeway lanes or significant mass-transit projects to handle the expected crush."[221] Yet, as the California Business, Transportation and Housing Agency's January 2002 report, "Golden Gateways Development Program," 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."

[221] *Los Angeles Daily News*, November 20, 2004.

One of the larger challenges of transportation planners lies in convincing airlines, freight-forwarders, trucking lines and other crucial elements of the infrastructure needed to support air cargo operations to assume the considerable costs and risks associated with shifting all or even part of their operations to an airport other than LAX (or SFO in the north.)

From the carrier perspective, LAX offers several advantages simply because it is the principal international passenger airport in the region as well as Southern California's primary domestic airport for several major airlines. As a transshipment hub, it would be very difficult and expensive to duplicate the breadth of air transport and logistical services available at LAX anywhere else. Moreover, despite population sprawl, LAX remains the most centrally located major airport in relation to the region's population and industrial base.[222]

From the perspective of shippers, truckers, and freight-forwarders, LAX offers similar advantages, most importantly an ability to accommodate larger aircraft (including the superjumbo Airbus 380), a central location relative to customers, and flight connections to a large number of destinations. The biggest disadvantages of LAX are reportedly the costs of leases[223], crowding, and traffic congestion.

In one recent study, interviewees indicated they were very concerned about traffic in the vicinity of LAX. However, the interviewees did not view Palmdale to be a viable alternative. The reduction in congestion, crowding and cost of operation evidently do not adequately compensate for its remoteness. And although the Palmdale airport is located in a less congested area, trucks would still need to negotiate considerable congestion in the LA region in order to reach Palmdale.[224]

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[222] Of course, one important reason for the continuing dominance of LAX is that, in failing to develop local airports to meet rising local demand for air transport services, residents and businesses in both Orange County and San Diego County have no alternative to LAX for their international travel or shipping needs.

[223] The University of Southern California's Randolph Hall reports that LAX currently has the second highest commercial lease rates in the country, behind only New York's JFK. See his report entitled "Alternative Access and Locations for Air Cargo" published in June 2002 by METRANS, a transportation research collaborative of the University of Southern California and California State University, Long Beach.

[224] Ibid.

The great majority of freight-forwarders operate in very close proximity to LAX as well as to SFO. In strong contrast to integrated carriers, forwarders do not spread their facilities throughout the region. This can be attributed to the relatively large size of their shipments (making it less important to consolidate loads close to the shipper/receiver), and due to forwarders' reliance on trucking companies for providing ground transportation service (which operate their own distinct terminals). The forwarders themselves are not positioned to serve airports other than LAX.

By contrast, San Diego's Lindbergh Field is simply not a significant player on the international air cargo scene. For 2004, for example, the airport's on-line monthly traffic reports indicate that international freight tonnage represented less than one-half of one percent of its total air cargo tonnage.[225] In fact, two-way international air cargo traffic through SAN had plummeted by nearly 90 percent from 2003. Airborne exports dropped to a mere 583.4 tons in 2004. In this case, the plunge in international air cargo was almost entirely attributable to the cessation of British Airways' non-stop service between San Diego and London in July 2003, leaving San Diego with international service only to Canada and Mexico. [226]

San Diego area officials and voters have long wrestled with how best to meet the area's current and future air transport needs. Over the past several years, various parties have proposed various schemes – including a cross-border airport venture with Tijuana, Mexico. Seeking to bring the civic dithering to an end, the California Legislature in 2001 established the San Diego County Regional Airport Authority. The new agency's objective is to present voters with a preferred site for a new regional airport by 2006, while keeping Lindbergh functioning as efficiently as possible through the decade or two that it would take to construct any new airport. The authority's search for a potential airport has centered on nine possibilities ---- eight new sites and a plan to aggressively expand Lindbergh Field itself. [227] The San Diego

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[225] San Diego's international air cargo traffic went from 6,499.8 tons in 2002 to $5,504.5 tons in 2003 to $583.4 tons in 2004. Through the first quarter of 2005, 160.5 tons of international cargo passed through the airport. Source: San Diego Airport Air Traffic Reports.

[226] See Michael Kinsman, **"**Flights to London to end soon,**"** *San Diego Union-Tribune*, July 11, 2003.

[227] The San Diego Regional Airport Authority has named nine potential sites for an international airport: the Marines' Miramar Air Station, East Miramar and Camp Pendleton; North Island Naval Air Station; March Air Reserve Base near Riverside; Boulevard in East County; the Borrego Springs area; the Imperial Valley desert; and an expansion of Lindbergh

County Regional Airport Authority expects to decide in 2005 which short-term course should be taken in shoring up the area's air transport system, while seeking to identify a site for a new regional airport.

In the meantime, San Diego will likely remain a relatively inconsequential player in the international air cargo industry. And that comes with a price. As UC San Diego professor Steven P. Erie concludes: "Lindbergh Field's international passenger and air cargo deficiencies cost the region's economy an estimated $4-5 billion annually in high value-added activity and hinder San Diego's aspirations to become a leading export-based high-tech center. That opportunity cost will only grow in the future."[228] Even worse, failure to develop an air transport facility commensurate with the needs of local industry only ensures that the San Diego region's economic destiny will continue to be influenced disproportionately by transportation infrastructure decisions taken by officials in other counties.

Air Cargo in the San Francisco Bay Area

Air cargo's role in the San Francisco Bay Area has been the subject of several recent reports, prominently including those undertaken by the Bay Area Economic Forum. In 2000, the Forum published a two-part assessment of the importance of air transport to the region's economy.[229] The organization also released a report on air transport in the Bay Area in the aftermath of the 9/11 tragedy.[230] Most recently, it issued a report in November 2004 on the economic effects of competitive air service at San Francisco International Airport.[231]

Field. Because of their distance from metropolitan San Diego, the Borrego Springs and Imperial Valley options appear to be non-starters. Consideration of military bases in the area inevitably funds afoul of the debate over military base-closings. For an analysis of the politics of regional airport selection, see Gig Conaughton, "Airport officials: Speed up Lindbergh improvements," *North County Times*, December 14, 2004.

228 Steven P. Erie, *Globalizing L.A.: Trade, Infrastructure, and Regional Development* (Stanford University Press, 2004), pp. 217-218.

229 "Air Transport and the Bay Area Economy: Phase One" was published in January 2000. Phase Two came out in November of that same year.

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

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

Unlike Southern California, there has been no concerted effort in the Bay Area to devise a comprehensive strategy for dealing with the region's air transport needs. Indeed, officials at SFO have strenuously resisted efforts to coordinate operations at the Bay Area's three principal 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 airports if enough flights are shifted to reduce SFO's delays, and (c) virtual elimination of freighter cargo at SFO.)[232]

Those needs are likely to be considerable in the years to come. The Bay Area Economic Forum anticipates that cargo tonnage through the Bay Area's three major international airports – SFO, Oakland International and Mineta San Jose International – is expected to double from 1.75 million tons currently 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 appear content to leave the problem's resolution to competition among Bay Area airports and those in adjacent areas of Northern California.

A November 2000 report by the Bay Area Economic Forum stated that 58 percent of the air freight shipped through SFO traveled in the bellies of passenger aircraft.[233]

By its own admission, SFO is one of the most weather-delayed airports in the nation, primarily because of its outdated runway configuration. The airport's parallel runways, built in the 1940s, are separated by 750 feet, whereas the Federal Aviation Administration now requires runways to be separated by 4,300 feet for use in all weather conditions. SFO can normally handle 60 landings an hour in clear weather. In poor visibility, however, federal regulations oblige airport authorities to close one of the runways, effectively cutting in half the number of permissible arrivals. In the

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[232] 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.

[233] "Air Transport and the Bay Area Economy: Phase Two," Bay Area Economic Forum (November 2000), p. 10.

fall of 2004, SFO installed a new instrument landing system that airport authorities expect will allow up to 38 landings per hour in adverse weather.[234]

Some aviation industry critics have argued that the situation at SFO has led some airlines to be reticent about inaugurating new service there. [235] While it is certainly true that SFO has dropped from being the nation's fifth busiest passenger airport in 2000 to 13th in 2003, it is a difficult allegation to prove. Indeed, the recent inauguration of new or expanded international service at SFO by carriers such as Cathay Pacific, Independence Air, Air New Zealand, Iceland Air, Vietnam Air and ATA suggests that SFO still has considerable drawing power.

Still, there remain questions about SFO's future role in serving Northern California's air cargo. Rather than consider proposals for a strategy of coordinating operations of the Bay Area's three primary airports, SFO management in the early 2000s banked heavily on securing clearance to build a new runway that would have extended out into the bay. When the new runway option was finally defeated in 2003, the Bay Area was left with a growing need for air transport services but no coherent plan to cope with it. The contrast with Southern California's efforts to alleviate the burden on LAX by shifting more of that region's international flights to other facilities could not be more stark.

Across the Bay, Oakland International (OAK) has lately replaced Mineta San Jose International as the Bay Area's second largest passenger airport. Its growth has been spurred by the advent of low-fare carriers, especially Southwest Airlines, and more recently JetBlue Airways. Officials at the Port of Oakland, which operates OAK, have indicated that they plan to continue to focus on low-fare flights to domestic airports as well as to vacation destinations in Mexico and the Caribbean. They insist they have plans to challenge San Francisco International for lucrative international fliers.[236]

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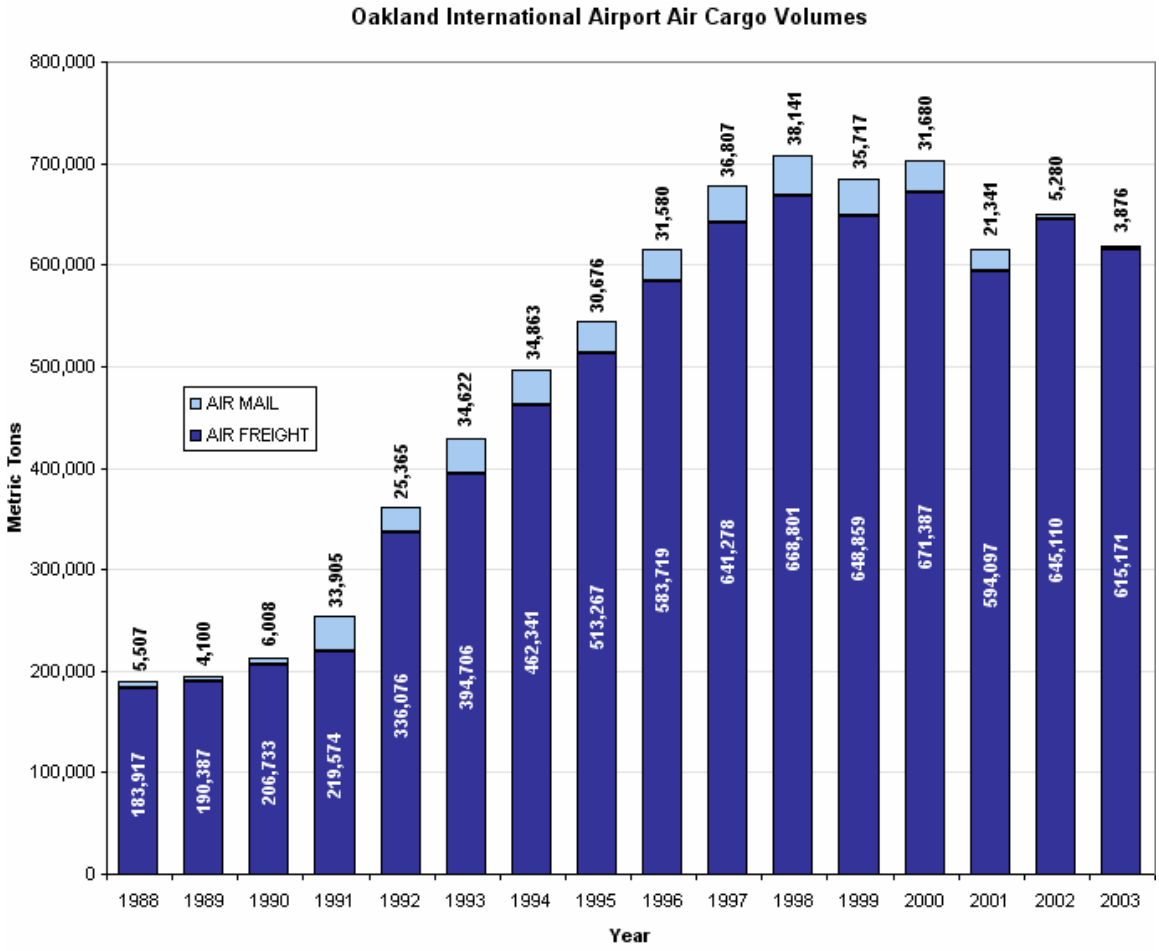
[234] Alan Gathright, "Technology to boost SFO's foggy landings," *San Francisco Chronicle*, October 27, 2004.

[235] Stanford Horn, "A small, fast way to end SFO delays," *San Francisco Chronicle* Open Forum, October 21, 2004. Horn, a Bay Area transportation writer, suggests diverting general aviation and smaller commuter aircraft to some of the region's secondary airfields, especially when visibility at SFO is poor.

[236] David Armstrong, "Port of Oakland in expansive mood; New chief's ambitious agenda," *San Francisco Chronicle*, August 15, 2004.

Oakland International Airport currently accounts for the largest share of air cargo operations of the three major Bay Area airports, carrying 70 percent of domestic air freight (Chart 4-5). Nearly 70 percent of its cargo business comes from FedEx, which uses Oakland as its West Coast hub. UPS accounts for another 20 percent of Oakland's air cargo.

Chart 4-5



Source: Oakland International Airport Website

International cargo traffic at Mineta San Jose International has fallen dramatically in the past three years, even though American Airlines has continued to offer a daily non-stop connection to Tokyo's Narita Airport. During the fiscal year ending June 30, 2002, SJC handled 771.4 short tons of international air freight. By the end of the next fiscal year, though, international cargo had fallen over 63 percent to 285.9 tons

and then dipped even more abruptly to just 7.9 tons in the fiscal year ending June 30, 2004.[237]

Airfield and facilities congestion currently constrain domestic air cargo development at SFO. As a result, future growth in domestic air cargo, as well as in domestic passenger volume, is expected to occur primarily at Oakland and San Jose International Airports. SFO, however, is expected to retain the lion's share of international air cargo arriving or departing the Bay Area.

While SFO may be the most preferred international gateway in Northern California, the region's shippers and freight-forwarders often send cargos by truck to Los Angeles International Airport. One reason for this is that LAX offers an even wider choice of air carriers flying to an even larger number of destinations worldwide. In addition, because of the more competitive air cargo market, shippers are usually able to find lower shipping rates for cargos moved through LAX.[238] Another reason is suggested by Sarah L. Bachman in a 2003 study for the Pacific Council on International Policy: "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. [239]

SFO, has lately come in for sharp criticism for an allegedly lax attitude toward air cargo. In a September 2004 commentary in *Air Cargo World*, David E. Wirsing, the executive director of the Airforwarders Association, a national organization representing air freight-forwarders, took SFO's management to task. Wrote Wirsing: "[T]he management of SFO has fallen short in ensuring that the airport's cargo infrastructure is as accessible for users as its passenger facilities….As a result of this inattention, it is an open question whether SFO will be able to provide the global links for air cargo that businesses in the Bay Area will require in the years ahead. It

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[237] Officials at SJC were unable to offer an explanation for the drop in international cargo except to say they were merely reporting figures provided by air carriers. Given the relatively low tonnage involved, it is possible that American Airlines decided to consolidate its freight handling at SFO.

[238] "Air Transport and the Bay Area Economy: Phase Two," Bay Area Economic Forum, November 2000, page 31.

[239] S. L. Bachman, "Globalization in the San Francisco Bay Area: Trying to Stay at the Head of the Class" (Los Angeles: Pacific Council on International Policy, January 2003), p. 1.

is well known in the air cargo industry that SFO has not taken seriously its responsibility to provide its tenants the facilities necessary to accommodate the demands of Northern California exporters."[240]

Wirsing was also critical of SFO's plan to construct over a period of several years a new air cargo terminal designed primarily to serve the needs of U.S. carriers such as United which do not operate air-freighters but carry cargos in the bellies of passenger aircraft. "The proposed terminal also is not intended to house the international carriers who use freighters to accommodate Northern California exporters. They would remain in warehouse facilities off-airport in congested areas never intended for those purposes."

Catering to the more automated requirements of all-cargo carriers is becoming a major point as more and more Asian carriers have – in contrast to their American counterparts -- been aggressively adding to their freighter fleets. At SFO, though, United Airlines is far and away the largest tenant, accounting for approximately 48 percent of the passenger traffic at the airport. Other airports in the region, notably Oakland and Sacramento's Mather Field, have been deliberately targeting Asian cargo carriers now using SFO by promising better facilities.[241]

Wirsing's laments about SFO echo a March 2001 commentary in the *Journal of Commerce.*[242] In describing the opening of SFO's massive new international passenger terminal, the newspaper's Chris Barnet remarked: "Not everyone, though, is thrilled with SFO's soaring new monument to foreign travel. Some shippers, forwarders, customs brokers and airlines see the passenger terminal and a new car rental complex as proof that air cargo is a second-class citizen at the nation's fifth-busiest airport."

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

[241] See Mark Larson, "Study sees China as huge boost to Mather," *Sacramento Business Journal*, April 15, 2005.

[242] Chris Barnett, "What about air cargo? Air cargo carriers complain that San Francisco International Airport is a difficult place to do business," *JoC*, March 12, 2001.

"Their frustration is growing," Barnet went on. "SFO's international cargo terminals are located three miles north of the airport. With Silicon Valley workers clogging the Bayshore Freeway and the main cargo access road torn up by four years of construction, carriers must impose early cutoff times that truckers, trapped in traffic, sometimes miss. Importers complain that while international travelers are promised swift U.S. Customs clearance, there is a shortage of agents to clear inbound freight."

Writing in the *San Francisco Chronicle* in November 2004, William F. Shea, a former associate administrator for airports with the Federal Aviation Administration and a former chief of Caltrans Aeronautics Division, warned that the "region's unmet aviation needs are in danger of spiraling out of control unless county and state policy-makers become more pro-active now and make plans to provide a new airport."[243]

Air Cargo in the Central Valley

California's Central Valley is the heartland of the state's agricultural economy. It is also a region undergoing a fast-paced metamorphosis as a result of extensive population growth and economic diversification. Although non-stop international service from its airports is currently limited to flights to Mexico, the situation is expected to change considerably within the next decade.[244]

Mexicana Airlines has been serving Sacramento International Airport (SMF) since 2002 with non-stop and direct flights to Mexico. And despite growers' concerns about airborne pests, the Mexican carrier has been building popular support for air serve from Fresno Yosemite Airport.[245]

The inauguration of direct or even non-stop air service to international destinations will offer grower/shippers more latitude in exploiting export opportunities. As

[243] Shea supports construction of an entirely new international airport to serve the Bay Area. As an interim measure to take the burden off of SFO, he has proposed that Travis Air Force Base in Solano County be opened to civilian flights. See his "Without new airport, unfriendly skies for Bay Area," *San Francisco Chronicle* Open Forum, November 28, 2004.

[244] As a next step in the direction of expanded international service, Sacramento International expects to add service to Vancouver, British Columbia in 2005.

[245] Dennis Pollock, "Fresno Growers bend on Mexican airline in Fresno," *Fresno Bee*, May 15, 2004.

discussed elsewhere, only a small portion of California's agricultural export currently trade now moves by air. Still, the prospects are high for a marked increase in airborne farm exports over the next decade as California agriculture becomes more fully enmeshed in a global agricultural economy.

Commodities with long shelf-lives and/or a low value-to-weight ratio typically journey to overseas markets by ship for the simple reason that the cost of ocean-shipping is normally far less than by air. Only very meager amounts of California's two leading farm exports in recent years – almonds and cotton – are ever shipped overseas by air (and usually then only because of glitches in regular delivery channels.) For that matter, most of the agricultural goods produced in California can be (and customarily are) shipped by sea.[246] No one seriously expects to see appreciable air shipments of such California farm products as rice or almonds.

Nevertheless, several of this state's high value-added specialty crops have grown uniquely dependent on air cargo. Most notably, virtually all of the state's shipments of fresh cherries to markets outside the North American Free Trade Area reach their destinations by air, as do significant volumes of other valuable crops including strawberries, peaches and nectarines, asparagus, table grapes, and lettuce. Fresh organically-certified commodities almost always require air-shipment if they are to reach distant markets.[247]

In 1998, UC Berkeley's Tsao took note of the importance of air cargo for shipping California's agricultural products to domestic or international destinations. But he also noted some major disadvantages in the way agricultural goods were being shipped to distant markets through LAX and SFO. "For example, trucking the products to those airports is often delayed by the congested bridges, highways and surface streets. It is well known that air cargo receives lower priority than passengers on passenger airlines. In addition, when air cargo is "bumped" for

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[246] Or overland in the case of Canada and Mexico.

[247] There is an interesting, if somewhat insidious campaign by some organic food organizations --- notably in the United Kingdom -- to oppose air shipment of organic farm products on the grounds that the fuel consumed to achieve such shipments is contrary to the ethic of organic farming. One suspects that the more straight-forward economic desire to keep distant producers out of local markets may also factor into this campaign.

accommodating passengers and their luggage, fruits and vegetables tend to get lower priority than commodities like computers and machinery."[248]

One ambitious yet ultimately unsuccessful effort to provide more direct air service to San Joaquin Valley exporters of fresh produce was made in the late 1980s by Farmington Fresh Inc. in conjunction with Stockton Metropolitan Airport. Spurred by the opening of Japan to fresh cherry and other horticultural imports from the U.S., the farmer co-op established a cold-storage packing operation just off Highway 99 and adjacent to an airport runway. The original intent was to use the facility as the principal consolidation point for different types of fruits and vegetables produced in the region. Fresh produce, including cherries, would be air-shipped to Japan and other destinations. Reportedly, there were also plans to truck fresh-cut beef to the facility from as far away as Kansas for air-shipping to foreign countries. The airport was also anticipating that it would receive imported shipments of fresh-cut lamb from Australia. For a variety of economic and logistical reasons, the venture never really took flight. While Farmington Fresh does operate as a packing operation for airborne export shipments, those shipments are then trucked to SFO and LAX.

That bad experience, however, has not deterred airport officials and government leaders in Stockton from continuing to promote the airport to agricultural exporters.

> From California's Central Valley, perishable agricultural products exported overseas are primarily trucked to San Francisco or Los Angeles for overseas export. At these and other international airports, produce is usually loaded as excess capacity in the cargo holds of passenger aircraft. However, because of the uncertainty regarding available cargo capacity on these flights, along with general flight delays, produce will often sit on tarmacs for extended periods, resulting in high rates of spoilage. In contrast, agricultural shipping facilities located at Stockton Metropolitan Airport use the unbroken cold chain approach. Produce is harvested and loaded unto refrigerated trucks, then transported to refrigerated storage at Farmington Fresh until it is ready to be flown out. Thus, fresh produce shipped through Stockton Metropolitan Airport will experience 20 percent to 30 percent less spoilage than produce shipped via other exporters.

Source: Excerpt from an Internet presentation by Stockton Metropolitan Airport dated December 2004

[248] Tsao, pp. 47-48.

As the preceding excerpt indicates, Stockton airport officials have been trying to promote the airport as a superior choice for shipping San Joaquin Valley produce by air.

Stockton Metropolitan has had an unhappy experience maintaining scheduled passenger service. In September 2003, the only passenger airline servicing the airport, America West Airlines, ceased flights from the airport, even though area leaders had spent a reported $800,000 in incentives to lure it. [249] That same year, though, Menlo Worldwide moved its headquarters from the Bay Area to Stockton's airport and started daily weekday cargo flights between Stockton and the company's national hub in Dayton, Ohio. Overall, Stockton reports having handled 15,348 metric tons of cargo in 2004, up 11.1 percent over the preceding year.[250]

Fresno likewise has keen ambitions for its airport. Indeed, Fred Burkhardt, Fresno's economic development director, has opined that "Fresno is positioned to capitalize on trade with Mexico, China, the Pacific Rim, and Central and South America.[251] Planning is under way for an Air Cargo Park to be located on approximately 87 acres on the north side of the airport. The cargo park will feature two aircraft ramps and over 500,000 sq. ft. of air cargo building space. Fresno's prospects for becoming a significant *international* air cargo are limited. In our estimation, the San Joaquin Valley will be able to support only one globally-focused air cargo hub, and Fresno's chances must be weighed against competing bids to play this same role from Stockton and Sacramento.

In Sacramento, airport planners have sought to establish Mather Field as the region's air cargo hub, while maintaining Sacramento International (SMF) as its chief passenger airport. The split has been somewhat imperfect because of the volume of air cargo carried in the bellies of passenger planes landing at SMF and because Federal Express has thusfar refused to move its facilities from SMF to Mather. (FedEx, whose entire operation depends on a tightly meshed scheduling of flights,

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[249] Michael Fitzgerald, "Stockton airport flying high on air cargo" Stockton *Record*,*net* March 31, 2004.

[250] Data contained in an email from Barry Rondinella, Stockton Metropolitan Airport manager, dated January 12, 2005.

[251] Quoted by Sanford Nax, "Flying for the long haul," *Fresno* Bee, June 27, 2004.

cites SMF's superior navigation systems for handling flights during fog and other adverse weather conditions as a reason for its reluctance to move to Mather.[252])

The two Sacramento airports sit amidst a network of major highways in the San Joaquin Valley's fastest-growing region. It is the municipal area within the San Joaquin Valley that, by virtue of demographic trends alone, is most likely to attract more and more international flights. As noted earlier, SMF already serves Mexican destinations with non-stop and direct flights and will add flights to Vancouver, British Columbia in 2005. However, according to market research conducted for Sacramento aviation officials, SMF's market is already large enough to make daily non-stop flights to London economically feasible. The same research also showed that SMF could sustain five flights per week to Frankfurt. However, the research did indicate that passengers flying to the Far East would continue to use SFO.

Given its current and projected market size, it is inevitable that Sacramento will offer passenger flights to the EU, although probably not to Asia, within the next decade. European flights would afford SMF with the opportunity to increase its role as an air cargo airport. That prospect should be appealing to San Joaquin Valley growers since it would provide an entirely new transportation channel for accessing a highly lucrative European market at a time when EU trade barriers against U.S. farm products are apt to become less restrictive.

Mather's international prospects are more directly linked to the transpacific trade and, more specifically, to the competition to lure a share of that traffic away from Bay Area airports. To achieve a greater role in transporting air cargo, however, Mather has to overcome or at least neutralize complaints about air craft noise. Moreover, to serve the San Joaquin Valley's agricultural exporters, a cold-storage facility would have to be built on or very near the airport.

The key to determining which San Joaquin Valley airport or airports will emerge as the region's international air cargo hub will ultimately be determined not by airport officials but by the willingness of airlines, freight-forwarders, trucking lines and other vital elements of the air cargo infrastructure to assume the costs and risks of investing in new

[252] Mather Field is due to have top-rated instrument landing equipment installed by 2007. Once that equipment is in place, Sacramento County airport officials expect UPS to establish a regional hub at Mather. They also expect DHL to build a sorting center at Mather and FedEx to move its operations to Mather from Sacramento International.

facilities. Given the inevitable emergence of SMF as the San Joaquin Valley's premier international passenger gateway, Mather's prospects for becoming an important international cargo airport would be thereby enhanced. Indeed, since the Sacramento area also offers the extensive aircraft maintenance and repair facilities at McClellan Park (formerly McClellan Air Force Base),[253] the region would seem particularly well-suited to support major airline operations involving overseas destinations.

[253] McClellan features 1.5 million square feet of aviation-related facilities, offering hangar storage, repair, maintenance, and painting capabilities for both commercial and private aircraft.

Chapter 5
Air Cargo Transportation Viewed by California Agricultural Exporters

To assist in the evaluation of air freight exporting of California's specialty crops a number of fruit and vegetable packers-shippers and industry representatives were surveyed. This survey was done primarily by personal interview although a few firm managers were contacted telephonically or by e-mail.

The industry representatives interviewed represented firms and industries that use air transport to export their products. The crops included cherries, desert grapes, asparagus, mixed vegetable, salads, strawberries, and other berries. The firms contacted were located throughout California.

The purpose of the survey was to collect information on (1) the volume of these commodities that are air-shipped to export markets; (2) the logistics that are employed in making air freight shipments; (3) the costs of air shipment to the major export markets; and (4) any difficulties that shippers had encountered in using the air cargo mode.

CHERRIES:

A survey was conducted of five packer-shippers located in the Stockton-Lodi, California areas. These firms are the leading cherry packer-shippers located in the state, cherries represented over 84 percent of all 2003 California air exported produce items[254].

Although only five firms were surveyed these firms handle 86 percent of the four major sweet cherry varieties (Bing, Van, Lambert and Ranier) packed during 2003 (California Cherry Advisory Board).

The following observations are a summary of personal interviews with the management of these firms.

[254] U.S. Department of Agriculture, Market News Service.

1. Type of Firm

All five firms are combined growers, packers and shippers.

2. Products Handled

While all of these firms pack and ship cherries, all of them, also pack and ship other products. The California cherry season usually starts at the end of April and concludes during the third week of June. This season may explain why cherry shippers usually handle other products. Some of the five firms also reported packing and shipping asparagus, bell peppers, blueberries, pears, wine grapes and apples.

3. Volumes Shipped

The annual volume of cherries shipped by the five firms varied from 500,000 to 1.1 million 18-pound cartons. The average annual cherry volume per firm was 830,000 cartons.

4. Products Exported

All of the surveyed firms export cherries, and four of the firms also export asparagus. Apples and blueberries were also reported to have been exported.

5. Quantities Exported

Export shipments range from 16 to 35 percent of all cherry shipments made by the surveyed firms. Exports represented an average of 26 percent of the cherry shipments made by the five firms.

6. Air Export Shipments

The surveyed firms all use air transportation to export cherries. Air export shipments of the five firms range from 80 to 100 percent of their cherry export shipments. In 2003, 94 percent of the cherry shipments made by these five firms were delivered to their foreign destination by airfreight.

7. Shipment Arrangements

The surveyed firms made export sales by their in-house sales staff, by brokers and by freight forwarders. The freight forwarder plays a dominant role in cherry exporting. While the sales staff or broker arranges the terms of sale, the freight forwarder handles the logistics of the product movement. Generally the shipper has the responsibility of getting the product to the airport. The freight forwarder handles the shipment thereafter to its final destination including documentation and shipment tracking.

8. Export Destinations

The survey firms sent cherries to the following countries:

Countries	Number of Shippers Reporting
Japan	5
Australia	3
Singapore	3
Taiwan	3
U.K.	3
Hong Kong	1
Germany	1
Malaysia	1
Korea	1
Mexico	1
South America	1

9. Air Freight Charges

Air freight charges reported by these surveyed shippers varied mostly with the size of the shipment and the available aircraft space. Air freight charges for shipping cherries from San Francisco to Japan ranged from $.89 to $2.64 per kilogram, with shipping rates generally starting higher at the beginning of the season then declining after peak production levels are reached. The average shipping charges for the five firms varied from $1.15 to $1.77 per kilogram.

Shipments made on passenger aircraft tend to be less expensive than the all cargo flights. Cherry shipments are sometimes given lower priority than other cargo and are, thus, "bumped" from a flight. Finding alternative flights increases costs. Demand for cargo space varies with the day of the week.

Trucking from the Stockton area to the San Francisco airport (SFO) ranged from $.55 to $.60 per box. Whole truckload shipments were reported to be $.34 per 18-pound boxes of cherries. Trucking from the Stockton area to the Los Angeles airport (LAX) was reported to be $1.10 per 18-pound box with the cost of about $.55 per box for a full truckload shipment. A truckload is slightly over 1,900 boxes. Cherries are packed in 18-pound boxes at the packing shed. The boxes are palletized in pallet

units compatible with aircraft containers. These pallets are trucked to the airport and put into aircraft containers. The usual reported airport charge varied from $25 to $100 per shipment. The higher cost is usually incurred when cargo space is limited causing the aircraft personnel to shift cherry shipments to alternative flights. The common smaller container (LD-2) holds 156 boxes of cherries.

In addition to the logistic costs a phytosanitary inspection certificate must accompany the shipment. This is issued by the Agricultural Inspector and usually costs from $25 to $55 per shipment. For a 156 box container load this would be $.26 per 18-pound box of cherries. Utilizing these data from the five surveyed firms, the following costs are incurred in shipping an 18-pound box of cherries from the Stockton-Lodi, California area to Japan:

Item	Cost/Box
Air Freight	$9.36 - $14.40
Trucking to San Francisco (156 box Pallet)	$.55 - $.55
Airport Containersizing (156 box Contianer)	$.40 - $.40
Phyto-Sanitary Certificate	$.26 - $.26
Total Range	**$10.57 - $15.61**

10. Documents Required

Generally these air exported cherry shipments require the following documentation:

- Phytosanitary Certificate
- Invoice
- Air Way Bill
- Certificate of Origin

11. Obstacles to Airfreighting

The surveyed shippers indicated the following obstacles to airfreight exporting:

- Getting the product to the airport on time.
- Airline cut-off of flights on which shipments are scheduled.

- Congestion at airports.
- Planes used are getting smaller leaving less space for cargo.
- Problems are greatest when air cargo space is "tight."

12. Reasons for Exporting

Cherry shippers air freight their product to foreign markets because this fruit is highly perishable. Cherries are fairly high value products and transportation costs are of less importance than for many other agricultural products. Several shippers indicated that market prices decline fairly rapidly once the season begins. These shippers like to get their product to buyers before another price drop "hits."

A review of cherry prices reported by the U.S.D.A. Market News Service supports the shipper's contentions. Prices reported from 1999 to 2003 for select given day prices reveal prices drop from about $55-60 per carton at the season's beginning to below $30 per carton by June 15, season's end (Table 5-1).

Table 5-1
Cherry Prices*, Per 18 Pound Carton, By Data and Year, Stockton, CA

	April 25	May 7	May 15	May 30	June 7	June 15
1999	–	–	–	40-44	30-33	26-28
2000	55	–	55-60	40-45	30-35	25-30
2001	–	–	50-55	37	30-32	28-30
2002	–	–	44.90	40.90-42.90	36.90-38.90	32.90
2003	–	–	55	35-40	27.90-30.90	22-24

(Source: USDA, Market News Service)

*Prices quoted for "mostly" sales.

13. Export Market Growth

All of these shippers expressed the belief that the export market will continue to increase during the next five to ten years. Although, one shipper said this market expansion is not a certainty. Two shippers indicated that California cherry acreage is increasing, thus, the industry will need to develop programs for market expansion.

14. Impact of the Food Security Act

Generally these cherry shippers had no real problems complying with the requirements of the Food Security Act. Initially there was some misunderstanding about registering as an exporter with the Food and Drug Administration.

15. Some Observations

The surveyed shippers and exporters made some additional observations about air freight exporting. They were:

- More cherry shipments are being flown out of Los Angeles because there are far more flights to Asia.
- Improved cold chain technology may make ocean transport a more viable transportation alternative.
- Cold chain management at destination airports should be improved. Airport handling personnel leave cherry pallets on the tarmac for extended periods.
- The Australian market for cherries has been increasing.

DESERT GRAPES

A survey was conducted among major shippers of table grapes in the desert region. The production area is located in the Coachella Valley centered in the Indio, California vicinity (Southeastern California). This production region usually produces seven to eight million cartons of grapes (19-pounds/carton) annually. The season usually begins about May 15 and ends about July 1. As the Coachella Valley grape season ends harvesting begins in the Kern District (Bakersfield area).

While the desert grape crop is made up of many varieties, the Perlette (early season), the Flame Seedless and the Thompson Seedless make up over 85 percent of the crop. The data cited in this section were obtained from shippers, exporters and freight forwarders that handle desert grapes.

1. Market Positioning

The Coachella Valley produces the first California grapes of the new season. Historically, these grapes commanded a high initial price as harvesting began. There was little competition in the market place for this product.

Today, improved storage and an extended season cause Chilean grapes to still be available as the Coachella Valley season begins harvest. Too, the Mexican table grape industry has expanded greatly and much of this fruit is exported to the U.S.

These grapes are also important competitors for the Coachella Valley fruit. Thus, the market window for desert grapes has decreased greatly.

2. Volume Exported

In 2003, there were 7.8 million cartons of grapes produced in Coachella Valley[255] Of these about 906,000 cartons were exported[256] Exports represented slightly over one percent of the crop during the 2003 season.

3. Air Exported Volumes

It was estimated by the surveyed industry members that about 20 percent of the exports are shipped by air. Most of these shipments leave the Los Angeles airport. Generally it was reported these air exports are made during the early part of the season.

4. Destinations of Air Exports

During the 2003 season, Coachella Valley grapes were exported to nine countries. The United Kingdom received over 43 percent of these shipments. Hong Kong was the next most important market taking 26 percent of the shipments.

The 2003 Coachella Valley export shipments were made to:

United Kingdom
Hong Kong
Singapore
Korea
Taiwan
Malaysia
Japan
Honduras
Guatemala

5. Shipment Arrangements

The desert grape industry uses in house sales staff and exporters to make sales. Generally, large frequent buyers deal directly with the packer shipper. All surveyed firms indicated that the transportation logistics are handled by freight forwarders. Several shippers and exporters indicated the Japanese system of moving product and documentation through the marketing channel is fairly extensive and is facilitated by the use of a freight forwarder.

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[255] U.S. Department of Agriculture, Market News Service.

[256] California Table Grape Commission, personal interview.

6. Air Freight Costs

Air freight costs varied from $10.84 to $14.08 per 19-pound carton for shipment to Singapore. The surveyed firms reported the following costs:

Transport Activity	Per Carton
Truck Transport Indio to LAX (96 carton pallet)	.70 to 1.04
Shipment Preparation at LAX airport ($25/pallet depend on insulation and material)	.26 to 1.00
Freight Forwarder Costs Transport and Documentation (to Singapore)	9.88 to 12.00
Total	**10.84 to 14.04**

7. Reasons for Air Shipments

The reasons the surveyed firms shipped their products by air freight were:

- Grape prices decline rapidly as the season gets under way. Shippers like to get their product sold and delivered before the price drop occurs.
- Rapid transit provides buyer with a more fresh product with higher quality.
- Buyers requested air shipments.

8. Price Variability

Desert grapes have a very limited market window. Having a shipment in transit seven days or more via ocean freight reduces retail shelf life and increases deterioration.

Prices reported by the U.S. Department of Agriculture's Market News Service support the industry leader's contention that grape prices decline rapidly as the harvest season gets under way (Table 5-2, Page 172).

Table 5-2

Coachella Valley Grape Prices on Specified Dates, Flame Seedless Variety, 19-Pound Cartons (For "Mostly" All Sales)

Year	Date					
	May 15	May 21	May 30	June 15	June 30	July 15
1999	–	18.50-20.50	16.50	14.00	13.50	–
2000	16.50	12.50-13.50	11.50	11.00	13.00	10.50
2001	–	40.85	31.85	15.85-16.85	8.85-9.85	7.85-8.85
2002	–	16.85-17.85	12.85-14.85	14.85	14.85	–
2003	14.85-16.85	12.85-14.85	13.85	14.85	15.85-16.85	9.85
2004	24.85-26.85	22.85-24.85	14.85	12.85	–	–

(Source: USDA, Market News Service)

Clearly seasonal price declines ---- with the season but weekly price changes can be substantial.

8. Future Concerns

All of these grape handlers were concerned about the growth of grape production in China. This could be serious competition for California desert grapes. The value of the U.S. dollar also influences foreign sales.

Despite these concerns the industry is optimistic about the future of export sales. Air freight will probably always be important to this industry because they have a very short market window. The desert grape will likely continue to be the first available American grape from each new season.

ASPARAGUS:

Asparagus is grown on about 70,000 acres in California, Michigan, New Jersey, Oregon and Washington. However, over 50 percent of this $200 million crop is grown in California. The other important production area, Washington, grows about 25 percent of the U.S. crop[257].

In California, asparagus is grown primarily in San Joaquin, Fresno, Imperial, Monterey, and Santa Barbara counties. The California harvest season ranges from mid-February through June 30. The state usually produces slightly over 100 million cwt. of asparagus annually and it is usually packed in 11 and 28 pound cartons. About 20 percent of the crop is exported.

Seven of the firms interviewed packed and shipped asparagus. These firms reported packing from one million to 30 million packages per firm of various products.

These asparagus packer-shippers exported from 5 to 50 percent of all the asparagus they packed. But, commonly the firms reported they exported 10 to 15 percent of their annual asparagus volume.

The use of air freight varies with the shipper. Five of these asparagus shippers use air freight exclusively for their export shipments.

1. Sales Arrangements

The export sales were made either by the in-house sales staff of by an exporter.

2. Transport and Logistics

The interviewed firms sent shipments out of San Francisco and Los Angeles. Generally the shipper was responsible for getting the shipment to the airport. A freight forwarder handled all the details thereafter.

3. Shipping Costs

Air transport costs varied with the destination and ranged from $0.80 to $1.10 per kilogram.

Truck transport from the shipper to the airport varied from $0.75 to $0.85 per carton.

[257] U.S. Department of Agriculture, NASS

4. Export Destinations

These exporters reported making shipments to:

Japan

Hong Kong

Taiwan

Switzerland

France

5. Reasons for Air Shipping

The most often mentioned reason for shipping asparagus by air freight was the perishability of the product. One shipper said they made only small volume shipments so that shipment by other than air was impractical.

6. Obstacles

Several shippers expressed the concern about imports. The Peruvian and Mexican asparagus industries have increased greatly. The U.S. is a major outlet for this product. The seasons overlap with the California harvest season. Also, it was reported that asparagus is grown in Peru on a year round basis. This asparagus could be a formidable competition for the California industry.

SALAD MIXES

One Salinas shipper reported exporting both pre-packaged and bulk salad mixes. The destinations were Japan and Taiwan. Essentially freight forwarders handled all of the logistic details of these shipments.

STRAWBERRIES

Strawberries are an important U.S. crop. There are about 48,000 acres of this crop grown commercially in about 15 states. Of the 48,000 acres, about 30,000, acres or 62 percent, of the U.S. crop is grown in California. The California Strawberry Commission reports that in 2003, California accounted for about 88 percent of the nation's fresh and frozen strawberry output[258]. The 2003 crop generated about $1.1 billion for its growers.

California strawberries are mainly grown in the coastal regions of the state with the largest production in the central coastal area. While strawberries are grown somewhere in California throughout the year the primary season is April, May, and June.

[258] California Strawberry Commission, Internet website.

Exports are an important market for California strawberries. In 2003, some 14 percent of the fresh production and 5 percent of the frozen production was exported[259]. Canada has been the leading market for fresh strawberries and Japan has been the leading market for frozen strawberries.

Strawberries are usually packed in a 12 pint flat container with a net weight of 12 pounds. One large shipper was interviewed for this study. This firm exports about five percent of its annual volume. An estimated 60 percent of the strawberries this firm exports are shipped by air.

1. Export Destinations

While 60 percent of this firm's exports were shipped to the United Kingdom, export destinations for this firm were:

United Kingdom
Japan
Taiwan
Singapore
Malaysia
Hong Kong

These shipments were made about equally from Los Angeles and San Francisco.

2. Transport Charges

Truck from packing house to Los Angeles airport	$0.55 per flat
Truck from packing house to San Francisco airport	$0.40 per flat
Air Freight from Los Angeles to Tokyo:	$6.75 per flat

3. Obstacles

High air freight costs.
Availability of space.
Time required to get shipment through security.
Cold chain control – leaving berries on tarmac for extended periods (over 45 minutes).
Fumigation requirements for Japanese shipments.

4. Future Concerns

Air export of strawberries will likely increase. Ocean transport is not a viable option because of the limited shelf life (7-10 days).

[259] California Strawberry Commission, Internet website.

BLUEBERRIES

Two large blueberry packer-shippers were surveyed in this study. While California has historically not been a blueberry production area, new varieties and renewed demand has prompted plantings of new acreage. As of 2004 it is estimated that about 1500 bearing and non-bearing acres of blueberries are growing in California. Blueberries are usually harvested from late April through June.

1. Destinations

The two shippers exported blueberries to:

Japan

Mexico

Canada (by truck)

2. Volume Exported

Exports represented from one to 35 percent of the surveyed firms' output.

3. Shipment Arrangements

Generally the packer-shippers have the responsibility of getting the shipments to the airport. Logistics thereafter were arranged by a freight forwarder.

4. Air Shipments

Essentially all of the export shipments were made by air with the exception of the Canadian sales which were made by truck.

5. Air Freight Costs

The shipments from these firms were shipped from both the Los Angeles and the San Francisco airports. Choice of airport depended mostly on availability of flights and space available.

Reported transport costs were:

Truck from packing house to Los Angeles airport	$0.55 per flat
Truck from packing house to San Francisco airport	$0.40 per flat
Air Freight to Japan:	$3.35 per flat (4.7 pounds)

6. The Future

These shippers expect the export market to grow.

In addition to blueberries, one large coastal shipper also exported raspberries and blackberries. The data for these berries were essentially the same as those for blueberries.

INDUSTRY OBSERVATIONS

After having interviewed the management of firms' air exporting California agricultural products the following generalizations can be made.

1. Seasonality

All of the high value specialty crop packer-shippers interviewed in this study deal with seasonal crops. These air freight shipments start about mid-February with asparagus. The season for all air freight shipments concluded about June 30. Thus, the present air freight produce shipment period is about 4.5 months long.

2. Destinations

The surveyed shippers reported marketing shipments to 13 different countries. Most of these destinations were Pacific Rim (Japan, Korea, Taiwan, Singapore, Malaysia, Hong Kong, and Australia). But several shippers made shipments to the United Kingdom, Switzerland, Germany, Mexico, Honduras, and Guatemala.

3. Air Freight Costs

Air freight costs vary by destination and other factors. For all of the products included in the survey, the air freight costs ranged from $.80 to $2.02 per kilogram. The highest freight costs were reported for cherries and the lowest freight costs were for asparagus.

4. Logistics and Pricing

Generally, the packer-shipper had the responsibility to get a shipment to the airport in sufficient time to be put in a cargo container and to clear security checks. Freight forwarders played a very important role for all products included in this study. Essentially, freight forwarders handled the shipment at the airport to the destination. All sales made by these packer-shippers were F.O.B. at the packing house. While they are concerned about transportation costs, their real responsibility is to make the air freight deadlines.

In several cases the foreign buyers came to the packing facility to make the purchase. And, it was reported some foreign buyers frequently check the packing operations.

5. Reasons for Air Shipping

The survey packers said they made air freight shipments for several reasons.

- Because the product is very perishable.
- To get the product to the buyer as quickly as possible to avoid price drops.
- The buyer requested air freight shipment.
- Rapid transport minimizes product deterioration and extends shelf life.

6. Obstacles of Air Freight

These packer-shipper firms made several observations about obstacles to making air freight shipments.

- Getting the product to the airport on time to meet the airlines requirements.
- Cut-off of flights on which shipments were scheduled.
- Traffic congestion at airports.
- Increasingly smaller sized aircraft are being used reducing freight space available.
- Some specialty agricultural products are being imported during the harvest season of some California specialty crops.
- World competition is increasing for high value specialty crops.

7. Perceptions of the Future

Despite high air freight prices and the listed obstacles, the surveyed firms were all optimistic about the future of air freight. Rapid transport is a requirement for maintaining a high quality in a perishable product.

Chapter 6
Principal Findings and Conclusions

Summary of Findings

- California's airborne agricultural export trade totaled $659.4 million in 2004, a 22 percent increase over the preceding year and a 42 percent increase over 2002.

- Although airborne shipments currently represent just over six percent of California's $10.4 billion agricultural export trade, several highly perishable, high value-added specialty crops – most notably fresh cherries, strawberries, asparagus and organically raised fruits and vegetables – have become acutely dependent on air transport to reach overseas markets.

- A much wider variety of fresh produce is also exported by air, particularly by those seeking to capture the premium prices that are generally prevalent only during that relatively brief period before more abundant supplies reach these markets via slower modes of transport.

- California's agricultural export trade grew by 40 percent between 1996 and 2004, while its airborne agricultural exports rose by 67 percent.

- Air transport will likely become an increasingly attractive alternative to ocean-shipping for California agricultural exporters, especially with respect to those economies with which the U.S. runs substantial merchandise trade deficits. In particular, shipping rates for airborne cargoes on westbound transpacific routes should become even more competitive as air carriers add cargo capacity to serve a burgeoning eastbound trade in U.S. imports from the Far East.

- Even though their near-monopoly over international air transport in California will gradually diminish, Los Angeles International Airport (LAX) and San Francisco International Airport (SFO) will continue to be California's primary international gateways for air cargo, including agricultural shipments.

- LAX has moved well ahead of SFO as the primary conduit for California's airborne export trade in recent years.

- Technological advancements in the aircraft and engine design will enable airlines to offer passengers as well as exporters more direct access to a wider range of overseas destinations. Within ten years, a new generation of medium-sized, long-range aircraft such as the Boeing 787 and Airbus 350 will permit airports in addition to LAX and SFO to provide non-stop service to destinations abroad.

- Oakland International Airport and Ontario International Airport will be the California airports most likely to see an expanded role in California airborne agricultural export trade, especially if integrated carriers such as FedEx and UPS secure a larger share of the international air freight market.

- Simple demographic factors associated with the spread of population and industry beyond the state's coastal regions will, in time, ensure that additional California airports will initiate scheduled passenger as well as all-cargo flights to overseas destinations.

- Because of the Sacramento area's rapidly growing population and economic base, Sacramento International Airport and Mather Field are airports that are most likely to emerge as new conduits for the state's airborne agricultural export trade.

- Establishment of international air cargo service at airports nearer to where high value-added specialty crops are grown will provide California growers with readier access to lucrative overseas markets in Europe as well as Asia.

Public Policy Issues

Capacity constraints at California's principal gateway airports, LAX and SFO, will continue to prompt a migration of air cargo services to other California airports. At the same time, the relentless spread of population and industry into inland regions of the state will eventually create the demographic conditions that will attract international air service.

Although desirable from any number of perspectives, the migration of international air service from SFO and LAX to other California airports will not be universally welcomed. It is almost axiomatic, for example, that residents of communities adjacent to those airports that will see an increasing number of flights – especially cargo flights arriving or departing in the evening or early morning – will resist increased flight operations at these airports. History indicates that such opponents are capable of mounting sustained campaigns involving political action and litigation that could severely impede if not thwart airport development plans. Similarly, public agencies as well as private groups dedicated to maintaining air quality standards can be expected to raise questions or indeed objections to any plans to expand airport operations. Moreover, in those cases where expanded flight operations would necessitate actual expansion of the airport itself, a whole host of land-use and environmental quality issues would come into play.

Even the agricultural sector will apt to be of several minds about the prospect of international flights taking off or landing at airports near some of the state's leading agricultural areas. While presenting the preliminary findings of this study to representatives of California agriculture, it was made clear to us that efforts to initiate direct or non-stop air service between airports in California's inland regions and overseas destinations will spark concern – if not outright opposition – from agricultural interests fearful that such flights will significantly heighten the risk of new alien pest infestations. Even though such flights would be highly beneficial to international travelers and businesses in such places as the San Joaquin Valley, growers have a legitimate concern that – either by accident or maliciousness – overseas flights could carry "passengers" that might prove devastating to growers, ranchers and dairy operators. Industry officials and state leaders should begin working together on developing the best available prophylactic measures to ensure that the needs of airline passengers and non-agricultural industries in all regions of the state are served without endangering California's agricultural economy.

Defining a constructive role that state government might play in enhancing California's air cargo infrastructure is a difficult task. In his 1998 study of California's air cargo system, Jacob Tsao warned that state government may not be able to play a major role in resolving some critical issues faced by the state's air cargo

industry.[260] One reason is jurisdictional in nature. Airports are typically operated by local governments or regional airport authorities. Moreover, their flight operations are tightly regulated by the federal government, while international flights are governed by bilateral accords. The role of state government, by contrast, has been fairly minimal. Indeed, state government's most obvious significant responsibility lies in ensuring that ground access to the state's major international air gateways is relatively unencumbered by traffic delays and diversions.

In a larger sense, though, the relatively marginal role of state government in the commercial aviation sector also arises from the fact that the movement of goods by air – whether domestically or internationally -- is a subject about which state policymakers are well-informed. At the State Capitol, for example, most pronouncements about the importance of international trade to the state's economy seem to implicitly assume that trade is an activity confined to the waterfront. Not surprisingly, new lawmakers are often surprised to learn that most of California's merchandise export trade (when measured by its dollar value) is airborne.

That level of awareness is, unfortunately, shared by many exporters, particularly those companies which have out-sourced the shipping function to freight-forwarders, integrators and other third-party logistics providers. In many instances, exporters are not much more familiar with the exact means used to transport their goods to distant markets than an individual handing a package to a Federal Express or UPS driver. This serves to diminish the effectiveness of those seeking to inform and advise state policymakers regarding transportation and other logistical matters and especially about the challenges facing the air cargo industry in California.

Absent a stronger voice from California businesses with a stake in maintaining efficient transportation links with foreign customers and suppliers, the goal of equipping California with the goods movement infrastructure it needs to compete effectively in the global economy of the 21st century will likely prove elusive.

[260] Tsao, "The Role of Air Cargo in California's Goods Movement," (UC Berkeley, Institute of Transportation Studies, 1998).

Appendices

Appendix A

The entire discussion of aviation's importance to California's agricultural economy according to the California Department of Transportation's 2003 report.

California is the country's leading agriculture producer. More than half of the nation's fruits, nuts and vegetables are grown in California. In 2001, the state's gross cash income from agriculture amounted to $27.6 billion, and fruits, nuts, livestock, poultry and vegetables accounted for over three-fourths of this income. California has 88,000 farming operations, and the state's agriculture industry employs 1.1 million people. The top four counties in agriculture production are Tulare, Fresno, Monterey and Kern Counties.

California is not only the leading, but the only producer of certain specialty crops as well. For example, in 2001, California accounted for over 99 percent of the nation's production of the following agricultural products: almonds, artichokes, clingstone peaches, dates, figs, kiwifruit, nectarines, olives, persimmons, pistachios, plums, dried prunes, raisins, and walnuts.

Approximately 14 percent of the state's agricultural production is shipped to foreign countries. If California were a nation, it would be the sixth leading agricultural exporter in the world. Annually, $6.5 billion in food and agricultural commodities are shipped around the world, much by air due to the perishable nature of the products.

Canada and Japan are the top two export destinations. The leading export products are almonds, cotton, wine, table grapes, milk/cream, oranges, processed tomatoes, rice, beef, and lettuce.

California's airports contribute greatly to the success of its agriculture industry, providing services for export shipment, corporate travel, crop dusting, crop storage facilities, and aerial photography. Some examples include:

- **Stockton Metropolitan Airport** has a long runway to facilitate the transport of highly perishable goods to Asian markets via jumbo jet. For example, cherries that sell for $25 per kilo in the basement of the high-end department stores in downtown Tokyo can be shipped overnight via air from facilities such as the Stockton Metropolitan Airport.

- Nunn Farms, one of the largest agricultural growers and processors of tomato products in California, maintains and fuels its aircraft in **Tracy Municipal Airport.** In addition, Morning Star Packing contracts with the Tracy Flight Center to conduct aerial monitoring of its crop development (primarily tomatoes) on several of its large farms between Tracy and Los Angeles.

- Diestal Farms, a major turkey grower, regularly uses the **Columbia Airport** for corporate travel.

- **Salinas Municipal Airport** is located in the Salinas Valley, the center of Monterey County's three billion dollar agriculture industry. Dole Foods, one of the largest fruit and vegetable producers, uses the airport for corporate travel on a daily basis. The airport anticipates that most of its future growth will be from agriculture-related travel.

- Most of the major tenants at **Shafter–Minter Field** are agriculture-related businesses, including Acala Seeds, Bender Farms, Crop Care Applicators, Inland Crop Dusting, G.K. Lewis Irrigation Services, and the California Department of Agriculture.

- Foster Farms, a dairy and poultry producer, has built new facilities at **Modesto City–County Airport.**

- Paramount Citrus relocated its operations to **Delano Municipal Airport** largely because of the aviation services available at the airport.

THE WINE INDUSTRY

Wine is not only California's number one finished agricultural product in retail value, it also has special significance in California culture. California ranks fourth in the world in wine production and accounts for 98 percent of the wine shipments from the United States. It employs 145,000 people in the state and pays $4.3 billion in wages. California wines are famous throughout the world and continue to win awards at international wine competitions.

There are approximately 850 commercial wineries in California. The majority of these are in Napa, Sonoma and San Luis Obispo Counties. A concentration of wineries is also found in Mendocino, Santa Cruz, Santa Barbara, Monterey and Alameda Counties.

The long-term outlook for the California wine industry is strong. There is increasing domestic demand for both moderately priced and luxury wines. Rising incomes and sophistication in many countries around the world are also driving growing export demand for California wines.

California's system of large and small airports plays an important role in the success of the wine industry. Key contributions include export shipment, pest control, local tourism and industry corporate travel. Some examples include:

- **Napa County Airport** is located in the Napa Valley, the best known wine-growing region in the United States. Local wineries, hotels, bed and breakfast lodges, and restaurants receive many tourists via the airport.

- Many tourists visit the wineries in the Livermore Valley because of the presence of the **Livermore Airport.**

- At the **Charles M. Schulz–Sonoma County Airport,** wine industry aircraft occupy the largest amount of hangar space. Located in the heart of Sonoma's wine country, this airport also receives a substantial number of winery visitors.

- **French Valley Airport** serves tourists visiting the Temecula wine country as this part of Riverside County becomes an increasingly popular attraction for wine enthusiasts.

- **Paso Robles Municipal Airport** is located in a region becoming a major wine growing area of California. Some wineries, such as the Treana Vineyards, have recently located in the Paso Robles area in part due to the nearby airport, which allows executives based in Napa to fly in for the day to inspect the vineyards. Airport officials estimate that one-third of the airport's activities are wine-industry related.

- **Porterville Municipal Airport** provides shuttle service for corporate travelers to and from Franzia Vineyards.

Aviation is also critical for pest management. For example, sulfur and copper sprays are extremely important for controlling powdery mildew, a problem that affects about 10 percent of wine grapes.

Applying sulfur from aircraft allows for rapid response even in wet weather as well as the coverage of a large area in a short period of time. Aviation has also been important for the industry's research and quality control. National Aeronautics and Space Administration (NASA) researchers have used remote-sensing technology images taken from airplanes and satellites to help vintners measure ripening rate, disease incidence, soil drainage, and fruit quality. Mondavi Winery of Oakdale has used remote-sensing technology extensively for this purpose. This technology was also used to initially site the wineries in Temecula.

Appendix B

California's Principal Civilian Airports

FRESNO YOSEMITE INTERNATIONAL AIRPORT (FAT)
Fresno (Fresno County)
Identifier: FAT.
www.flyfresno.com.
Air Service:
Total Carriers: 7
All-Cargo: 5.
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 345,663 s.f.
Warehouse Space: 15,128 s.f.
Occupied: 86 percent
FTZ: Yes
Customs: 6 miles away
USDA Inspector: 6 miles away
Traffic:
Total '03 Tonnage: 5,175.97 m.t., -181.8 percent.
Total '03 Aircraft Movements: 160,926, +4 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 10,
Ocean Port: 160,
Interstate Hwy: 2,
Truck Terminal: 10,
Comments: New cargo facilities to be completed by November 04, estimated 345,000 s.f. of ramp space. Fresno Yosemite International Airport will not construct any new warehouse facilities. Any new warehouse space will be constructed by tenants. FYI's cargo project is nearly completed. Early last spring, bulldozers began the long process of moving ground to prepare the north side of the airport for a new parking ramp for our current air cargo carriers. The final cargo project will measure 20 acres, with spaces and infrastructure for support to accommodate all current air cargo operations and future growth; up to and including 747 air-freighters. Total project cost of $11 million has been paid by FAA airport improvement funds comprised of 90% federal aviation dollars and 10% matching airport revenue.J

JOHN WAYNE AIRPORT (SNA)
Costa Mesa (Orange County)
Identifier: SNA.
www.ocair.com.
Air Service:

Total Carriers: 12 commercial airlines, 3 commuter airlines
All-Cargo: 2
Cargo Space: SNA has no on-site warehouse space
Customs: In Los Angeles
Traffic: Total '03-'04 Tonnage: 14,198 m.t., +4.6 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 40,
Ocean Port: 40,
Interstate Hwy: 2,
Truck Terminal: 40.

ONTARIO INTERNATIONAL AIRPORT (ONT)
Ontario (San Bernardino County)
Identifier: ONT.
www.lawa.org/ont
Air Service:
Total Carriers: 42,
All-Cargo: 16
Special Services/Facilities: Handling for large animals, equine. Planned refrigeration for cut flowers, perishable food, frozen goods. Planned quarantine, HazMat, bonded and secure storage.
Customs: Yes
USDA Inspector: Yes
Traffic:
Total '03 Tonnage: 529,184 m.t., +6.6 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 12,
Ocean Port: 60,
Interstate Highway: On Site,
Truck Terminal: On Site,
Intermodal Center: 12

LOS ANGELES INTERNATIONAL AIRPORT (LAX)
Los Angeles (Los Angeles County)
Identifier: LAX.
www.lawa.org/lax
Air Service:
Total Carriers: 106,
All-Cargo: 34
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 170 acres.
Warehouse Space: 2.1 million s.f.
Occupied: 99 percent
FTZ: No
Special Services/Facilities: Handling for large animals,equine; refrigeration for cut flowers, perishable food, frozen goods; bonded and secure storage.
Customs: Yes
USDA Inspector: Yes

Traffic:
Total '02 Tonnage: 1,806,164 m.t. +2.7 percent.
Total '02 Aircraft Movements: 622,378, -3.6 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 17,
Ocean Port: 20,
Interstate Hwy: less than 1,
Truck Terminal: 3-5

MARCH GLOBAL PORT (RIV)
Moreno Valley (Riverside County)
Identifier: RIV.
www.marchglobalport.com.
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 1.1million s.f.
Warehouse Space: 225,00 s.f.
Occupied: 95 percent
Special Services/Facilities: Handling for large animals, equine; refrigeration for cut flowers, perishable food, frozen goods; bonded and secure storage. Planned quarantine and HazMat.
USDA Inspector: 19 miles away.
Distance to Connecting Transport (miles):
Rail Terminal: 1,
Ocean Port: 60,
Interstate Hwy: On Site,
Truck Terminal: 1,
Intermodal Center: On Site.
Comments: Planned new cargo facilities to be completed October 2005; estimated an additional 300,000 of warehouse space.

MINETA SAN JOSE INTERNATIONAL AIRPORT (SJC)
San Jose (Santa Clara County)
Identifier: SJC.
www.sjc.org.
Air Service:
Total Carriers: 12,
All-Cargo: 5,
Non-Scheduled Charter: 7
Cargo Space:
Ramp/Tarmac Surface for Cargo Handling: 43,961 s.f.
Warehouse Space: 19,200 s.f.
Occupied: 100 percent.
FTZ: No
Customs: Yes
USDA Inspector: Yes
Traffic:
Total '03 Tonnage: 108,317 m.t., -22.7 percent.

Distance to Connecting Transport (miles):
Interstate Hwy: 0.2

OAKLAND INTERNATIONAL AIRPORT (OAK)
Oakland (Alameda County)
Identifier: OAK.
www.oaklandairport.com.
Air Service:
Total Carriers: 18,
All-Cargo: 4
Major Cargo Carriers: Airborne Express, Ameriflight, FedEx, United Parcel Service
Number of Daily Departures (2004): 282 (74 are all-cargo flights)
Runways: 10,000-foot asphalt runway (can be extended to 11,600 feet)
6,200-foot asphalt runway
5,020-foot asphalt runway
3,300-foot crosswind asphalt runway
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 38 acres
Warehouse Space: 400,000 s.f.
Occupied: 100 percent.
Cargo Sort Facilities: Airborne (5.6 acres)
FedEx Domestic Sort (46.6 acres)
FedEx Int'l Import Clearance Center (.65 acres)
United Parcel Service (21.6 acres)
U.S. Postal Service (1.1 acres)
FTZ: 1.5 miles away
Special Services/Facilities: Handling for large animals, HazMat.
Customs: Yes Avg.
Customs Clearance Time: Within 24 hrs.
USDA Inspector: 4 miles away
Freight Forwarders: 5
Traffic:
Total '03 Tonnage: 620,453 m.t., -4.82 percent.
Total '03 Aircraft Movements: 342,871.
Distance to Connecting Transport (miles):
Rail Terminal: 9,
Ocean Port: 9,
Interstate Highway: 1.5,
Truck Terminal: 1.5, Intermodal Center 1.5
Comments: Six-lane parkway between the airport and major interstate highway opened in 2003, providing quicker access to/from air cargo facilities.

SACRAMENTO INTERNATIONAL AIRPORT (SMF)
Sacramento (Sacramento County)
Identifier: SMF
www.sacairports.org/int
Air Service:

Total Carriers: 14,
All-Cargo: 2.
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 260,000 s.f.
Warehouse Space: 38,500 s.f.
Occupied: 100 percent
Special Services/Facilities: Handled by Individual Carriers.
Customs: Yes Avg.
Customs Clearance Time: Varies
USDA Inspector: 10 miles away
Traffic:
Total '03 Tonnage: 78,898 tons, +1.3 percent.
Total '03 Aircraft Movements: 159,360, +.7 percent.

SACRAMENTO MATHER AIRPORT (MHR)
Rancho Cordova (Sacramento County)
Identifier: MHR
www.sacairports.org/mather
Air Service:
Total Carriers: 2,
All-Cargo: 2,
Non-Scheduled Charter: 7
Cargo Space: Total Ramp/Tarmac Surface for Cargo Handling: 60 acres.
Warehouse Space: 500,000 s.f.
Occupied: 80 percent.
Customs: 20 miles away
Avg. Customs Clearance Time: 4 hrs.
USDA Inspector: 20 miles away.
Traffic:
Total '03 Tonnage: 60,124 tons, -2.7 percent.
Total '03 Aircraft Movements: 70,709, -16.8 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 12,
Ocean Port: 80,
Interstate Hwy: 1,
Truck Terminal: 12,
Inland Waterway Port: 15.
Comments: Extension of short runway planned for next 3-5 years; development of west end of cargo apron (also in 3-5 years).

SAN DIEGO INTERNATIONAL AIRPORT
San Diego (San Diego County)
Identifier: SAN.
www.san.org.
Air Service:
Total Carriers: 19,
All-Cargo: 8
Cargo Space:

Total Ramp/Tarmac Surface for Cargo Handling: 768,561 s.f.
Warehouse Space: 103,832 s.f.
Customs: Yes Avg.
Customs Clearance Time: 2 hrs
USDA Inspector: Yes
Traffic:
Total '02 Tonnage: 133,081 m.t., -12.2 percent
Distance to Connecting Transport (miles):
Rail Terminal: 2,
Ocean Port: 1,
Interstate Highway: 1,
Truck Terminal: 5,
Inland Waterway Port: 3,
Intermodal Center: 2

SAN FRANCISCO INTERNATIONAL AIRPORT (SFO)
San Bruno (San Mateo County)
Identifier: SFO.
www.flysfo.com
Air Service:
Total Carriers: 56
All-Cargo: 10,
Non-Scheduled Charter: 3
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 53.5 acres
Warehouse Space: 845,000 s.f.
Occupied: 96 percent
Special Services/Facilities: Refrigeration of cut flowers, perishable food; quarantine, HazMat, bonded and secure storage.
Customs: On airport
USDA Inspector: Yes
Traffic:
Total '03 Tonnage: 573,448 m.t., -3.8 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 30,
Ocean Port: 15,
Interstate Hwy: 1,
Truck Terminal: 2,
Inland Waterway Port: 30

SOUTHERN CALIFORNIA LOGISTICS AIRPORT (IVCV)
Victorville (San Bernardino County)
Identifier: IVCV
www.logisticsairport.com.
Air Service:
Scheduled Charter: 6
Cargo Space:
Ramp/Tarmac Surface for Cargo Handling: 75 acres.

Warehouse Space: 300,000 s.f.
Occupied: 50 percent
FTZ: Yes
Special Services/Facilities: Planned handling for large animals, equine, quarantine; refrigeration for cut flowers, perishable food, frozen goods, HazMat, bonded and secure storage, refrigeration on site (in consolidated freight station)
Customs: Yes
USDA Inspector: Yes
Distance to Connecting Transport (miles):
Rail Terminal: On Site,
Ocean Port: 90,
Interstate Hwy: 1,
Truck Terminal: On site,
Intermodal Center: On Site

STOCKTON METROPOLITAN AIRPORT (SCK)
Stockton (San Joaquin County)
Identifier: SCK.
www.stocktonmetro.com.
Air Service:
Total Carriers: 1,
All-Cargo: 1,
Non-Scheduled Charter: 3.
Cargo Space:
Total Ramp/Tarmac Surface for Cargo Handling: 11 acres.
Warehouse Space: 200,000 s.f., 1 million cubic feet refrigerated storage.
Occupied: 28 percent
FTZ: Yes
Special Services/Facilities: Handling for large animals, equine, refrigeration for cut flowers, perishable food, frozen goods, secure storage.
Customs: By appointment 3 miles away
USDA Inspector: By appointment 2 miles away.
Freight Forwarders: 1
Traffic:
Total '03 Tonnage: 13,809 MT
Total ’04 Tonnage: 15,348 MT +11.1 percent
Total '03 Aircraft Movements: 66,489, -16 percent.
Distance to Connecting Transport (miles):
Rail Terminal: 2,
Interstate Hwy: 2,
Truck Terminal: 2,
Inland Waterway Port: 5,
Intermodal Center: 2
Comments: New cargo facilities to be completed in September 2005 to add 1 acre of ramp space, essentially doubling the parking apron adjacent to the Farmington Fresh cold storage facility to allow parking of two 747’s.