1. Report No. SWUTC/08/473700-00037-1	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Evaluation of the Role and Needs of Air Cargo in Texas		5. Report Date March 2008 6. Performing Organization Code
7. Author(s) Benjamin R. Sperry, Jeffery E. Warner, and Jeffrey D. Borowiec		8. Performing Organization Report No. Report 473700-00037-1
9. Performing Organization Name and Address Texas Transportation Institute Texas A&M University System College Station, Texas 77843-3135		10. Work Unit No. (TRAIS) 11. Contract or Grant No. DTRS99-G-0006
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute Texas A&M University System College Station, Texas 77843-3135		13. Type of Report and Period Covered 14. Sponsoring Agency Code

15. Supplementary Notes

Supported by a grant from the U.S. Department of Transportation, University Transportation Centers Program
Research Project Title: Evaluation of the Role and Needs of Air Cargo in Texas

16. Abstract

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It has been more than 30 years since the state has made a comprehensive review of the air cargo business within its borders. In that time, much has changed in Texas, in the United States, and across the globe. The industry has changed through consolidation and mergers with ground transportation companies, in the services they provide, and in the current level of technology employed. The world is a different place, our economies have been transformed, and the nature of doing business has altogether changed. So far, the impact of growth in air cargo on the Texas transportation system has gained little attention when compared to issues related to seaport traffic.

The research objective for this project is to better understand the operations of the air cargo industry in Texas in order to better accommodate the industry's needs, provide for a more efficient transportation network, better utilize general aviation facilities, and provide for economic development across the state.

This research identifies the existing demand for air cargo movement in Texas, the ground facilities available to process this demand, and a network that would be efficient and responsive to the needs of industry stakeholders. It also identifies the state's network of existing air cargo facilities, both those handling existing air cargo activity and those capable of handling air cargo in the future.

17. Key Words	18. Distribution Statement
Air Cargo, Air Freight, Texas Airport System, Economic Trade, Texas Economy	No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif.(of this report)	20. Security Classif.(of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	128	

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Evaluation of the Role and Needs of Air Cargo in Texas

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Research Report SWUTC/08/473700-00037-1

Sponsored by the
Southwest Region University Transportation Center

March 2008

TEXAS TRANSPORTATION INSTITUTE
Texas A&M University System
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ABSTRACT

According to the U.S. Department of Transportation, the cargo industry continues to grow, with air cargo identified as the fastest growing segment within the cargo industry. The value of freight moved by air has doubled since 1993 and currently exceeds $2.7 billion per day. During that same period, the typical freight shipment distance increased 40 percent, partly due to the distances of the air cargo movements. Because most air cargo shipments begin and end using trucks, growth in this segment will undoubtedly create additional growth in truck movements in and around the airport environment.

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EXECUTIVE SUMMARY

It has been more than 30 years since the state has made a comprehensive review of the air cargo business within its borders. In that time, much has changed in Texas, in the United States, and across the globe. The industry has changed through consolidation and mergers with ground transportation companies, in the services they provide, and in the current level of technology employed. The world is a different place, our economies have been transformed, and the nature of doing business has altogether changed. So far, the impact of growth in air cargo on the Texas transportation system has gained little attention when compared to issues related to seaport traffic.

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Air and truck cargo makes up only 0.03 percent of the total tons for shipments originating or terminating in Texas, according to the Freight Analysis Framework (FAF) database. The percentage share for these same shipments is expected to be 0.08 percent in 2035. Only 7 percent of air cargo is moved internationally by truck through border gateways or seaports, according to the FAF Border and Sea datasets.

Of the 2002 air cargo moved, 60 percent involved international air movements. More international air cargo terminated in Texas than originated. For domestic shipments in 2002, more tons originated in Texas than terminated. Overall, air cargo inbound and outbound movements were evenly split.

It is expected that air cargo to or from Texas will increase by over 526 percent, or roughly 16 percent per year, between 2002 and 2035. This is mostly driven by the expected 682 percent, or 21 percent per year, increase in international air cargo tons. The urban areas and border regions are expected to continue seeing increases in air cargo demand in the state.

Much of the air cargo activity in the state occurs in the state's largest urban areas. Airports in Dallas and Houston account for more than 60 percent of the state total. The top 11 airports account for more than 99 percent of the Texas total. Dallas serves as a major gateway for air cargo to Asia, while Houston Intercontinental serves as a gateway to Europe.

Texas' airport system is well suited to accommodate future air cargo growth. The state has a network of airports with appropriate airside facilities and appears capable of supporting air cargo demand within reasonable distances of all major economic and population centers.

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ACKNOWLEDGMENTS

The authors recognize that support for this research was provided by a grant from the U.S. Department of Transportation, University Transportation Centers Program, to the Southwest Region University Transportation Center.

CHAPTER 1: INTRODUCTION

It has been more than 30 years since the state has made a comprehensive review of the air cargo business within its borders. In that time, much has changed in Texas, in the United States, and across the globe. The industry has changed through consolidation and mergers with ground transportation companies, in the services they provide, and in the current level of technology employed. The world is a different place, our economies have been transformed, and the nature of doing business has altogether changed. So far, the impact of growth in air cargo on the Texas transportation system has gained little attention when compared to issues related to seaport traffic.

This research seeks to provide a better understanding of the air cargo industry in Texas in order to better accommodate the industry's future needs, provide for a more efficient transportation network, better utilize general aviation facilities, and provide for economic development across the state.

BACKGROUND

According to the U.S. Department of Transportation, the cargo industry continues to grow, with air cargo identified as the fastest growing segment within the cargo industry. The value of freight moved by air has doubled since 1993 and currently exceeds $2.7 billion per day. During that same period, the typical freight shipment distance increased 40 percent, partly due to the distances of the air cargo movements. Because most air cargo shipments begin and end using trucks, growth in this segment will undoubtedly create additional growth in truck movements in and around the airport environment.

This growth in conjunction with increasing roadway and airspace congestion in the metropolitan areas provides a rationale for assessing the air cargo business in Texas to better understand it and to develop a long term strategic plan for accommodating the growing air cargo demand and its related impact on truck traffic and the Texas transportation network.

OBJECTIVES OF STUDY

The research objective for this project is to better understand the air cargo industry in Texas in order to better accommodate the industry's needs, provide for a more efficient transportation network, better utilize general aviation facilities, and provide for economic development across the state. This will be accomplished by completing an inventory of air cargo facilities in the state, identifying the current cargo types, identifying potential new air cargo facilities and locations/regions in the state, exploring the possible role of general aviation airports in air cargo, and identifying the existing and potential air cargo markets for Texas.

Market changes and pivotal events like September 11, 2001, have impacted air cargo dramatically. This study takes a comprehensive review of how the air cargo business has changed and what we might expect for the future as it relates to Texas. This review focuses on how the air cargo industry in Texas can address the national trends in air cargo, provide an efficient transportation network, utilize general aviation facilities better for air cargo, and increase economic development opportunities across the state.

BRIEF HISTORY OF AIR CARGO AND AIR FREIGHT

In 1925 through the Airmail Act, air freight began as an industry. World War II established the critical value of aircraft for hauling cargo efficiently and in a timely manner. During the beginnings of deregulation, air cargo was the first component to be deregulated in 1976. Around that same time the difference between air freight and air cargo began to blur with integrated carriers utilizing airports that were not deemed exclusively as air cargo airports (*1*). Air cargo was faster than other modes of transport, and there have been dramatic improvements in aircraft technology: "Just after WWII, it would have taken a DC-3 carrying 6,000 pounds of cargo almost 24 hours and four stops to make it across the U.S. Now those trips can be accomplished in a 747 flying non-stop in about four hours and carrying over 200,000 pounds of cargo (*2*).

The main transcontinental route in 1926 covered New York to San Francisco with limited connection to the southern states. One feeder route to the Dallas/Fort Worth area was used for air mail (*3*). The American Railway Express Company realized the potential for air cargo and began to launch air express services. After failed attempts, in 1927 air express service began to provide

door to door shipping of urgent small and medium sized packages (*3*). This kicked off an industry that continues to grow today.

Though air mail was the catalyst for transporting air cargo in general, the increased role of freight in air cargo was noted by the 1950s. This is shown in Table 1 in revenue ton-kilometers (RTK). In the 1960s, the advent of jet propulsion and containers began to double the capacity of airplanes to transport more goods and passengers (*3*).

Table 1. Comparative Development of Mail and Freight Traffic (in Million RTK).

Year	Mail	Freight	Total	Relative Percentages	
				Mail	Freight
1938	36	17	53	68%	32%
1946	100	120	220	45%	55%
1950	200	770	970	21%	79%
1951	230	870	1,100	20%	80%

Source: The History of Air Cargo and Airmail

AIR CARGO INDUSTRY

Operations and Trends

Air cargo is generated from a wide variety of suppliers and is used to transport items that must be delivered on a timely basis and/or are high in value. Typically supplies are shipped in by truck to the airport or to a nearby consolidator or forwarder, and transported by air for the bulk of the trip and connections to retail or other consignee. The flow chart in Figure 1 prepared by the Federal Highway Administration (FHWA) illustrates this general trend.

In recent years, the air cargo industry has seen an increase in the growth of all-cargo carriers. This has been the result of increased security standards for carrying cargo on passenger flights. Another recent event has been the decision by the U.S. Postal Service to use all-cargo carriers for transporting mail. This has resulted in an increase in expected growth for the all-cargo carriers. Additionally, the Federal Aviation Administration (FAA) reports that a slight decline in domestic revenue ton-miles reflects a continuation of a modal shift away from air cargo for some domestic cargo movements. The implementation of fuel surcharges has contributed to this shift. These activity trends are discussed later in this chapter.

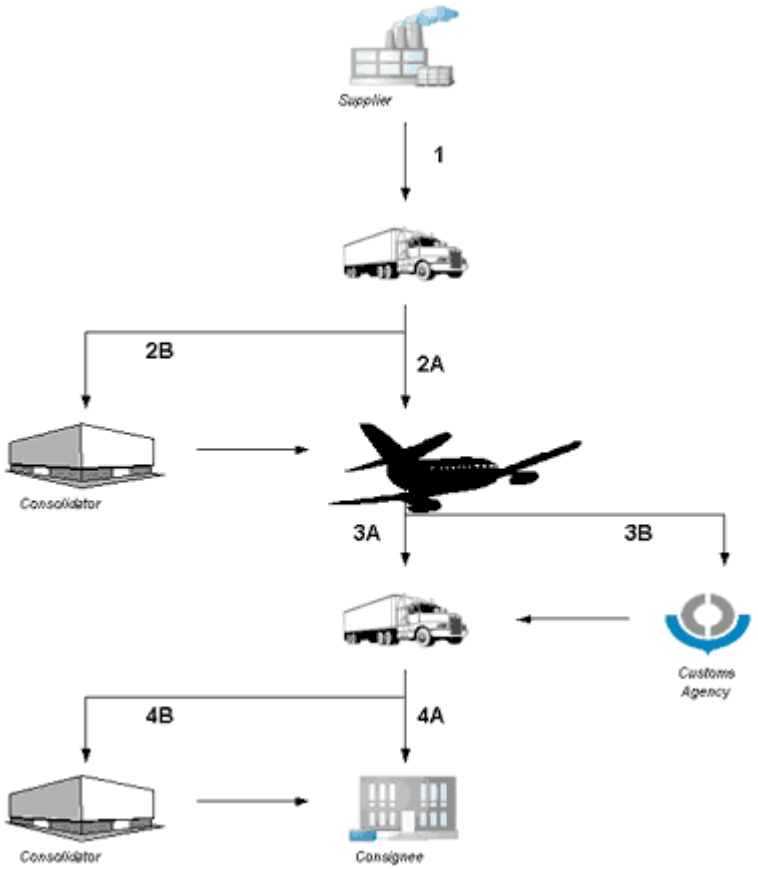


Figure 1. Simplified Depiction of Physical Freight Flow for Time-Sensitive Freight (*4*).

As part of operations, air cargo carriers must have good connections with their suppliers. Shippers and forwarders will evaluate the performance of an air carrier based on their statistics for "flown as booked." This entails both keeping entire shipments together as well as being on time. Some shippers expect 100 percent performance or they will shift to another carrier. This has implications on operations given that suppliers may bring their product at the last minute or bring less tonnage than originally promised. In order to stay on time, air cargo carriers may be forced to fly with only partially full aircraft (*5*).

Air cargo provides a necessary element to the transportation system because of the time savings compared to other modes. Beyond the speed or time factor that air cargo provides, issues related to the value of goods are also addressed by air cargo with increased security and less time in warehouses. Air cargo operations continue to be influenced by five factors:

- relation of a particular airport to the market needing to be served;

- transportation connections from the airports to those markets (trucks, rail, and a good roadway system);
- labor;
- a favorable tax structure for shippers; and
- overall business costs at that location (*1*).

These are relevant factors today and are perhaps even more important within the more global-based economy.

The growth in air cargo is projected to steadily increase over the next 10 years: "Between 1991 and 1995, an estimated $22 billion was invested in cargo infrastructure worldwide and it is estimated that a further investment of approximately $75 billion will be required through the year 2010 in order to handle the expected growth associated with air cargo (*6*)." This is an opportunity for airports seeking to increase their activity and revenues by addressing the critical needs of air cargo.

The Players

The companies involved in the movement of goods in the air cargo business include the combination carriers, the all-cargo carriers, and the freight forwarders. The all-cargo carriers can be further classified as integrated carriers or traditional/line-haul carriers. These air cargo service providers are described below and summarized in Table 2.

Table 2. Types and Characteristics of Air Cargo Carriers.

Type of Carrier	Example of Carrier	Characteristics	Customers	Market/Movement	Type of Cargo
Combination carrier	Most passenger airlines	Baggage hold of passenger aircraft	Wholesale, mail, retail	Airport to airport	Mail, freight
Integrated carrier	UPS, FedEx, DHL	Main decks of all-cargo aircraft	Retail	Door to door	Packages
Traditional/ line-haul carrier	Cargolux, Kitty Hawk	Main decks of all-cargo aircraft	Wholesale	Airport to airport	Larger, specialized freight
Freight forwarders	BAX, Global	All-cargo and passenger aircraft	Wholesale	Feeder services (pickup and delivery)	Ocean and air freight pickup and delivery

Combination (Belly Cargo) Carriers

Combination carriers are defined as passenger airlines that transport cargo below the main deck. They are also referred to as belly cargo carriers. After September 11, 2001, belly cargo significantly declined due to restrictions on what could be carried with passenger flights (*7*). However, 33.1 percent of all revenue ton-miles were carried by passenger carriers in 2004, showing an increase of 9.8 percent from 2003 (*8*). Belly cargo is the lowest-cost form of cargo capacity and remains competitive as overall air cargo demand continues to increase (*9*). A majority of air cargo is shipped as belly cargo. In 1995, belly cargo was 59 percent of all air cargo; "combi" aircraft shipped 7 percent, and all-cargo aircraft shipped 34 percent of all air cargo (*6*). This trend appears to be shifting to more all-cargo aircraft, and it is predicted that by the year 2015 the split between belly cargo and all-cargo aircraft will be 54 percent belly cargo and 44 percent all-cargo or freighter aircraft (*6*).

Some forwarders are paying close attention to Southwest Airlines with their limited belly cargo as both a model for point-to-point efficiency, reliability, and locating away from "gridlocked airports" and financial stability compared to other airlines (*10*). As one source says, "The bottlenecks (at major airports) are certainly an issue. But a lot of smaller and medium sized airports, like Indianapolis, are becoming major distribution points. We see a shift in the market going to the smaller airports and that has helped us. More and more distribution centers are not tied to hub areas (*10*)."

It should also be noted that some airlines have separate operations that move cargo on the main decks of all-cargo aircraft in addition to their passenger service. These carriers are sometimes referred to as mixed carriers.

All-Cargo Carriers

The growing demand for air cargo has created a strong market for more all-cargo and integrated carriers. Unlike the combination carriers that carry both passengers and belly freight, all-cargo carriers transport only cargo on the main decks of the aircraft. All-cargo carriers can be further classified as integrated carriers or traditional/line-haul carriers. Integrated carriers are those that provide door-to-door service such as UPS and FedEx. Traditional/line-haul carriers are those that typically provide airport-to-airport service and include carriers like Cargolux and Kitty Hawk.

These carriers, especially those providing express service, account for a significant portion of the cargo industry and have pushed the market growth significantly in the last 10 years (*6*). Express carriers provide "guaranteed or time definite" service and utilize passenger/cargo aircraft, all-cargo aircraft, and integrated carriers (*11*). FedEx, UPS, DHL, and others continue to provide express service and have been a catalyst for improved cargo services at appropriate airports, such as Alliance Airport in the Dallas/Fort Worth area.

In 2005, 70.9 percent of total revenue ton-miles were carried by all-cargo carriers (*12*). In order to remain competitive, airports that want to maintain or increase their cargo activity will have to adapt and be able to provide good access to distribution centers and truck connections (*7*). Integrated carriers may have a "one-stop shop" approach and provide air and trucking services under one company, which can make them competitive with other carriers by providing seamless shipping.

It is a balancing act that air cargo plays with the trucking industry. The impact of trucking to respond to cargo transport at a fraction of the air rates means air cargo has to look at methods to provide new services and comparable rates to compete. All-cargo and integrated carriers are beginning to pull shipments off long-haul trucking routes: "There is a shift that has been happening, particularly on the short-haul,' said Donald Broughton, an investment analyst in St. Louis with A.G. Edwards. 'But that is really part of the normal ebb and flow of business in a recession. What is happening, if you really look at the data from the truckers and the air carriers, is that the airlines have lost traffic, yes. But they have lost it to the integrated guys. These are not air shipments that are going LTL (less-than-truckload) now. The long-haul LTL truckers are actually showing dramatic declines (*13*)."

All-cargo and integrated carriers can offer speed that trucking alone cannot provide and the dedicated service focus that belly cargo carriers are unable to provide. Additionally a reliance on air cargo to bypass distribution centers entirely and direct products from the manufacturer to the retail store is becoming more common where the savings from handling costs offset costs for air transport. This is where integrated carriers may surpass all other types of carriers (*14*).

Freight Forwarders

Air freight forwarders operate a business that assembles items for shipment by air transport. Forwarders can be considered an indirect air carrier or can operate like an integrated

carrier. The forwarder coordinates connections between "point of receipt to point of destination," which may involve air and trucking transport. The forwarder may utilize its own aircraft and trucks or connect with other air or trucking providers (*15*). It is important for airports to maintain good connections to the forwarders in order for the shipments to efficiently reach their final destinations. These companies operate their own fleet of trucks and aircraft. They may also purchase capacity on other carriers including passenger carriers to accommodate their customers.

Aircraft

There are three types of aircraft typically used for air cargo: passenger, "combi," and freighter. Passenger aircraft use their belly area for cargo and can transport approximately 8–12 metric tons depending on distance and passenger load. Combi aircraft are certified and configured to carry both passengers and cargo on the main deck (*15*). Combi aircraft can hold approximately 25–35 metric tons, and freighters can carry approximately 100 metric tons (*9*).

Aircraft are further categorized by the size of the body of the plane and the number of engines. In 2005, narrow-body aircraft accounted for 50.4 percent of the cargo fleet, and wide-body aircraft accounted for the remainder. The forecast for aircraft that will be used for air cargo in 2017 transport is broken down into number of engines and body type (see Table 3).

Table 3. Projected Gowth in Number of Air Cargo Aircraft by Type (2005–2017).

Number of Engines	Narrow Body		Wide Body	
	2005	**2017**	**2005**	**2017**
Two engines	177	177	244	528
Three engines	236	209	195	260
Four engines	102	41	67	130
Total	515	427	506	918

Source: FAA Aerospace Forecasts, 2005–2006

For the wide-body aircraft growth conversions of DC-10s to MD-10s, new MD-11Fs and some A380s will contribute to the shift in aircraft types for the future (*16*). The shift to wide-body aircraft will help address the projected shortfall of capacity for air cargo in the future.

Figure 2 shows the gap in passenger airline traffic and cargo. This is relevant because relying on belly cargo will not keep up with the demand for air cargo, and flying empty

passenger compartments to transport cargo below is not an efficient practice. This will likely further the trend for air freight operators to increase the size of aircraft to reduce unit costs (*9*).

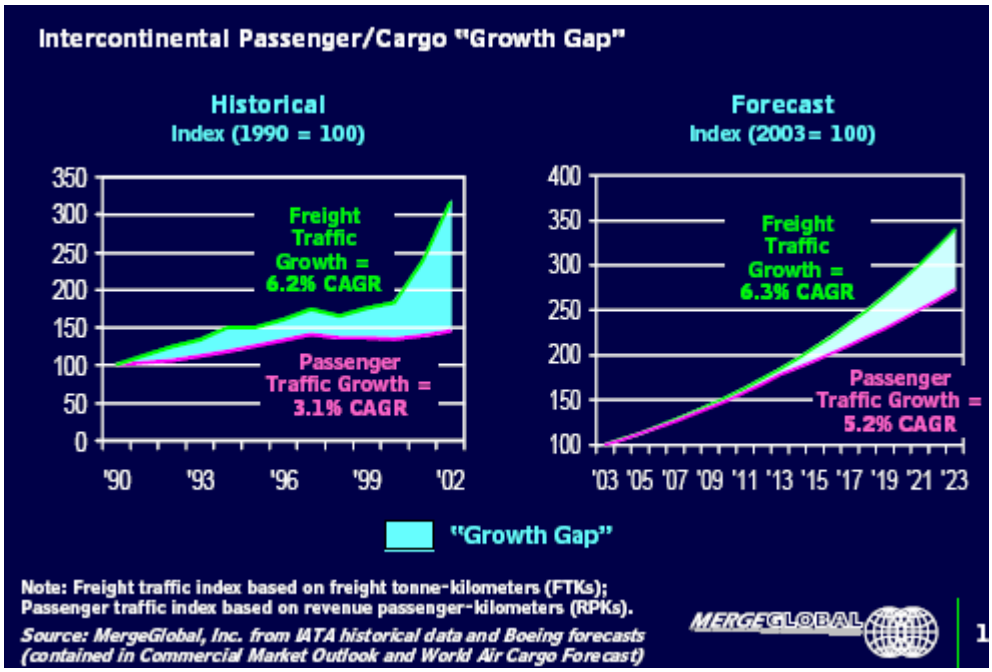


Figure 2. Passenger/Cargo Growth Gap.

OVERALL NATIONAL TRENDS AND GROWTH RATES

Overall progress in air cargo has resulted in overnight express service being possible to almost every zip code in the country. The speed of transporting items has allowed for small communities to participate more aggressively in the global economy. Passenger airlines are playing less of a role in small packages but still carry up to 60 percent of all air cargo as belly cargo (*17*). Boeing's World Air Cargo Forecast has predicted an annual growth rate in world cargo of 6.7 percent (*18*). This rapid and continuous growth is a strong indicator that airports consider cargo more than just a side business.

Trends in Volume and Commodity Type

The commodity types that are typically shipped via air cargo require fast shipping, such as perishables or items requiring refrigeration, fashion, and electronics (see Figure 3).

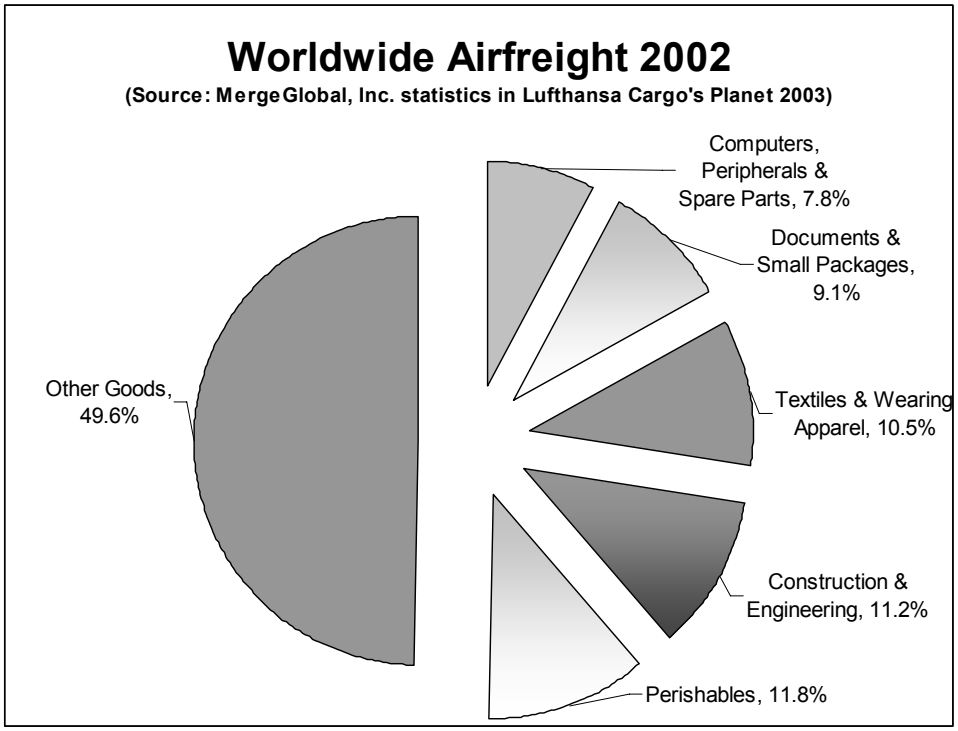


Figure 3. Worldwide Distribution of Time-Sensitive Commodities (*19*).

Figure 3 illustrates that the commodities that often have time-definite delivery requirements are approximately 50 percent of the market. However, manufacturing also utilizes air cargo:

> It is the manufacturing sector that, perhaps above all others, needs air cargo. High-technology components and goods meet all the key criteria for cargo that absolutely has to move by air: high value, fragile and requiring fast, time-definite delivery. Experts say trends in high tech manufacturing and the continuing economic explosion in Asia portend rapid growth in technology air shipping (*20*).

Computers and technology in general move at such a rapid pace and keep very little stock on hand. Air cargo operators become part of the "high tech assembly line" getting goods to manufacturers who begin to fill orders for their products. Air cargo is ideal for these types of goods because they are of high value and take up less space than some cargo. However, the down sides are that the materials must be protected from inclement weather and security must be stringent due to government standards and the high value of the products. A detailed discussion of cargo types is included in a later chapter.

As generally understood and stated in reports by the FAA and the Boeing Company, demand for air cargo services is largely a function of economic conditions and the gross domestic product (GDP). Table 4 shows the forecasted growth in domestic product and inflation. The long-term outlook for the economy and thus air cargo services appears positive according to the FAA forecast. Risks to the forecast include the rising price of fuel, which has already dampened some of the previously expected growth in air cargo.

Table 4. Historical and Forecasted Gross Domestic Product and Consumer Price Index, 2000–2017.

Fiscal Year	Gross Domestic Product (Billions 2000$)	Consumer Price Index (1982–84=100)
Historical		
2000	9,762.8	170.74
2001	9,885.1	176.27
2002	10,002.4	178.86
2003	10,218.9	183.10
2004	10,657.0	187.34
2005E	11,044.7	193.48
Forecast		
2006	11,418.5	199.93
2007	11,799.5	204.72
2008	12,186.7	209.64
2009	12,572.8	214.67
2010	12,962.5	219.82
2011	13,364.4	225.18
2012	13,773.9	230.82
2013	14,187.0	236.58
2014	14,612.6	242.49
2015	15,051.1	248.57
2016	15,502.6	254.77
2017	15,967.8	261.13
Average annual growth 2005–2017	3.1%	2.5%

Source: FAA Aerospace Forecasts, 2006–2017

While economic activity is the major force in air cargo demand throughout the country and world, other factors and forces play a role. The Boeing Company has illustrated these forces and constraints, shown in Figure 4. Boeing further identifies specific favorable and unfavorable

factors affecting the industry. These are shown in Figure 5 and will impact air cargo activity in Texas as well.

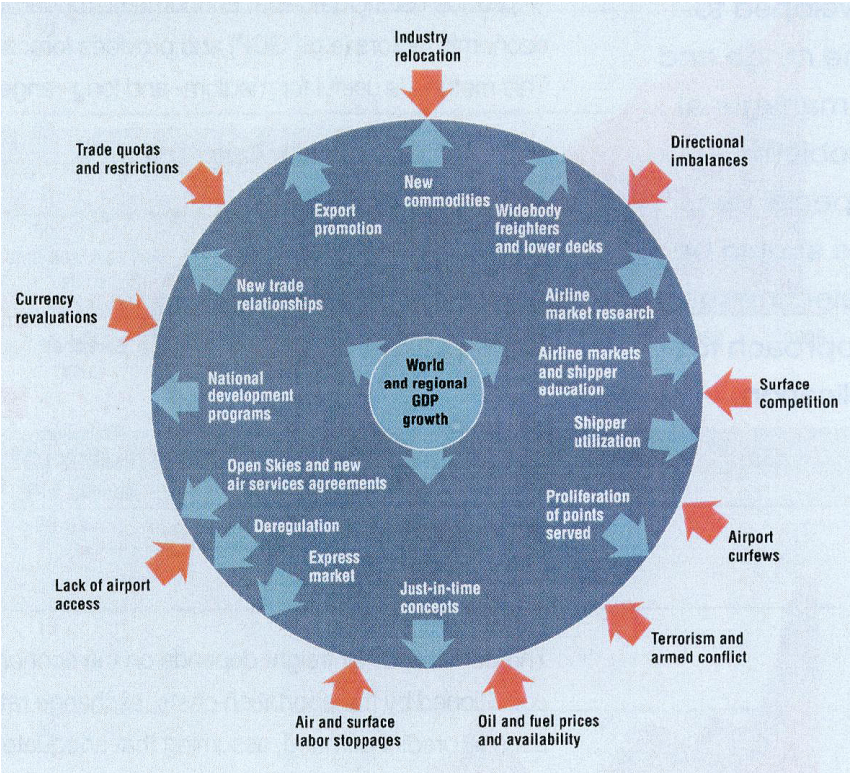
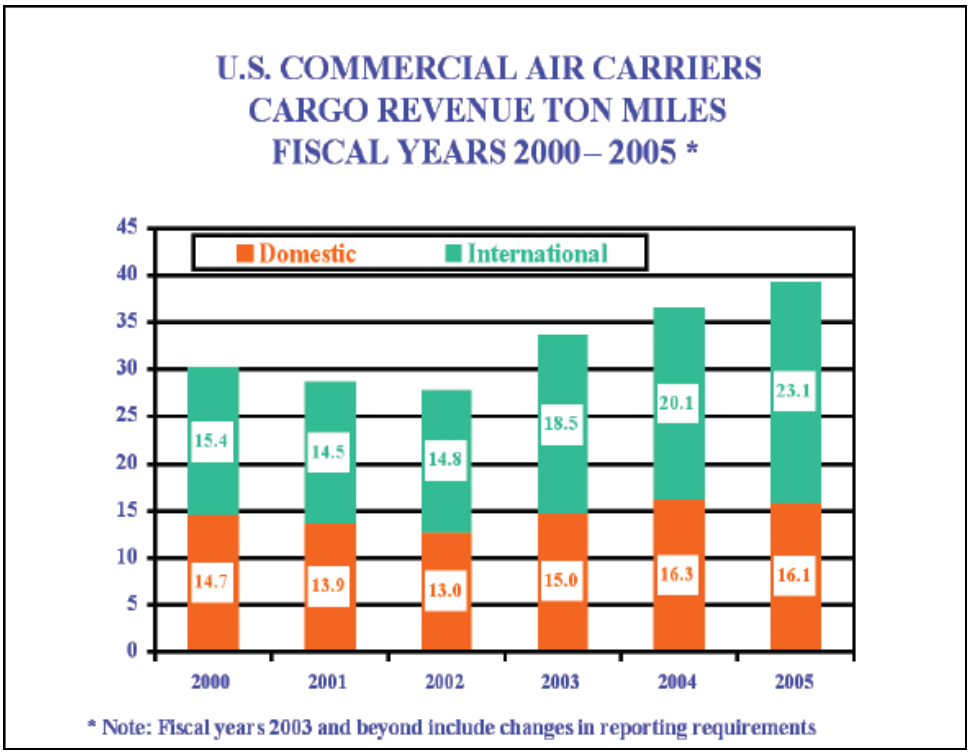


Figure 4. Forces and Constraints for Air Cargo Growth.

Favorable	Unfavorable
Asia's market expansion	Trading blocs and protectionism
Currency strength	Terrorism and armed conflict
Middle East stability	Political volatility
National debt management plans	Rising jet fuel prices
Oil marketing agreements	High interest rates
Easing interest rates	Debt burdens

Figure 5. Favorable and Unfavorable Factors Affecting Air Cargo Growth.

Figure 6 shows the domestic and international cargo revenue ton-miles for 2000 to 2005. International activity has been growing at a faster pace than domestic, as one would expect due to the emerging global economies. This is expected to continue as opportunities abound in overseas markets.



Source: FAA Aerospace Forecasts, 2006-2017

Figure 6. Cargo Revenue Ton-Miles for U.S. Air Carriers, 2000–2005.

Synopsis of Air Cargo Activity in the United States

In the United States, the top 25 airports have had some fluctuation in the total tonnage transported. Table 5 shows the relative volume for the top 25 airports.

Air cargo is increasingly capturing more of the value and tonnage of freight movement compared to other modes. This shift can be seen in the modal changes shown in Table 6. This is abating somewhat today as companies struggle with fuel prices and other recent changes. In the past air cargo made great strides in increasing business from other modes. Currently, this is becoming more difficult.

Table 5. Top 25 Airports in North America in Cargo Traffic (2006, Percent Change from 2005).

City (Airport Code)	Total Cargo (Metric Tonnes)	Percent Change from 2005
Memphis (MEM)	3,692,081	2.6
Anchorage (ANC)	2,691,395	5.4
Louisville (SDF)	1,983,032	9.2
Los Angeles (LAX)	1,907,497	(1.6)
Miami (MIA)	1,830,591	4.3
New York (JFK)	1,636,357	0.2
Chicago (ORD)	1,558,235	0.8
Indianapolis (IND)	987,449	0.2
Newark (EWR)	974,961	2.6
Dallas/Fort Worth Airport (DFW)	757,856	2.1
Atlanta (ATL)	746,502	(2.8)
Oakland (OAK)	668,217	(0.7)
San Francisco (SFO)	594,857	0.7
Philadelphia (PHL)	532,163	(2.8)
Toronto (YYZ)	505,000	6.3
Ontario (ONT)	493,952	(5.3)
Honolulu (HNL)	443,560	(3.0)
Houston (IAH)	409,122	5.3
Toledo (TOL)	353,508	0.3
Washington (IAD)	350,826	15.8
Seattle (SEA)	341,952	1.0
Boston (BOS)	324,859	(8.8)
Phoenix (PHX)	286,798	(5.1)
Portsmouth (PSM)	285,267	138.5
Portland (PDX)	283,773	8.5

Source: Airports Council—North America

Table 6. Modal Change in Value, Tonnage, and Ton-Miles between 1993 and 2002 (*21*).

Transportation Mode	Percentage Change between 1993 and 2002		
	Value (Real)	Tons	Ton-Miles
Air (includes truck and air)	96.7	45.9	63.2
Truck	42.2	26.4	55.5
Rail	39.2	19.9	29.9
Water	39.9	10.2	–16.9
Pipeline	–8.7	3.8	27.0
Multimodal combinations	67.0	–7.5	36.7
Other/unknown	53.4	–7.6	–17.3

SELECTED AIR CARGO STUDIES IN THE UNITED STATES

Air Cargo Study from ITS/University of California, Berkeley—California

The Institute of Transportation Studies (ITS) analyzed air cargo in the state of California and focused on three basic traffic performance measures:

- total weight of air cargo enplaned or deplaned,
- weight of air cargo enplaned, and
- weight of air cargo deplaned.

Based on tonnage, growth in air cargo traffic in California at least doubled between 1991 and 1996. The study also found that air cargo in California transported, on average, products that were approximately 37 times more valuable than trucked goods. California also plays a significant role in the value of air cargo for the nation where 21.4 percent of non-parcel air cargo originating in the United States originated in California (*22*).

Regional Air Cargo Airports Feasibility Study—Case Study: Washington, D.C., Area

This study focused on analyzing the efficiency and cost-effectiveness of separate air cargo airports from passenger operations. At the completion of this report in 1991, the research indicated that the only successful examples of all-cargo airports were related to sorting and express delivery services. The hypothesis upon embarking on the study to separate passenger traffic from all-cargo aircraft was "all-cargo aircraft require take-off, landing, and runway time that could be used by passenger aircraft. A corollary of this is that cargo operations use valuable ramp space, and their warehouses and cargo-handling facilities occupy potential passenger terminal space." The study found that mixing cargo operations overall did not impact passenger services with increased congestion or delays because cargo tends to utilize off-peak hours for flights (*17*). It still remains to be seen how effective all-cargo airports can be; however, in certain markets they may have enough activity.

Air Cargo Study—Minneapolis-St. Paul

The Minneapolis-St. Paul Air Cargo Study identified many issues that are applicable nationwide for the cargo industry. First, SITA Logistics Solutions identified that most airports have two types of air cargo tenants:

- traditional freight forwarders and airlines and
- integrated operators.

This study noted that the growing share of the higher value products are going to integrated operators. For those airports following the traditional model, forwarders are pressing to use major airport hubs as gateways and to consolidate freight in order to minimize costs. This trend is heavily influenced by the passenger side of the airline industry. The study ultimately contained recommendations that supported separating cargo and passenger operations in order to become more competitive in the future with growing air cargo needs (*23*).

FACTORS THAT MAY INFLUENCE AIR CARGO IN THE REGION

There have been conflicting discussions about whether separating cargo from passenger service is beneficial. Advantages for creating a regional all air cargo airport are increased capacity, new economic development, addressing the predicted growth in air cargo's future, and potentially joint use of underutilized military air bases. Disadvantages for creating a regional all air cargo airport include cost, space requirements, infrastructure (roads, utilities, etc.), operational issues related to separating belly cargo from all air cargo shipments, and potential delays with increased trucking needs because of the separation from belly cargo shipments (*17*). These factors are relevant to small, medium, and large airports considering how air cargo fits into their operations.

Generally, runway requirements for regional all air cargo airports should be 10,000 to 12,000 feet long and 150 feet wide and be able to support a fully loaded freighter. Boeing's newest 747-400f freighter has a maximum takeoff weight of 870,000 pounds. Landing aids ranging from a control tower to landing lights are ideal. Other elements such as storage, ground movement, infrastructure, and access to a semi-skilled labor force are also necessary for establishing a regional all air cargo airport (*17*). Typical or basic elements for a regional all air cargo airport are shown in Table 7

Table 7. Typical All Air Cargo Airport Elements.

Facility
• Runway and taxiway system • Terminal area with service/access roads • Instrument Landing System, landing lights • Control tower • Surface/road access/potential highway interchanges • Vital infrastructure/utilities (water/wastewater, power, telecommunications) • Small terminal

Beyond the basic requirements of an airport runway and instruments, adequate support infrastructure that connects air cargo to final destinations is critical. The increasing market for air cargo has launched a new concept of a "cargo village." Instead of placing all the cargo in remote areas of the airport with poor access and conditions, the shift to a cargo village is to create an area with all components necessary for improved cargo services, which could include freighter parking, container storage, customs facilities, special facilities for radioactive and perishable goods, animal and plant quarantine areas, trucking facilities, freight forwarder facilities, maintenance areas, and staff parking (*6*).

When the desired outcome is to effectively reduce congestion and delays, the all air cargo airport must be located far enough away from the metropolitan airport but still close to the metro area of the city to facilitate good access (*17*). Many shippers want to locate their distribution centers near airports, but part of their selection of which airport is determined by the infrastructure and access to and from the airport (*24*). Converting military bases in rural areas to "aeroplexes" where the airfield is closely tied to an industrial park has been successful where the market for air service is tied to industrial park business. Examples of this type of conversion include Williams Air Force Base (AFB) in Phoenix, Arizona, and Grissom AFB in north-central Indiana (*25*). However, when considering location factors, proximity to activity centers is a significant factor: "Cargo traffic has been successfully brought to secondary airports in middle-sized metropolitan areas; airfields located in uncongested rural areas have not attracted much cargo traffic because of their lack of connectivity on the ground (*25*)."

According to a survey of freight operators, the most important factors in selecting an airport are:

- night operations,
- minimizing overall costs,
- airport cargo reputation,
- local origin-destination demand,
- influence of freight forwarders,
- airport road access,
- Customs clearance times,
- financial incentives from the airport, and
- trucking time to main markets.

These factors can influence airport selection because some locations do not provide the flexibility or incentive for cargo operations. Freight operators ship a bulk of their cargo during off-peak or nighttime time periods. In some communities, the addition of additional airline noise at night may make freight operations at a particular airport infeasible due to proximity to residential areas and certain commercial developments. Another factor is that financial incentives such as lower airport user costs can influence airport selection. All other aircraft-related costs are fixed, so despite the relative percentage that user fees play in overall costs, it is a variable cost that operators would like to keep low (*26*).

In order to capitalize on the expected growth in air cargo, it is recommended that airport operators develop a marketing plan to promote future cargo business at their location. Factors that airport operators should consider include:

- proximity to shippers and forwarders,
- transportation infrastructure into and out of the airport,
- environmental constraints and noise issues related to proximity to incompatible land uses,
- growth opportunities, and
- operating costs.

Managing accessibility and growth issues will enable airports to provide good air cargo services and remain competitive (*6*).

CHAPTER 2: INVENTORY OF TEXAS AIR CARGO FACILITIES

The Texas airport system consists of more than 300 airports, which range in size from small community airports serving agricultural purposes to large urban airports serving millions of passengers and international destinations. These airports are diverse in both size and function and are shown graphically in Figure 7.

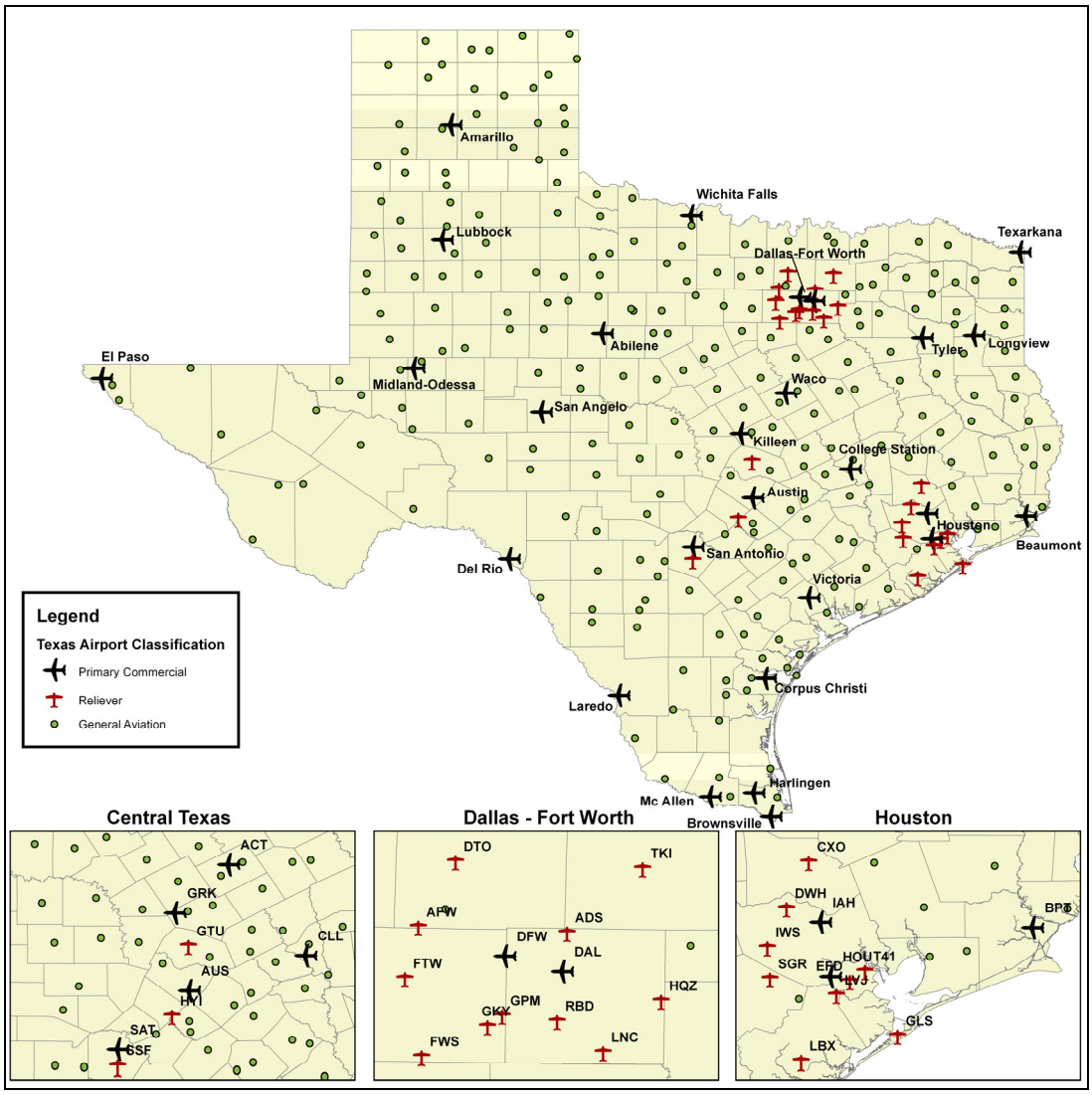


Figure 7. Texas Airports by Classification.

Not all of these airports, however, are suitable for air cargo activities. This largely depends on the nature of air cargo activities desired or ongoing at a particular airport. Some air cargo activity requires very long runways with substantial ramp space, while others can utilize

much shorter runways and existing ramp spaces. International air cargo activities are indicative of the former, while smaller feeder cargo services are indicative of the latter.

The length of the available runway is the most obvious sign of an airport's suitability for accommodating air cargo demand should it exist. In some cases, airports are able to extend their existing runway. In other cases, the airport does not control or is not able to control the land to make necessary airport improvements. Further, some airports may be sufficiently encroached by other development precluding any improvements. While individual airports have their own unique set of circumstances, the Texas airport system as a whole has a number of facilities capable of handling air cargo demand of a varying nature.

Assuming the existing runway length is indicative of the airport's ability to handle aircraft requiring such length in terms of overall design standards, Texas is well positioned across the state to capitalize on any demand in air cargo. Figure 8 shows Texas' airports across the state and the runway facilities they offer.

The state has nine geographically diverse facilities with runways of 10,000 feet or longer. Another 16 airports have runways of between 8,000 and 10,000 feet. These facilities are also spread out across the state covering the economic and population centers of the state. This is shown visually in Figure 9 and Figure 10. The vast majority of the state has great accessibility to these facilities. Every major population center is accommodated by an airport offering at least 8,000-foot runways within a 100-mile radius. The combined coverage is shown in Figure 11.

The sparsely populated border region north of Laredo and some pockets in north-central Texas and east Texas are the only parts of the state not within 100 miles of an airport with a runway of 8,000 feet or more. This provides significant opportunities for locating businesses dependent or reliant on air cargo across the state. The Texas airport system, as it currently stands, meets the air cargo needs of its residents and businesses.

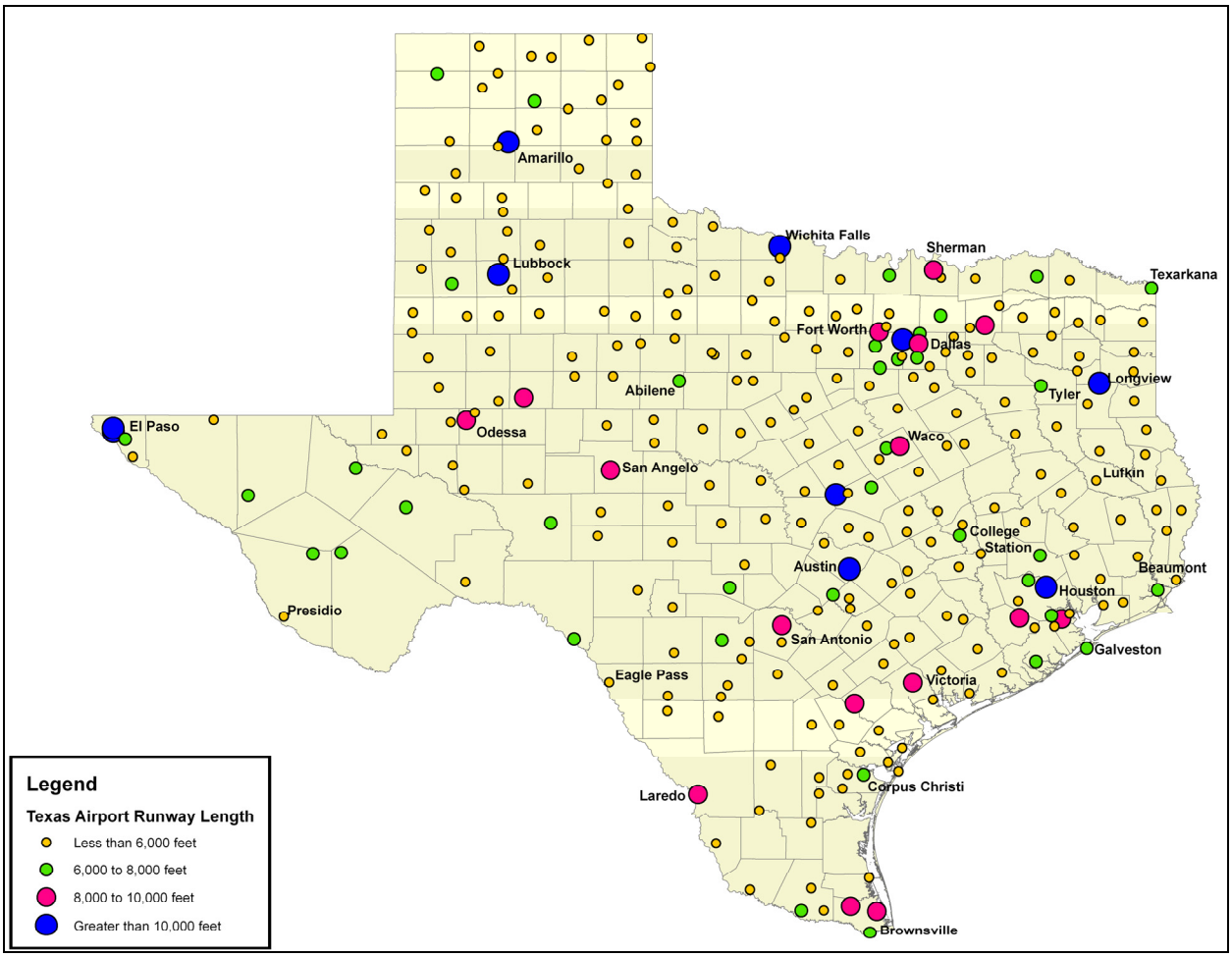


Figure 8. Texas Airports Classified by Runway Length.

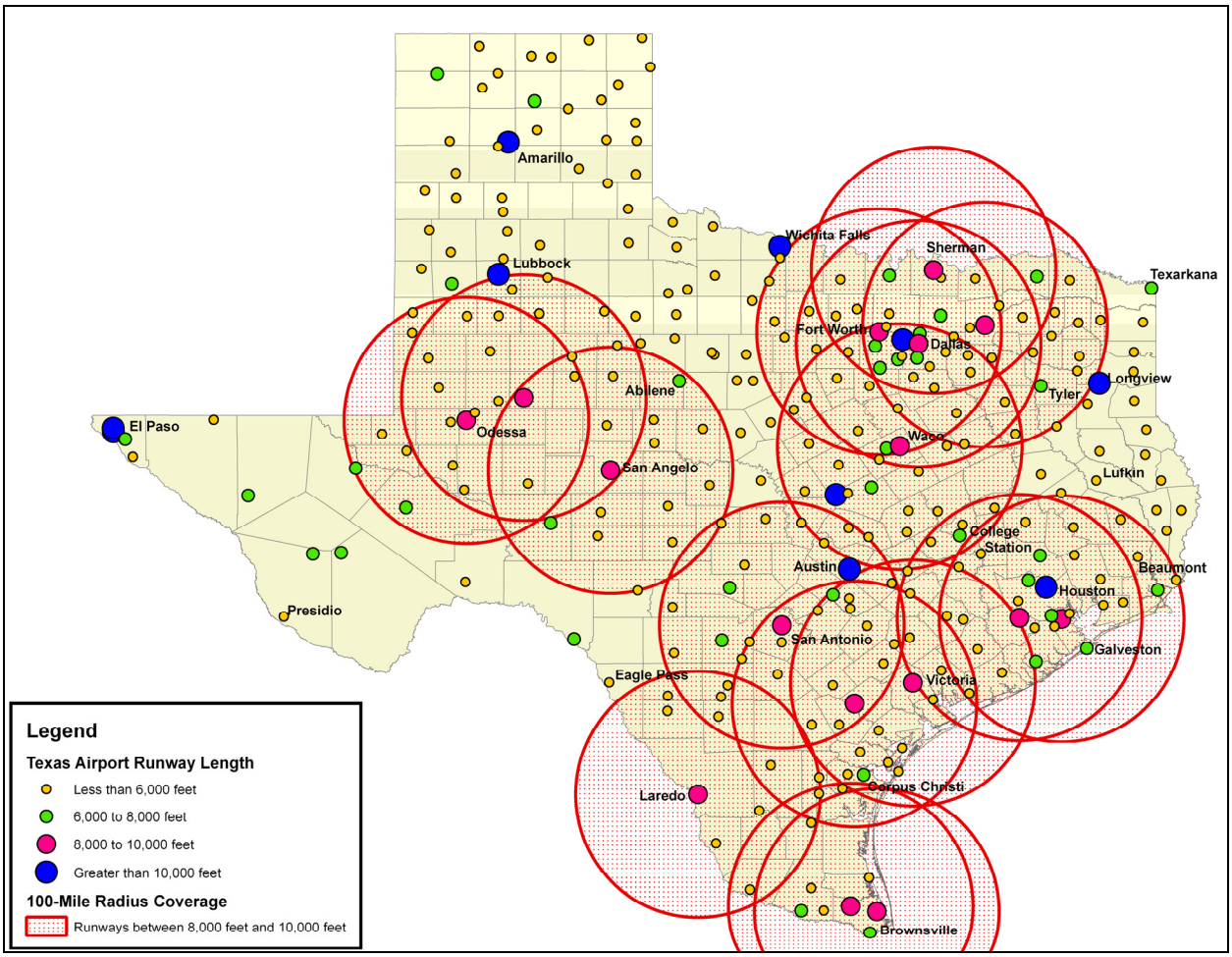


Figure 9. 100-Mile Radius Coverage for Texas Airports with Runways between 8,000 Feet and 10,000 Feet.

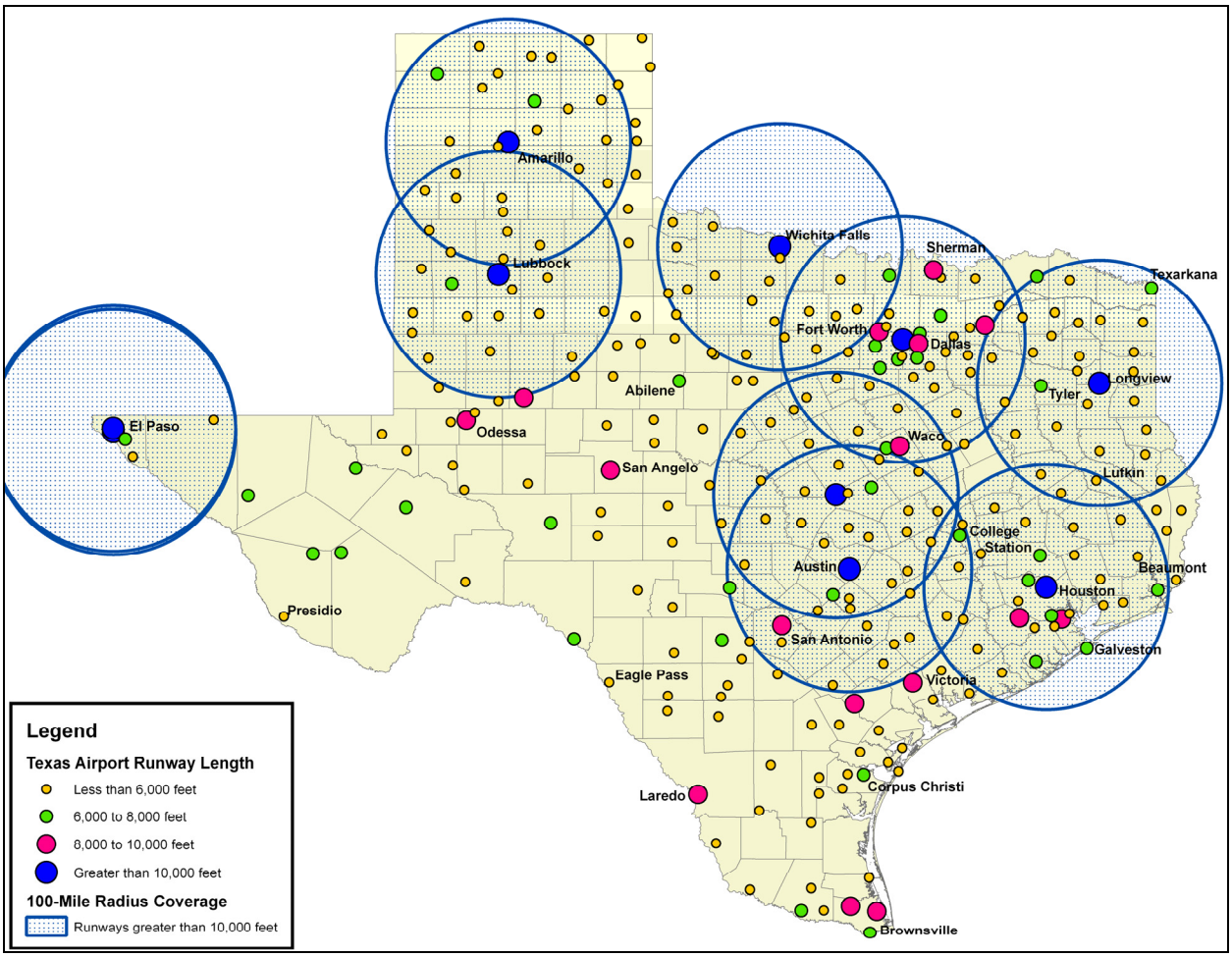


Figure 10. 100-Mile Radius Coverage for Texas Airports with Runways Greater than 10,000 Feet.

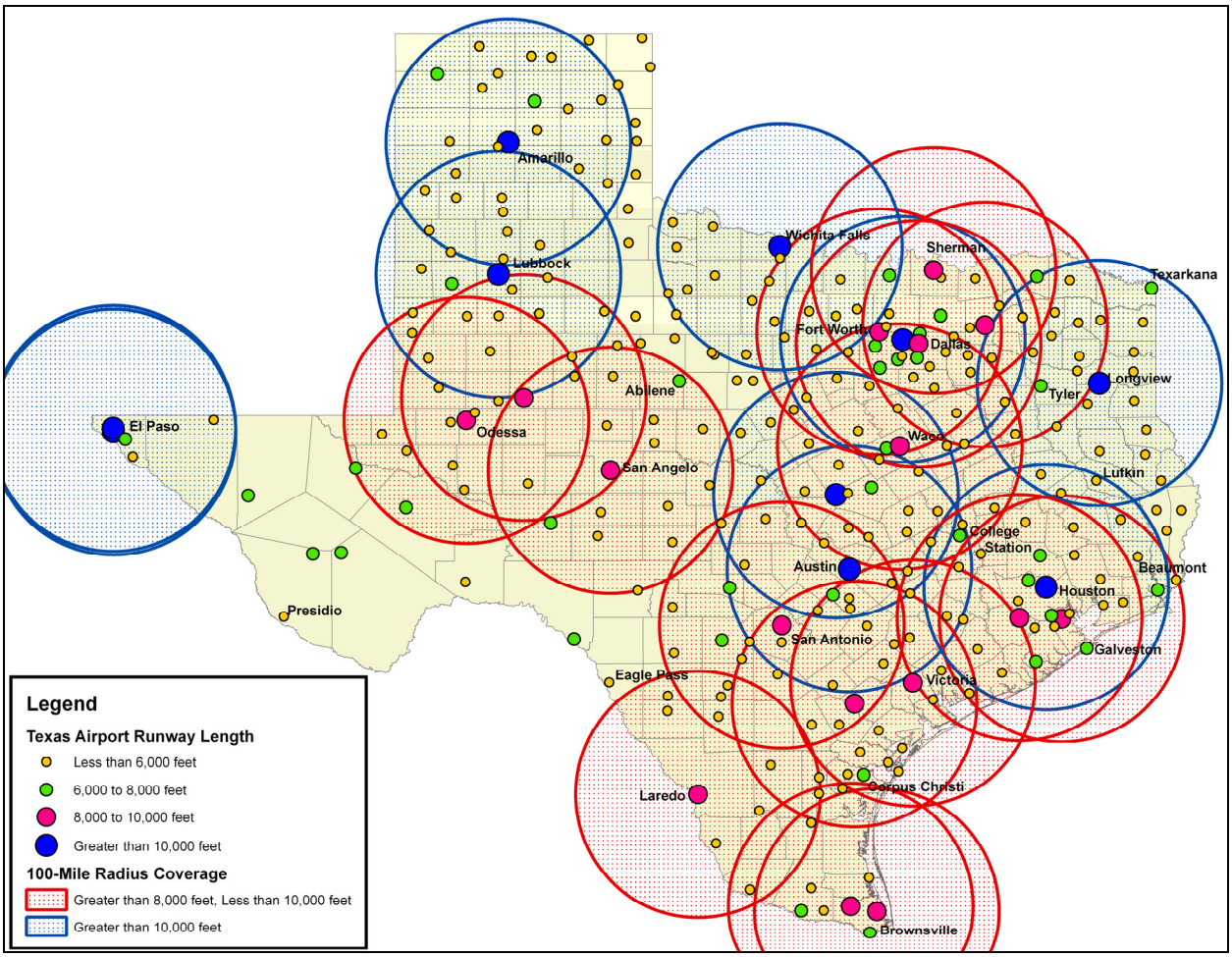


Figure 11. 100-Mile Radius Coverage for Texas Airports with Runways Greater than 8,000 Feet.

CHAPTER 3: AIR CARGO ACTIVITY IN TEXAS

This chapter focuses on air cargo activity in Texas and where it is taking place. It includes data for the commercial service airports in Texas and the top states and countries the cargo is going to and coming from. The source of the data is the T-100 Databank/Form 41 obtained from the Bureau of Transportation Statistics. This chapter provides a good snapshot of activity using 2006 data, the last year available. The top air cargo carriers in the state are also included. The origins or destinations of air cargo at Texas airports can be classified as intrastate, domestic (not including Texas), or international.

Intrastate air cargo has its origin and destination at airports that are a part of the Texas Airport System Plan (TASP), which includes the Texarkana Airport, even though is it located entirely within the state of Arkansas. Using the 2006 total tons moved as the basis, the 25 largest intrastate air cargo routes are reported in Table 8. These 25 city or region pairs accounted for 98.6 percent of the total intra-Texas air cargo activity in 2006. Some of the city pairs shown in Table 8 represent the sum of air cargo activities at multiple airports within one or both of the endpoints. It is not surprising that routes connecting Texas' largest cities comprise many of the city pairs listed in Table 8.

What is not shown in Table 8 is the directional balance between the city pairs. In most cases, the balance is nearly equal, with approximately the same amount of cargo going in both directions. For city pairs that include one end near the Mexican border, the dominant direction of air cargo flow is north from the border city, away from the border.

It should be noted that for this data, "Dallas/Fort Worth" includes Dallas/Fort Worth International, Alliance, Dallas Love, Fort Worth Meacham, Addison Municipal, Dallas North Airport (Carswell), and Arlington Municipal. "Market data" indicates that the freight starts and ends in that city pair. The following should also be noted for these city pairs: 97 percent of the San Antonio–El Paso city pair is from San Antonio to El Paso, 92 percent of El Paso–Austin is from El Paso to Austin, 99 percent of Laredo–San Antonio is from Laredo to San Antonio, and 87 percent of Laredo–Houston is from Laredo to Houston.

Table 8. Top 25 Texas Intrastate Air Cargo Routes—2006 (Tons).

Rank	City Pair	Total Tons	% Share
1	Dallas/Fort Worth–Houston	32,167.0	34.8%
2	Dallas/Fort Worth–San Antonio	13,198.4	14.3%
3	San Antonio–Harlingen	9,293.9	10.1%
4	San Antonio–El Paso	5,970.6	6.5%
5	Dallas/Fort Worth–El Paso	4,622.3	5.0%
6	Houston–San Antonio	3,197.1	3.5%
7	Dallas/Fort Worth–Lubbock	2,970.4	3.2%
8	Dallas/Fort Worth–Austin	2,792.3	3.0%
9	Lubbock–Midland/Odessa	2,545.1	2.8%
10	Houston–El Paso	2,442.2	2.6%
11	Houston–Austin	2,244.9	2.4%
12	Austin–El Paso	1,557.0	1.7%
13	San Antonio–Laredo	1,536.0	1.7%
14	Houston–Harlingen	998.3	1.1%
15	Houston–Mission/McAllen/Edinburg	840.1	0.9%
16	Lubbock–Abilene	833.9	0.9%
17	Austin–San Angelo	741.2	0.8%
18	Dallas/Fort Worth–Midland/Odessa	622.6	0.7%
19	Dallas/Fort Worth–Laredo	528.3	0.6%
20	Dallas/Fort Worth–Amarillo	426.1	0.5%
21	Dallas/Fort Worth–Harlingen	422.0	0.5%
22	Lubbock–Laredo	297.3	0.3%
23	Austin–Brownwood	287.3	0.3%
24	Houston–Corpus Christi	278.6	0.3%
25	Houston–Laredo	164.9	0.2%
Remainder of Texas Intrastate Routes		1,261.6	1.4%
	Totals	92,239.4	100.0%

Table 9 shows the cargo activity for Texas' primary commercial service airports for calendar year 2006. The data are further classified by inbound and outbound. Air cargo activity in the state is dominated by Dallas/Fort Worth International with nearly 50 percent of the state's total. The top four airports—Dallas/Fort Worth International, George Bush Houston Intercontinental, San Antonio International, and Austin-Bergstrom International—accounted for 88 percent of the state's total air cargo activity in tons.

Table 9. Texas' Primary Commercial Airport Cargo—2006 (Tons).

City	Name	Inbound	Outbound	Total
Abilene	Abilene Regional	520.2	341.2	861.4
Amarillo	Amarillo International	507.8	277.8	785.6
Austin	Austin-Bergstrom International	60,648.9	58,436.8	119,085.7
Beaumont/ Port Arthur	Southeast Texas Regional	0.0	0.7	0.7
Brownsville	Brownsville/South Padre Island Int.	10.3	44.9	55.2
College Station	Easterwood Field	0.3	2.8	3.1
Corpus Christi	Corpus Christi International	263.5	123.5	387.1
Dallas	Dallas Love Field	17,330.3	17,258.0	34,588.3
Dallas/Fort Worth	Dallas/Fort Worth International	481,322.4	408,279.8	889,602.2
El Paso	El Paso International	37,053.4	37,651.0	74,704.5
Harlingen	Rio Grande Valley International	16,778.6	15,356.9	32,135.5
Houston	William P. Hobby	8,969.1	11,482.6	20,451.7
Houston	George Bush Intercontinental Airport	230,865.0	219,864.3	450,729.3
Killeen	Robert Gray Army Air Field	14.7	236.0	250.7
Laredo	Laredo International	14,880.2	8,790.2	23,670.5
Longview	East Texas Regional	1.3	7.9	9.2
Lubbock	Lubbock International	16,095.1	8,995.4	25,090.5
McAllen	McAllen Miller International	544.8	698.9	1,243.6
Midland	Midland International	1,958.9	1,559.5	3,518.4
San Angelo	San Angelo Regional/Mathis Field	491.5	265.7	757.2
San Antonio	San Antonio International	87,210.1	58,185.9	145,396.0
Texarkana	Texarkana Regional	1.4	1.1	2.5
Tyler	Tyler Pounds Regional	1.5	0.2	1.7
Victoria	Victoria Regional	0.0	0.0	0.0
Waco	Waco Regional	26.8	22.8	49.6
Wichita Falls	Sheppard AFB/Wichita Falls Mun.	10.8	4.1	15.0
	Totals	975,506.9	847,888	1,823,395.2

Table 10 shows the air cargo activity at reliever and general aviation airports in the state. Two military installations are included in the data as well. Fort Worth Alliance is the largest general aviation cargo airport and ranks third in the state overall. The general aviation airports are not currently significant players in the air cargo in the state, Fort Worth Alliance notwithstanding, but some are in a position to play an increasingly larger role. Those airports that surround airports where there is existing demand stand to benefit from some activity as airspace, ramp space, and roadways become increasingly congested.

Table 10. Texas Reliever, General Aviation, and Military Airport Cargo—2006 (Tons).

City	Name	Inbound	Outbound	Total
Reliever				
Arlington	Arlington Municipal	149.2	17.2	166.4
Dallas	Addison	33.4	36.4	69.8
Denton	Denton Municipal	39.9	0.0	39.9
Fort Worth	Fort Worth Alliance	115,795.7	122,134.3	237,930.0
Fort Worth	Fort Worth Meacham	12.0	3.0	15.0
Houston	Ellington Field	124.3	126.4	250.7
	Reliever Totals	**116,154.5**	**122,317.3**	**238,471.8**
General Aviation				
Brownwood	Brownwood Regional	166.0	122.6	288.6
Cotulla	Cotulla-La Salle County	21.7	0.0	21.7
Del Rio	Del Rio International	90.3	197.9	288.3
Lufkin	Angelina County	7.2	7.2	14.3
Waco	Texas State Tech. College Waco	1,033.9	0.0	1,033.9
	General Aviation Totals	**1,319.1**	**327.7**	**1,646.8**
Military				
Fort Bliss/El Paso	Biggs Army Air Field (Fort Bliss)	23.1	105.9	129.0
San Antonio	Kelly AFB	0.0	346.1	346.1
	Military Totals	**23.1**	**451.0**	**129.0**
	Grand Totals	**117,496.7**	**123,097**	**240,593.7**

Table 11 depicts the top Texas airports by total air cargo activity. This table combines all civilian airports in Texas. Only the top five airports exceed the federal designation of 100 million landed pounds, making them eligible for federal cargo entitlement money. The largest 11 airports by total cargo tons in 2006 represent 99.48 percent of all the cargo activity in the state of Texas by tonnage. Houston Hobby (number 11) represents 0.99 percent, while Midland-Odessa (next on the list at number 12) represents just 0.17 percent, a significant drop-off.

Table 12 includes the air cargo activity and compares the amount of freight handled by Texas' commercial service airports.

Table 13 shows the top 10 states where Texas freight is going to or coming from. These rankings are dominated by freight movements to and from large distribution hubs operated by FedEx, UPS, and DHL. Intrastate air cargo in Texas would rank it number 3 between California and Kentucky on this list.

Table 11. Top 11 Texas Airports by Total Air Cargo Activity—2006 (Tons).

Rank	City	Name	Inbound	Outbound	Total
1	Dallas/ Fort Worth	Dallas/Fort Worth International	481,322.4	408,279.8	889,602.2
2	Houston	George Bush Intercontinental Airport	230,865.0	219,864.3	450,729.3
3	Fort Worth	Fort Worth Alliance	115,795.7	122,134.3	237,930.0
4	San Antonio	San Antonio International	87,210.1	58,185.9	145,396.0
5	Austin	Austin-Bergstrom International	60,648.9	58,436.8	119,085.7
6	El Paso	El Paso International	37,053.4	37,651.0	74,704.5
7	Dallas	Dallas Love Field	17,330.3	17,258.0	34,588.3
8	Harlingen	Rio Grande Valley International	16,778.6	15,356.9	32,135.5
9	Lubbock	Lubbock International	16,095.1	8,995.4	25,090.5
10	Laredo	Laredo International	14,880.2	8,790.2	23,670.5
11	Houston	William P. Hobby	8,969.1	11,482.6	20,451.7
Remainder of Texas			4,601.1	6,106.5	10,707.6
Totals			**971,036.4**	**1,093,055.4**	**2,064,091.7**

Table 12. Air Cargo and Mail Tons for Primary Commercial Airports—2004.

City	Name	Cargo Tons	Mail Ton	Total Tons	Percent Mail
Abilene	Abilene Regional	845	2	847	0%
Amarillo	Amarillo International	1,059	114	1,173	10%
Austin	Austin-Bergstrom International	136,620	5,794	142,414	4%
Beaumont/Port Arthur	Southeast Texas Regional	16	0	16	0%
Brownsville	Brownsville/South Padre Island International	3,445	2	3,447	0%
College Station	Easterwood Field	0	0	0	0%
Corpus Christi	Corpus Christi International	407	160	567	28%
Dallas	Dallas Love Field	40,862	758	41,620	2%
Dallas/ Fort Worth	Dallas/Fort Worth International	901,325	67,910	969,235	7%
El Paso	El Paso International	83,467	2,602	86,069	3%
Harlingen	Rio Grande Valley International	33,459	1	33,460	0%
Houston	William P. Hobby	22,084	3,538	25,622	14%
Houston	George Bush Intercontinental Airport	416,340	40,629	456,969	9%
Killeen	Robert Gray Army Air Field	5	0	5	0%
Killeen	Killeen Municipal	8	0	8	0%
Laredo	Laredo International	27,517	2	27,519	0%
Longview	East Texas Regional	10	8	18	44%
Lubbock	Lubbock International	28,703	194	28,897	1%

Table 12. Comparison of Cargo and Mail Tons for Primary Commercial Airports—2004 (Continued).

City	Name	Cargo Tons	Mail Ton	Total Tons	Percent Mail
McAllen	McAllen Miller International	1,515	337	1,852	18%
Midland	Midland International	3,665	104	3,769	3%
San Angelo	San Angelo Regional/Mathis Field	832	0	832	0%
San Antonio	San Antonio International	134,421	8,675	143,096	6%
Texarkana	Texarkana Regional	3	0	3	0%
Tyler	Tyler Pounds Regional	3	10	13	77%
Victoria	Victoria Regional	0	0	0	0%
Waco	Waco Regional	2	0	2	0%
Wichita Falls	Sheppard AFB/Wichita Falls Municipal.	315	0	315	0%
	Totals	**1,836,928**	**130,840**	**1,967,768**	**7%**

Table 13. Top 10 Sources of Domestic Air Cargo—2006 (Tons).

Rank	State	Inbound	Outbound	Total
1	Tennessee	186,208.2	154,852.4	341,160.6
2	California	93,120.7	93,182.4	186,303.0
3	Kentucky	97,906.9	76,432.9	174,339.7
4	Ohio	53,167.5	52,881.1	106,048.6
5	Illinois	49,023.5	34,887.4	83,910.9
6	Florida	31,897.2	39,871.0	71,768.2
7	Indiana	25,702.4	32,559.7	58,262.1
8	New Jersey	27,397.5	23,547.4	50,944.9
9	Georgia	24,642.0	15,339.8	38,981.8
10	Alaska	12,599.6	5,631.0	18,230.6
	Totals	**529,285.0**	**601,665.5**	**1,130,950.5**

Figure 12 through Figure 15 further characterize Texas air cargo activity. Figure 12 and Figure 13 show sharp increases in activity from 2000 to 2003. This growth was across the board for all but one of the top 11 airports with cargo activity in Texas. More specifically, UPS began service at Dallas/Fort Worth International in 2001. The airport saw an increase from 416,094 tons to 810,964 tons over the period. Also, activity at Fort Worth Alliance, due to FedEx operations, picked up, increasing from 114 tons to more than 142,000 tons over the same period. Dramatic increases also occurred at San Antonio International, Austin-Bergstrom International, and El Paso. This growth is a function of both domestic activity, especially from the integrated carriers, and international activity. Activity at the 11 airports with the greatest cargo activity in

Texas is discussed in greater detail in Chapter 5, including historical cargo activity dating back to 1996.

Figure 12 shows the breakdown and trend of Texas air cargo by international, domestic, or intrastate from 1996 to 2006. Domestic activity is the largest category followed by international and intrastate. As the global economy develops, one would expect the international market share to increase. Figure 13 shows the trend of domestic air cargo from 1996 to 2006 by inbound and outbound direction for both freight and mail. Inbound and outbound freight and inbound and outbound mail, respectively, trace nearly identically, with inbound freight outpacing outbound freight.

Figure 14 illustrates the international cargo by direction. Inbound air cargo exceeds the outbound flow and has since the late 1990s. Figure 15 further classifies the international air cargo data by showing the continent where the cargo is heading to/from. Asia has led the way since 2004 when it moved ahead of Europe, its nearest competitor.

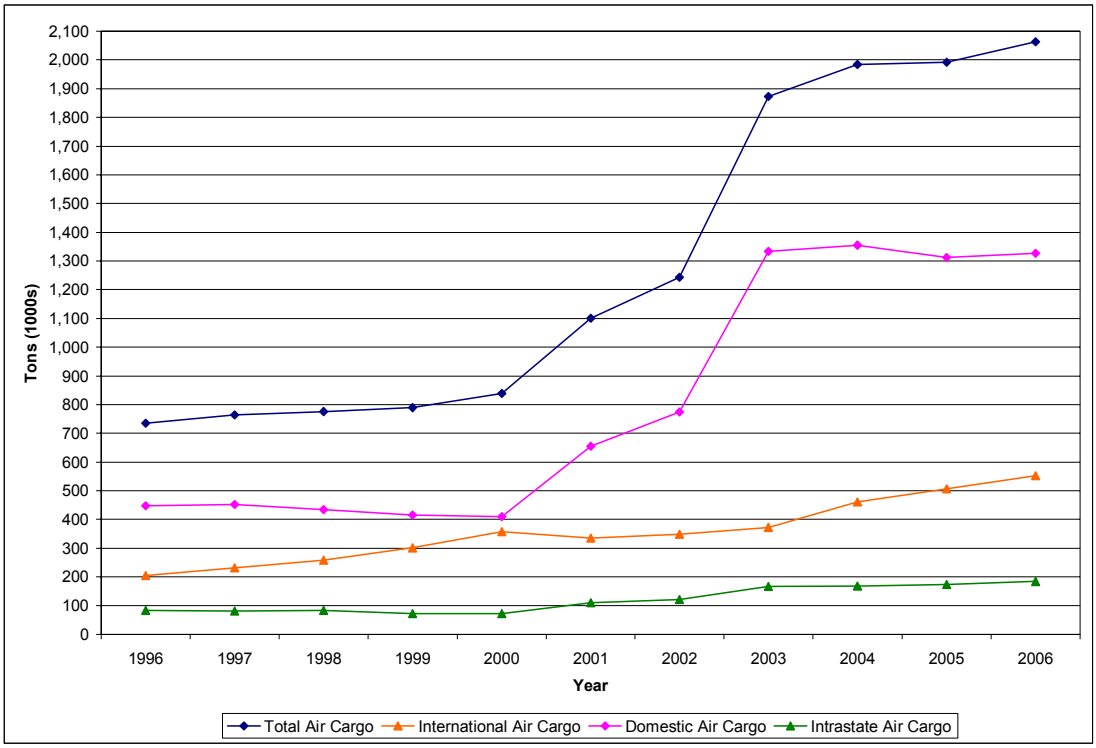


Figure 12. Sources of Texas Air Cargo (1000s Short Tons).

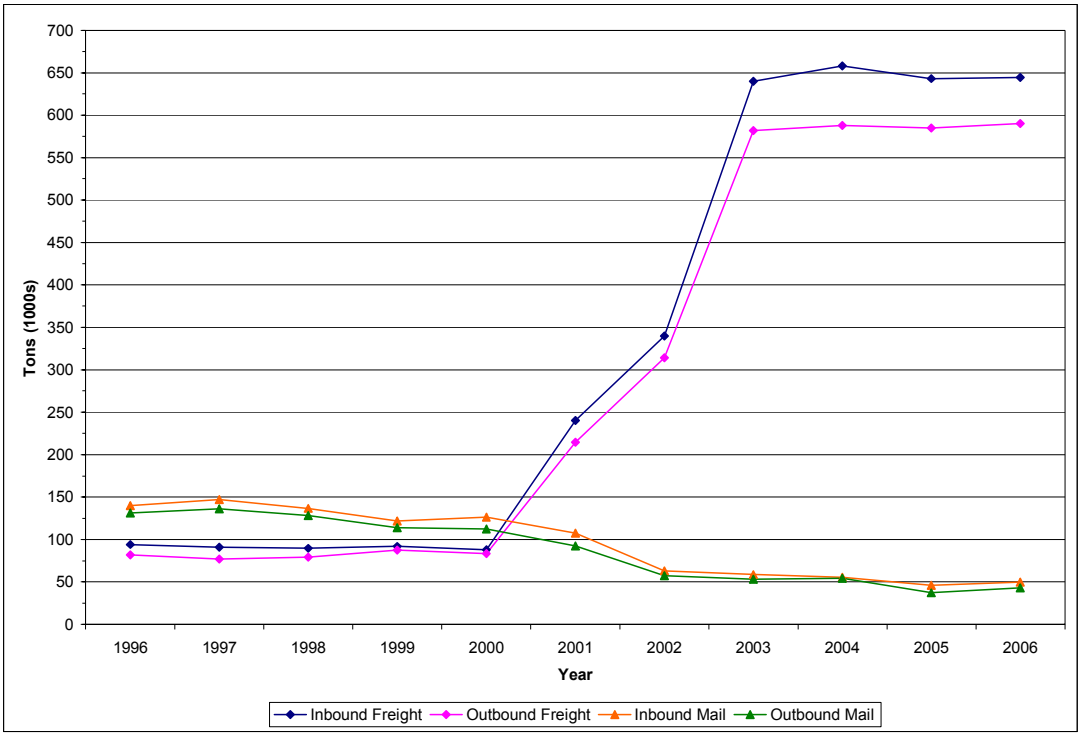


Figure 13. Domestic Air Cargo (1996–2006, by direction, 1000s Short Tons).

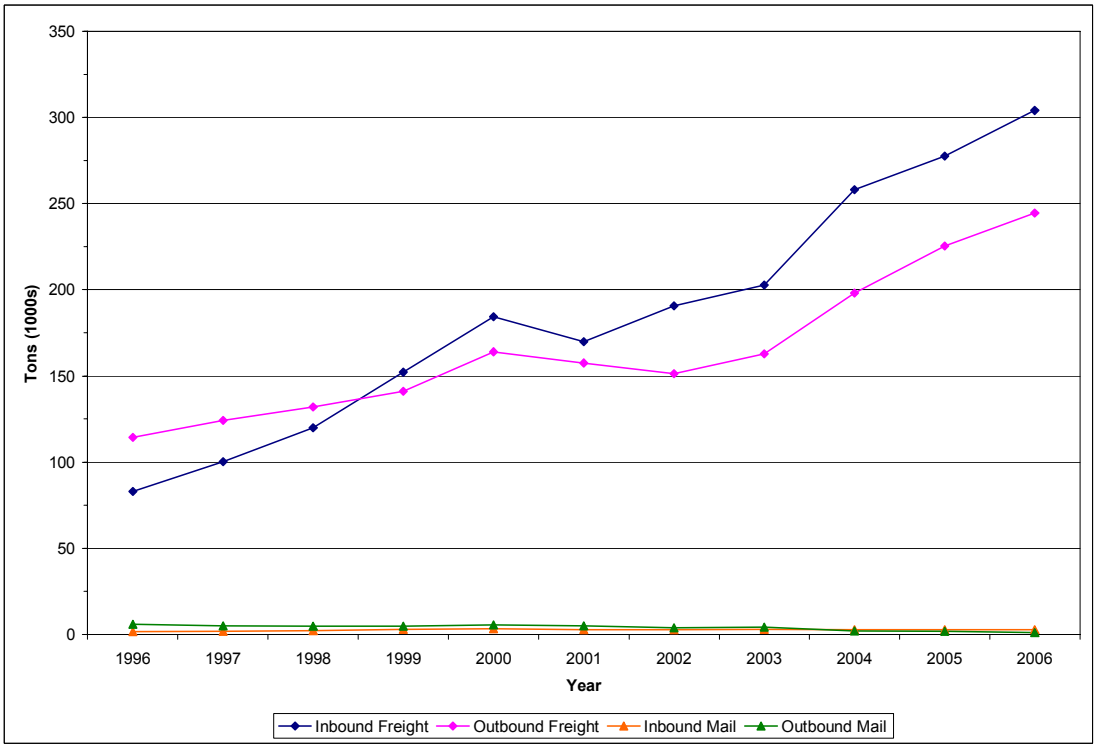


Figure 14. International Air Cargo (1996–2006, by direction, 1000s Short Tons).

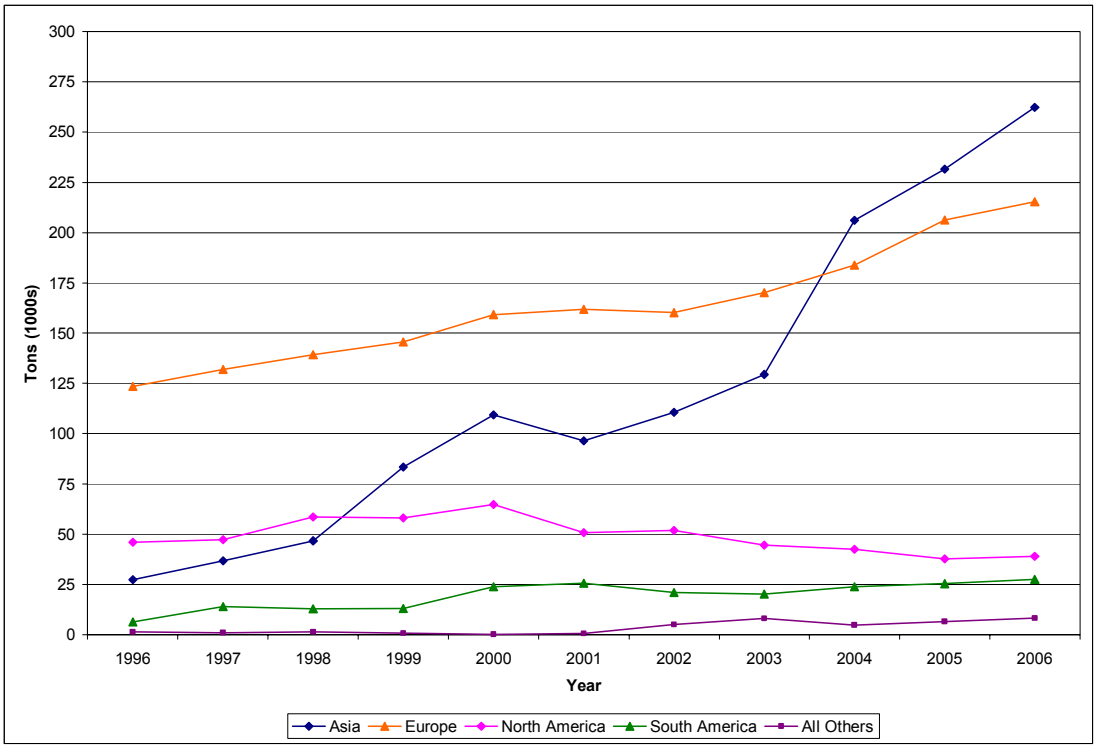


Figure 15. International Air Cargo (1996–2006, by Continent, 1000s Short Tons).

Asia shows the most promising growth, with Europe also growing steadily. The North America numbers do not include the United States but do include everywhere else in North America including Canada, Mexico, Central America, and the Caribbean Islands. The contributions from Africa, Australia, and Oceania are relatively minor.

Table 14 through Table 17 show a further breakdown of air cargo from a variety of continents and countries. These tables show the five most active countries in each of the following continents: Europe, Asia, North America, and South America. These tables represent the quantities of air cargo (freight plus mail) between Texas and the countries of each respective continent for calendar year 2006.

Table 16 represents the quantities of air cargo (freight plus mail) between Texas and the countries of North America (excluding the United States) for Calendar Year 2006.

Table 14. Top Five Sources of European Air Cargo—2006 (Tons).

Rank	Country	Inbound	Outbound	Total
1	United Kingdom	31,466.1	45,462.6	76,928.7
2	Germany	22,857.4	19,196.6	42,054.0
3	France	17,224.3	20,757.1	37,981.4
4	Netherlands	16,398.0	15,807.3	32,205.3
5	Luxembourg	2,052.3	10,305.7	12,358.0
N/A	All others	2,325.3	11,432.8	13,758.1
	Totals	**92,323.4**	**122,962.1**	**215,285.5**

Table 15. Top Five Sources of Asian Air Cargo—2006 (Tons).

Rank	Country	Inbound	Outbound	Total
1	Taiwan	63,131.8	34,138.8	97,270.6
2	South Korea	36,793.5	25,580.1	62,373.6
3	China	27,698.1	6,922.1	34,620.2
4	Japan	17,720.0	9,736.9	27,456.9
5	Hong Kong	17,310.9	6,891.5	24,202.4
N/A	All others	12,287.8	4,052.2	16,340.0
	Totals	**174,942.1**	**87,321.6**	**262,263.7**

Table 16. Top Five Sources of North American Air Cargo—2006 (Tons).

Rank	Country	Inbound	Outbound	Total
1	Mexico	17,493.4	12,763.8	30,257.3
2	Canada	928.0	2,054.6	2,982.5
3	Costa Rica	1,565.9	205.0	1,770.9
4	Guatemala	866.4	111.6	977.9
5	El Salvador	749.4	215.4	964.8
N/A	All others	1,510.4	529.6	2,040.0
	Totals	**23,113.5**	**15,880**	**38,993.4**

Table 17. Top Five Sources of South American Air Cargo—2006 (Tons).

Rank	Country	Inbound	Outbound	Total
1	Brazil	6,130.0	5,429.0	11,559.0
2	Argentina	4,825.2	3,153.6	7,978.8
3	Chile	3,347.4	2,257.1	5,604.5
4	Peru	865.4	37.5	902.9
5	Colombia	539.2	55.7	594.9
N/A	All others	526.0	280.6	806.6
	Totals	**16,233.2**	**11,213.5**	**27,446.7**

The data presented in the previous tables include mail. Figure 16 shows the percentage of the overall freight that is comprised of mail. All of the air cargo categories shown experienced a

sharp decline between 2000 and 2002 with the exception of international air freight. Domestic mail dropped significantly following the terror events of September 11, 2001. Since this time, shipments of U.S. mail weighing more than one pound have been restricted from passenger aircraft and limited to all-cargo aircraft. This has significantly reduced the mail carried by passenger aircraft. Further, less mail in general is being carried by aircraft. It is now carried by other modes (*27*). The mail component of international activity was already low and remained steady. Presently, less than 10 percent of the total quantity of air cargo transport is mail.

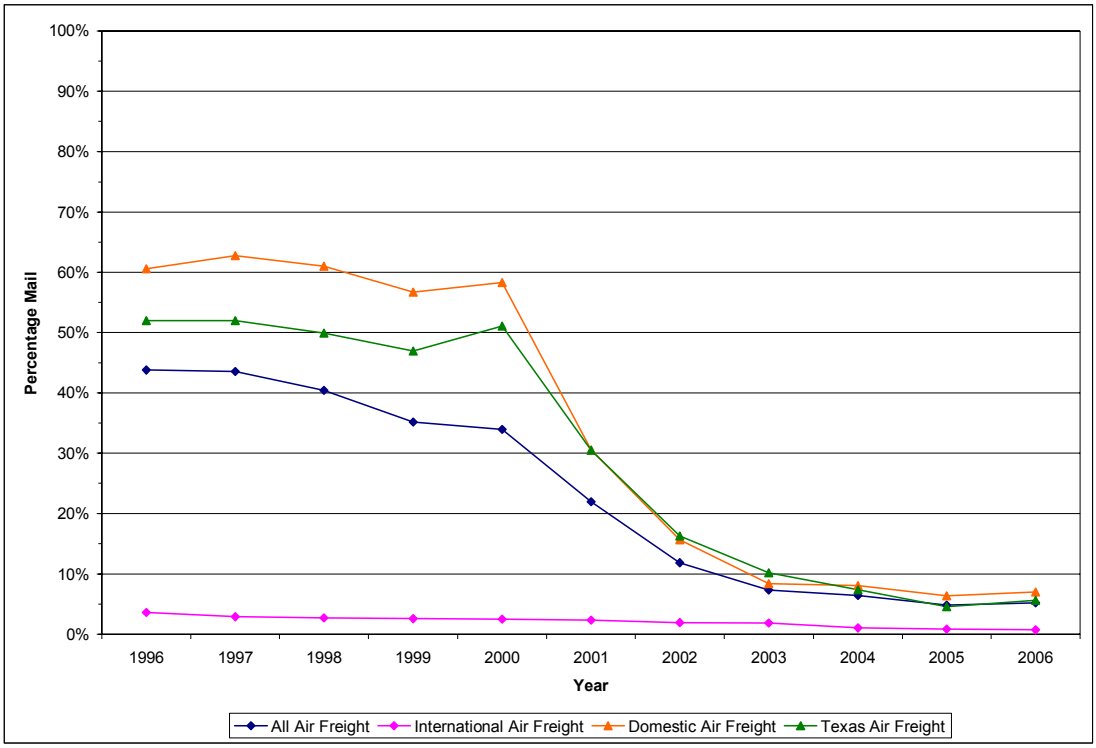


Figure 16. Mail as Percentage of Total Air Freight (1996–2006).

Much has been said about the types and quantities of air cargo activity in Texas but nothing of the airlines that fly the cargo. Table 18 lists the top 15 air cargo carriers as measured by total inbound and outbound cargo in 2006. Not surprisingly, FedEx and UPS lead the way with a combined market share of nearly 52 percent.

Table 18 Top 15 Air Cargo Carriers—2006 (Tons).

Rank	Air Carrier	Inbound	Outbound	Total	% Share
1	Federal Express Corporation	345,439.9	321,812.4	667,252.3	32.3%
2	United Parcel Service	212,640.9	186,342.4	398,983.3	19.3%
3	American Airlines	86,196.3	82,958.5	169,154.8	8.2%
4	Continental Air Lines	82,688.0	68,405.0	151,093.0	7.3%
5	Eva Airways	36,098.8	19,910.3	56,009.1	2.7%
6	Southwest Airlines	26,546.3	26,568.4	53,114.7	2.6%
7	Abx Air	24,906.3	25,810.0	50,716.2	2.5%
8	Korean Air Lines	31,483.8	16,230.1	47,713.9	2.3%
9	Astar Air Cargo	22,083.9	19,744.6	41,828.5	2.0%
10	China Airlines	27,033.0	14,228.5	41,261.5	2.0%
11	Southern Air	23,870.6	17,238.0	41,108.6	2.0%
12	Singapore Airlines	20,082.7	12,460.2	32,542.9	1.6%
13	British Airways	15,575.7	15,493.0	31,068.6	1.5%
14	Air Transport International	16,537.7	13,939.9	30,477.6	1.5%
15	Lufthansa German Airlines	15,360.7	14,857.2	30,217.9	1.5%
Remainder of air carriers serving Texas		106,510.7	115,037.9	221,548.6	10.7%
	Totals	**1,093,055.4**	**971,036.4**	**2,064,091.7**	**100%**

Several passenger airlines are among the most active, including the three passenger airlines based in Texas. Many international carriers are also in the top 15, making up more than one-third of the list. The top 15 account for almost 90 percent of the total air cargo activity in the state.

CHAPTER 4. CHARACTERIZATION OF TEXASAIR CARGO ACTIVITY

This chapter focuses on the types of air cargo activity taking place in Texas. The primary source of data for this analysis is FHWA's Freight Analysis Framework. It should be noted that the data in this chapter may not exactly coincide with the data used in the Texas air cargo profiles in Chapter 5. The sources are different but no less important. The FAF provides the best opportunity to understand the type and quantity of commodities being moved into and out of the state.

FHWA FREIGHT ANALYSIS FRAMEWORK VERSION 2.2

FHWA indicates the latest Freight Analysis Framework Version 2.2 (FAF^2) Commodity Origin-Destination database "estimates tonnage and value of goods shipped by type of commodity and mode of transportation among and within 114 areas, as well as to and from seven international trading regions through the 114 areas plus 17 additional international gateways. The 2002 estimate is based primarily on the Commodity Flow Survey and other components of the Economic Census. Forecasts are included for 2010 to 2035 in five-year increments (*28*). FAF^2 does not specifically include through freight movements. The data, methods, and results developed as part of FAF^2 are publicly available.

Modes of Transportation

The seven modes of transportation included in FAF^2 are defined in the *User Guide* as:

- truck—includes private and for-hire truck;
- rail—any common carrier or private railroad;
- water—includes shallow draft, deep draft, and Great Lakes shipments;
- air (air and truck)—includes shipments by air or a combination of truck and air;
- truck-rail intermodal—includes shipments by a combination of truck and rail;
- other multiple modes—includes shipments typically weighing less than 100 pounds by parcel, U.S. Postal Service, or courier, as well as shipments of all sizes by truck-water, water-rail, and other intermodal combinations; and
- pipeline and unknown—pipeline is included with unknown because region-to-region flows by pipeline are subject to large uncertainty (*29*).

Commodity Codes

FAF^2 utilizes commodity codes based on the Standard Classification of Transportation Goods (SCTG). Presented at the two-digit level, there are 43 different commodity code categories, with the final code representing "unknown" commodities. The commodity listing with full descriptions is included in Appendix B.

Data Tables

The FAF^2 Version 2.2 database contains the following data tables, as described in the *User Guide*:

- Domestic—contains commodity flows between domestic origins and destinations. Fields include zone of origin, zone of destination, commodity, mode, value in millions of dollars, and tons in thousands of short tons.
- Border—contains commodity flows by land from Canada and Mexico via ports of entry on the U.S. border to domestic destinations and from the United States via ports of exit on the U.S. border to Canada and Mexico. Fields include zone of origin, zone of destination, port of entry or exit, commodity, mode used on the domestic leg of the movement, value in millions of dollars, and tons in thousands of short tons.
- Sea—contains commodity flows by air and water from overseas origins via ports of entry to domestic destinations and from domestic origins via port of exit to overseas destinations. Fields include zone of origin, zone of destination, port of entry or exit, commodity, mode used on the domestic leg of the movement, value in millions of dollars, and tons in thousands of short tons.
- International air—contains international air commodity flows from foreign origins via ports of entry to domestic destinations and from domestic origins via port of exit to foreign destinations. Fields include zone of origin, zone of destination, port of entry or exit, commodity, mode used on the domestic leg of the movement (all are "air and truck"), value in millions of dollars, and tons in thousands of short tons (*29*).

FAF Regions

For the FAF evaluation, 114 regions are utilized to define origins and destinations. Some states are only represented on a state-wide basis, while other states have multiple regions. Texas

has five defined regions, as indicated in Table 19, with one region defined as any portion of Texas outside the Austin, Dallas, Houston, or San Antonio defined areas. Only these five regions show as an origin or destination for air cargo in Texas. For the Border, Sea, and International Air databases, the identified ports of entry/exit provide insight as to the location of entry or exit into the United States. Table 19 also contains the five defined gateways located in Texas. When considering air cargo in Texas, many of these regions contain more than one airport transporting freight. Figure 17 displays the FAF regions and gateways located in Texas, along with the commercial service airports in the state. Most of the air cargo travels through the commercial service airports.

Table 19. Texas Freight Analysis Framework Region and Gateway Descriptions.

FAF ID	FAF Region	Region Description
97	Austin	Austin-Round Rock, TX MSA
98	Dallas	Dallas/Fort Worth, TX CSA
99	Houston	Houston-Baytown-Huntsville, TX CSA
100	San Antonio	San Antonio, TX MSA
101	Remainder of Texas	Remainder of Texas
Gateway ID	**FAF Gateway**	**Gateway Description**
127	Beaumont	Beaumont, TX
128	Corpus Christi	Corpus Christi, TX
129	Brownsville/Hidalgo	Brownsville/Hidalgo, TX
130	Laredo	Laredo, TX
131	El Paso	El Paso, TX

Note: MSA = Metropolitan Statistical Area; CSA = Combined Statistical Area

FREIGHT ANALYSIS FRAMEWORK ANALYSIS OF TEXAS AIR CARGO ACTIVITY

Using the 2002 base year data for all "air and truck" tons within the FAF datasets, Texas experienced over 583,435 tons in total air cargo. Table 20 shows the total and also demonstrates that the air cargo tons into and out of Texas was distributed almost equally, with 51 percent of the total tons originating in Texas and 49 percent terminating. Only 7 percent of the air cargo tons were involved in cross-border or seaport movements. Sixty percent of the cargo moved by air involved international movements, with total tons equaling 348,341 tons in 2002. More of the international movements terminated in Texas than originated. For domestic shipments, more tons were originated than terminated. Domestic air cargo tons totaled 33 percent of the total 2002 air cargo tons.

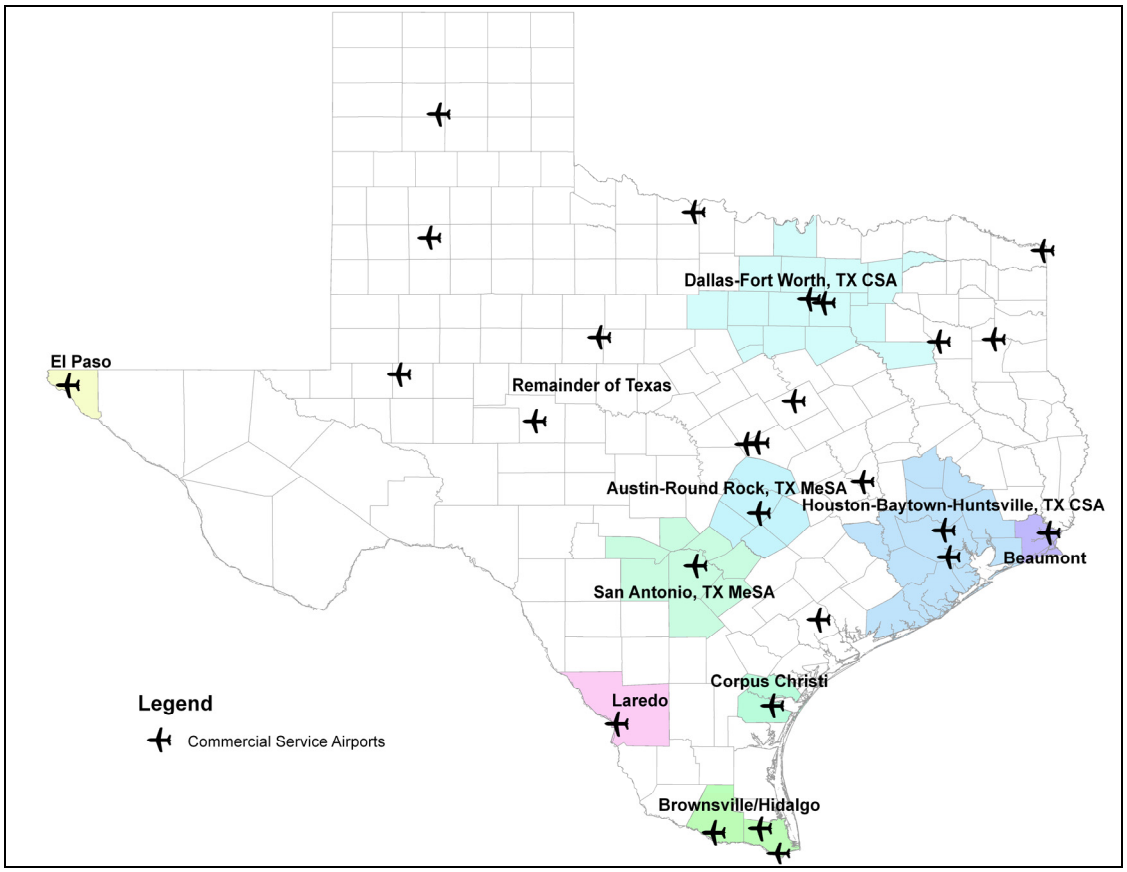


Figure 17. Texas Freight Analysis Framework Zones.

Table 20. Texas Air Cargo Activity by FAF Database (Tons—Year 2002).

FAF Database	Originate		Terminate		Total	
	Tons	% Out	Tons	% In	Tons	% Total
Domestic	117,570	40	77,531	27	195,101	33
International	155,178	53	193,163	67	348,341	60
Border and sea	22,448	8	17,545	6	39,993	7
Totals	**295,196**	**100**	**288,239**	**100**	**583,435**	**100**
% originates =		51%	% terminates =		49%	

Table 21 contains the commodity breakdown of the 2002 domestic air cargo tons for Texas origins or destinations. The top 10 commodities account for 87 percent of the total domestic air cargo tons. Electronics accounts for over 33 percent of the total domestic air cargo tonnage transported, followed by transportation equipment with over 20 percent and motorized vehicles with almost 11 percent. Table 21 also shows the quantity of air cargo tons that both

originates and terminates within the state. The 4,289 tons represents slightly more than 2 percent of the total shipment tons.

The commodity breakdown shows that the movement of freight by air is generally limited to high value commodities or commodities that have a high time sensitivity, such as a piece of equipment that might be urgently required by a manufacturer for operations.

Table 22 contains the commodity breakdown for the international air cargo shipments. The top 10 commodities account for 87 percent of the total international air cargo tons. Machinery ranks first with over 121,500 tons, representing almost 35 percent of the total international air cargo tons. Electronics ranks second with 22 percent of the total international air cargo, followed by textiles/leather with over 7 percent and precision instruments with over 5 percent. Table 22 also shows the same tendency as the domestic shipments to be mostly high value, high time sensitive products.

The FAF International dataset contains the port of entry or exit in which the air cargo trip entered or exited the United States. Table 23 shows the air cargo ports of entry and exit for international shipments originating or terminating in Texas for 2002. The table shows that all of the international shipments traveling through a Texas port of entry/exit had either an origin or destination located in Texas. Dallas and Houston are the two major FAF ports of entry and exit. The tons traveling from and to the Houston FAF region are equally distributed. The Dallas FAF region experiences a higher level of goods coming in from foreign origins for processing than outbound shipments.

Table 23 also indicates international shipments originating or terminating in Texas but that went through a port of entry/exit outside Texas. The Alaska-Anchorage FAF gateway experiences 85 percent of the non-Texas port of entry/exit activity. International air cargo shipments to or from Texas regions predominately utilize Texas gateways—81 percent versus 19 percent.

Table 21. FAF Commodities of Domestic Air Cargo Shipments (Year 2002).

Code	Commodity	Domestic						
		Originating (Outbound)		Terminating (Inbound)		Total		Intra-state
		Tons	% Out	Tons	% In	Tons	% Total	
1	Live animals/fish	0	0.0	8	0.0	8	0.0	0
3	Other ag. prods.	0	0.0	37	0.0	37	0.0	0
5	Meat/seafood	0	0.0	1,210	1.6	1,210	0.6	0
6	Milled grain prods.	0	0.0	4,160	5.4	4,160	2.1	0
7	Other foodstuffs	260	0.2	1,680	2.2	1,940	1.0	0
8	Alcoholic beverages	0	0.0	73	0.1	73	0.0	0
11	Natural sands	0	0.0	1,020	1.3	1,020	0.5	0
13	Nonmetallic minerals	0	0.0	10	0.0	10	0.0	0
19	Coal—n.e.c.	90	0.1	1,580	2.0	1,670	0.9	0
20	Basic chemicals	954	0.8	1,054	1.4	2,008	1.0	660
21	Pharmaceuticals	1,253	1.1	1,195	1.5	2,448	1.3	398
23	Chemical prods. (6)	180	0.2	7,038	9.1	7,218	3.7	0
24	Plastics/rubber	2,422	2.1	1,223	1.6	3,645	1.9	118
26	Wood prods.	0	0.0	196	0.3	196	0.1	0
27	Newsprint/paper	47	0.0	116	0.1	163	0.1	6
28	Paper articles	59	0.1	43	0.1	102	0.1	40
29	Printed prods. (7)	1,357	1.2	4,255	5.5	5,612	2.9	33
30	Textiles/leather (10)	0	0.0	4,256	5.5	4,256	2.2	0
31	Nonmetal min. prods.	194	0.2	227	0.3	421	0.2	1
32	Base metals (8)	3,440	2.9	1,796	2.3	5,236	2.7	100
33	Articles—base metal (5)	4,893	4.2	2,612	3.4	7,505	3.8	400
34	Machinery (4)	5,375	4.6	3,344	4.3	8,719	4.5	676
35	Electronics (1)	43,546	37.0	22,098	28.5	65,644	33.6	552
36	Motorized vehicles (3)	13,943	11.9	7,329	9.5	21,272	10.9	0
37	Transport equip. (2)	34,840	29.6	4,403	5.7	39,243	20.1	16
38	Precision instruments	707	0.6	1,124	1.4	1,831	0.9	50
39	Furniture	980	0.8	351	0.5	1,331	0.7	0
40	Misc. mfg. prods. (9)	2,801	2.4	1,964	2.5	4,765	2.4	1,198
41	Waste/scrap	0	0.0	150	0.2	150	0.1	0
43	Mixed freight	229	0.2	2,979	3.8	3,208	1.6	41
	Totals	**117,570**	**100.0**	**77,531**	**100.0**	**195,101**	**100.0**	**4,289**

Note: Numbers in parenthesis represent the top 10 commodities ranked by total tons.
n.e.c. = not elsewhere classified

Table 22. FAF Commodities of International Air Cargo Shipments (Year 2002).

Code	Commodity	International					
		Originating (Outbound)		Terminating (Inbound)		Total	
		Tons	% Out	Tons	% In	Tons	% Total
1	Live animals/fish (10)	296	0.2	5,211	2.7	5,507	1.6
2	Cereal grains	3	0.0	4	0.0	8	0.0
3	Other ag. prods.	1,135	0.7	3,599	1.9	4,735	1.4
4	Animal feed	82	0.1	300	0.2	382	0.1
5	Meat/seafood	4,616	3.0	186	0.1	4,802	1.4
6	Milled grain prods.	422	0.3	81	0.0	503	0.1
7	Other foodstuffs	1,163	0.7	366	0.2	1,529	0.4
8	Alcoholic beverages	383	0.2	564	0.3	947	0.3
9	Tobacco prods.	5	0.0	77	0.0	82	0.0
11	Natural sands	0	0.0	0	0.0	0	0.0
13	Nonmetallic minerals	515	0.3	130	0.1	645	0.2
14	Gravel	15	0.0	1	0.0	16	0.0
19	Coal—n.e.c.	139	0.1	193	0.1	332	0.1
20	Basic chemicals	3,033	2.0	1,241	0.6	4,275	1.2
21	Pharmaceuticals	1,276	0.8	656	0.3	1,932	0.6
22	Crude petroleum	0	0.0	4	0.0	0	0.0
23	Chemical prods. (7)	6,769	4.4	4,646	2.4	11,415	3.3
24	Plastics/rubber (5)	9,422	6.1	6,417	3.3	15,839	4.5
26	Wood prods.	290	0.2	489	0.3	779	0.2
27	Newsprint/paper	25	0.0	1	0.0	26	0.0
28	Paper articles	1,641	1.1	813	0.4	2,454	0.7
29	Printed prods.	1,151	0.7	1,482	0.8	2,633	0.8
30	Textiles/leather (3)	3,173	2.0	23,514	12.2	26,686	7.7
31	Nonmetal min. prods.	1,516	1.0	2,143	1.1	3,658	1.1
32	Base metals	2,559	1.6	1,777	0.9	4,336	1.2
33	Articles—base metal (6)	7,692	5.0	6,196	3.2	13,887	4.0
34	Machinery (1)	61,281	39.5	60,294	31.2	121,575	34.9
35	Electronics (2)	28,028	18.1	48,722	25.2	76,750	22.0
36	Motorized vehicles (9)	1,785	1.2	3,851	2.0	5,636	1.6
37	Transport equip.	2,145	1.4	895	0.5	3,040	0.9
38	Precision instruments (4)	11,373	7.3	7,779	4.0	19,152	5.5
39	Furniture	870	0.6	2,352	1.2	3,222	0.9
40	Misc. mfg. prods. (8)	1,634	1.1	5,231	2.7	6,864	2.0
41	Waste/scrap	0	0.0	0	0.0	0	0.0
43	Mixed freight	739	0.5	3,947	2.0	4,687	1.3
	Totals	**155,178**	**100.0**	**193,163**	**100.0**	**348,337**	**100.0**

Note: Numbers in parenthesis represent the top 10 commodities ranked by total tons.
n.e.c. = not elsewhere classified

Table 23. FAF Ports of Entry/Exit for International Air Shipments Originating or Terminating in Texas (Tons—Year 2002).

Ports of Entry/Exit	Originating (Outbound)	Terminating (Inbound)	Total
Texas Ports of Entry/Exit			
Austin	3,692	6,855	10,547
Brownsville/Hidalgo	52	0	52
Corpus Christi	0	1	1
Dallas	48,871	79,263	128,135
El Paso	1,934	2,048	3,981
Houston	64,085	65,998	130,083
Laredo	639	877	1,516
San Antonio	5,164	3,157	8,321
Remainder of Texas	70	20	90
Totals	**124,507**	**158,219**	**282,726**
Non-Texas Ports of Entry/Exit			
Alaska-Anchorage	24,027	31,423	55,450
Washington, D.C.	2,401	1,561	3,962
Washington-Seattle	3,004	1	3,005
New York-New York	695	288	984
California-Los Angeles	0	941	941
Other	543	731	1,274
Totals	**30,671**	**34,944**	**65,615**

Table 24 shows the commodities for both the FAF Sea and Border datasets, where "air and truck" are identified as the transportation mode. The top 10 commodities in terms of total tons account for over 95 percent of the total tons represented in the above table. Electronics account for almost 25 percent of the shipments that enter or exit the United States through seaports or border ports. Transportation equipment represents over 17 percent of the total, while mixed freight accounts for 14 percent, and coal and petroleum products account for 10 percent. Very little air cargo shipments are combined with sea transportation. Two commodities, machinery and base metals, make up 81 percent of the tons in the Sea dataset. The major commodities contained within Table 24, electronics and transportation equipment, involved border movements exclusively.

Table 24. FAF Commodities of Air Cargo Shipments through Seaports and Border Ports of Entry (Tons—Year 2002).

Code	Commodity	Sea		Border		Total	
		Originating (Outbound)	Terminating (Inbound)	Originating (Outbound)	Terminating (Inbound)	Tons	% Total
1	Live animals/fish	0	1	0	30	31	0.1
2	Cereal grains	0	0	0	0	0	0.0
3	Other ag. prods.	0	8	0	50	58	0.1
4	Animal feed	0	0	0	0	0	0.0
5	Meat/seafood	0	0	0	60	60	0.2
6	Milled grain prods.	0	0	0	0	0	0.0
7	Other foodstuffs	0	0	0	0	0	0.0
8	Alcoholic beverages (9)	0	0	800	100	900	2.3
9	Tobacco prods.	0	0	10	0	10	0.0
11	Natural sands	0	0	0	0	0	0.0
13	Nonmetallic minerals	0	0	0	0	0	0.0
14	Gravel	40	0	0	0	40	0.1
19	Coal—n.e.c. (4)	0	0	1,100	2,950	4,050	10.1
20	Basic chemicals (7)	0	0	1,640	730	2,370	5.9
21	Pharmaceuticals	0	0	0	0	0	0.0
22	Crude petroleum	0	0	0	0	0	0.0
23	Chemical prods.	60	341	0	0	401	1.0
24	Plastics/rubber (10)	0	0	740	70	810	2.0
26	Wood prods.	0	0	0	0	0	0.0
27	Newsprint/paper	0	0	20	0	20	0.1
28	Paper articles	10	1	250	150	411	1.0
29	Printed prods.	0	0	0	0	0	0.0
30	Textiles/leather	0	0	30	0	30	0.1
31	Nonmetal min. prods.	0	136	90	10	236	0.6
32	Base metals (8)	16	1,297	360	10	1,683	4.2
33	Articles—base metal (6)	0	0	1,730	720	2,450	6.1
34	Machinery (5)	193	1,586	1,430	260	3,469	8.7
35	Electronics (1)	0	0	1,280	8,550	9,830	24.6
36	Motorized vehicles	0	0	210	20	230	0.6

Table 24. Commodities of Air Cargo Shipments through Seaports and Border Ports of Entry (Tons—Year 2002) (Continued).

Code	Commodity	Sea		Border		Total	
		Originating (Outbound)	Terminating (Inbound)	Originating (Outbound)	Terminating (Inbound)	Tons	% Total
37	Transport equip. (2)	0	0	6,740	230	6,970	17.4
38	Precision instruments	0	0	130	50	180	0.5
39	Furniture	0	0	0	20	20	0.1
40	Misc. mfg. prods.	0	0	100	30	130	0.3
41	Waste/scrap	0	0	0	0	0	0.0
43	Mixed freight (3)	9	115	5,460	20	5,604	14.0
Totals		**328**	**3,485**	**22,120**	**14,060**	**39,993**	**100.0**

Note: Numbers in parenthesis represent the top 10 commodities ranked by total tons.
n.e.c. = not elsewhere classified

Table 25 provides the breakdown of the border gateway and seaport locations for shipments originating or terminating in Texas. Laredo and El Paso experience the most activity, with Brownsville/Harlingen also experiencing a significant level. Dallas and Houston, acting as a border port, signify the U.S. Customs district of record.

Table 25. FAF Border and Seaport Ports of Entry/Exit for Shipments Originating or Terminating in Texas (Tons—Year 2002).

Port of Entry	Border Port	Seaport	Total
Laredo	7,340	0	7,340
El Paso	7,200	0	7,200
Brownsville/Harlingen	2,820	0	2,820
Dallas	870	0	870
Houston	30	171	201
Corpus Christi	0	25	25
Beaumont	0	14	14
Texas remainder	520	82	602
Totals	**18,780**	**292**	**19,072**

Table 26 shows the ports of entry/exit located outside Texas for shipments originating or terminating in Texas. The table presents the top five Border and Seaport dataset gateways. The most significant gateways for both databases are located in the state of New York. Buffalo, New York, sees the highest border air cargo, while New York, New York, experiences the greatest level as a seaport.

Table 26. FAF Border and Seaport Ports of Entry/Exit outside of Texas with Texas Origins or Destinations (Tons—Year 2002).

Rank	Border Port of Entry	Border	Seaport of Entry	Seaport	Grand Total
1	New York-Buffalo	6,500	New York-New York	1,336	7,836
2	Michigan-Detroit	4,070	California-Los Angeles	1,119	5,189
3	Montana	2,690	Connecticut-Remainder	200	2,890
4	Louisiana-New Orleans	1,550	California-Remainder	150	1,700
5	Minnesota-International Falls	970	Florida-Remainder	117	1,087
-	Other	1,620	Other	599	2,219
	Total	**17,400**	**Total**	**3,521**	**20,921**

FAF REGIONAL ANALYSIS

The next several tables pertain to the regional activities in Texas. Table 27 shows the Texas FAF region tons by direction for each dataset. The Dallas FAF area experiences the greatest amount of air cargo in the state with 331,000 tons, followed by Houston with 165,000 tons in 2002. Together these two regions experience 85 percent of the total air cargo activity in Texas.

Table 27. Texas FAF Regional Air Cargo Activity by Dataset (Tons—Year 2002).

FAF Region	Domestic		International		Border and Sea		Total
	Originate (Outbound)	Terminate (Inbound)	Originate (Outbound)	Terminate (Inbound)	Originate (Outbound)	Terminate (Inbound)	
Austin	743	1,740	3,692	7,043	973	1,019	15,210
Dallas	95,736	35,817	75,901	111,278	9,279	2,992	331,004
Houston	3,628	19,616	67,291	68,438	2,817	3,456	165,245
San Antonio	494	1,579	5,166	3,136	880	850	12,105
Remainder	16,969	18,779	3,128	3,267	8,499	9,228	59,871
Totals	**117,570**	**77,531**	**155,178**	**193,163**	**22,448**	**17,545**	**583,435**

Examining individual origin-destination pairs displayed in Table 28 shows that the Dallas region is the origin for all the top five domestic shipments originating in Texas. Dallas to Chicago, Illinois, is the origin-destination pair with the greatest domestic activity, followed by the Illinois part of the St. Louis FAF region. Outside of the Dallas to Los Angeles, California, region, the other top five pairs represent shipments from Dallas to middle America.

Table 28. Top Five FAF O-D Pairs for Domestic Shipments (Year 2002).

Rank	Origin	Destination	Total Tons
Texas Origins			
1	Dallas	Illinois-Chicago (Ill. part)	20,180
2	Dallas	Illinois-St. Louis (Ill. part)	15,250
3	Dallas	Arkansas	12,000
4	Dallas	Colorado-Denver	7,690
5	Dallas	California-Los Angeles	4,600
		Top five total	**59,720**
		Originating total	**117,570**
Texas Destinations			
1	Indiana-Indianapolis	Dallas	4,582
2	Arkansas	Dallas	4,146
3	Missouri-Kansas City (Mo. part)	Houston	3,852
4	Arkansas	Remainder of Texas	3,810
5	California-San Jose	Houston	2,440
		Top five total	**18,830**
		Terminating total	**77,531**
		Domestic grand total	**195,101**

The shipments traveling to Texas are split between Dallas and Houston, as also shown in Table 28. As with the air cargo shipments originating in Texas, most of the major origin-destination pairs are with locations on the interior part of the United States.

Table 29 shows the major origin-destination pairs for international shipments from the International dataset. Europe and Asia are major partners for both origins and destinations. The Americas (other) represents North and South American countries other than Canada and Mexico.

Table 29. Top Five FAF O-D Pairs for International Shipments (Year 2002).

Rank	Origin	Destination	Total Tons
Texas Origins			
1	Houston	Europe	48,595
2	Dallas	E. Asia/S. Asia/Russia	36,225
3	Dallas	Europe	31,155
4	Houston	Mexico	8,877
5	Dallas	Americas (other)	5,512
		Top five total	**130,365**
		Originating total	**155,178**
Texas Destinations			
1	E. Asia/S. Asia/Russia	Dallas	63,604
2	Europe	Houston	45,543
3	Europe	Dallas	33,813
4	Americas (other)	Dallas	11,677
5	Americas (other)	Houston	8,585
		Top five total	**163,224**
		Terminating total	**193,163**
		International grand total	**348,341**

The following tables are from the Domestic and International datasets only and do not include the Border or Sea datasets. Table 30 contains the total domestic and international air cargo commodities for each Texas FAF region. Most of the commodities are focused in the Dallas or Houston areas. Commodity code number 11, natural sands, is one commodity exclusively identified as only pertaining to the remainder of Texas. Electronics, motorized vehicles, and transportation equipment are the top three commodities, and each is concentrated in the Dallas area. Tables detailing the base year domestic and international air cargo inbound and outbound totals for each FAF region are provided in Appendix C.

FAF FORECASTED DATA ANALYSIS

The Freight Analysis Framework forecasts the data out to 2035, with intermediate dates every five years between 2010 and 2035. For this analysis, the 2035 forecast is utilized to compare against the base 2002 data. Tables in this section present the evaluation of the projected air cargo data.

Table 30. Total Air Cargo Tons by Texas FAF Zone for Domestic and International Air Cargo Shipments (Tons—Year 2002).

Code	Commodity	Austin	Dallas	Houston	San Antonio	Remainder	Total
1	Live animals/fish	204	3,234	1,969	98	9	5,515
2	Cereal grains	0	4	3	0	0	8
3	Other ag. prods.	143	2,523	1,972	91	43	4,772
4	Animal feed	15	288	67	12	0	382
5	Meat/seafood	182	4,646	937	244	4	6,012
6	Milled grain prods.	11	680	3,951	21	0	4,663
7	Other foodstuffs	38	2,561	804	44	22	3,469
8	Alcoholic beverages	21	325	595	14	65	1,020
9	Tobacco prods.	2	35	36	1	8	82
11	Natural sands	0	0	0	0	1,020	1,020
13	Nonmetallic minerals	11	170	453	11	10	655
14	Gravel	0	4	4	0	8	16
19	Coal—n.e.c.	10	236	165	9	1,583	2,002
20	Basic chemicals	87	2,045	3,046	141	964	6,283
21	Pharmaceuticals	306	2,354	1,013	162	545	4,380
22	Crude petroleum	0	1	2	0	0	4
23	Chemical prods.	508	12,426	5,258	318	124	18,633
24	Plastics/rubber	449	7,653	8,577	715	2,090	19,484
26	Wood prods.	20	629	306	19	0	975
27	Newsprint/paper	1	23	2	2	161	189
28	Paper articles	83	1,410	859	71	133	2,556
29	Printed prods.	113	3,925	2,231	113	1,863	8,245
30	Textiles/leather	750	13,363	14,791	455	1,583	30,942
31	Nonmetal min. prods.	98	1,994	1,903	75	10	4,079
32	Base metals	101	2,921	3,020	104	3,426	9,572
33	Articles—base metal	674	8,845	8,303	274	3,297	21,392
34	Machinery	3,764	65,706	52,711	2,842	5,271	130,294
35	Electronics	4,079	98,829	24,515	3,017	11,954	142,394
36	Motorized vehicles	154	18,844	4,429	421	3,062	26,908
37	Transport equip.	140	39,918	1,902	153	170	42,283
38	Precision instruments	501	9,887	9,318	522	756	20,983
39	Furniture	341	2,723	1,112	144	233	4,553
40	Misc. mfg. prods.	269	7,014	2,359	193	1,793	11,629
41	Waste/scrap	0	150	0	0	0	150
43	Mixed freight	140	3,367	2,360	90	1,937	7,895
	Totals	**13,218**	**318,733**	**158,972**	**10,375**	**42,144**	**543,442**

n.e.c. = not elsewhere classified

Table 31 shows the expected levels of air cargo tons between 2002 and 2035 for each FAF dataset. Combined, it is expected that air cargo will increase by over 526 percent, or

roughly 16 percent per year. Air shipments to and from international locations are expected to experience the greatest level of change, with almost 682 percent over the time period.

Table 31. Projected Air Cargo Tons by FAF Database for Shipments Originating or Terminating in Texas.

Database	2002	2035	% Change
Domestic	195,101	745,559	282.1
International	348,341	2,723,755	681.9
Border and Sea	39,993	187,487	368.8
Total	**583,435**	**3,656,801**	**526.8**

Table 32 and Table 33 pertain to the tons for the base year and projected commodities. Table 32 provides the expected change in air cargo tons per commodity for the Domestic and International datasets. The domestic air cargo shipments to and from Texas are expected to increase by 282 percent between 2002 and 2035, which equates to less than 9 percent per year. The international shipments are expected to grow a total of 682 percent over the period, or approximately 21 percent annually.

Table 33 combines the domestic and international air cargo tons per commodity and provides a rank based on total tons. All of the commodities in the top 10 in 2002 are in the top 10 in 2035, with several changes in position. Electronics and machinery remain the top two commodities, with electronics expected to grow by over 1,000 percent and machinery by 485 percent. Precision instruments are expected to grow by over 1,220 percent over the period, moving it to the third position in 2035. Other commodities outside the top 10 that experience tremendous growth include cereal grains, primarily since it goes from only 8 tons per year to 164 tons, and pharmaceuticals, which is forecasted to experience a 746 percent increase in total tons.

Table 32. Projected FAF Air Cargo Tons by Commodity for Shipments Originating or Terminating in Texas.

Code	Commodity	Domestic			International			Total
		2002	2035	% Change	2002	2035	% Change	% Change
1	Live animals/fish	8	10	25.0	5,507	8,203	49.0	48.9
2	Cereal grains	0	0	0.0	8	164	2,036.4	2,036.4
3	Other ag. prods.	37	73	97.6	4,735	7,097	49.9	50.3
4	Animal feed	0	0	0.0	382	1,906	399.3	399.3
5	Meat/seafood	1,210	2,749	127.2	4,802	12,645	163.3	156.0
6	Milled grain prods.	4,160	7,130	71.4	503	981	95.1	73.9
7	Other foodstuffs	1,940	5,240	170.1	1,529	3,141	105.4	141.6
8	Alcoholic beverages	73	38	–48.5	947	1,262	33.2	27.4
9	Tobacco prods.	0	0	0.0	82	32	–61.1	–61.1
11	Natural sands	1,020	250	–75.5	0	0	0.0	–75.5
13	Nonmetallic minerals	10	10	0.0	645	2,064	219.9	216.6
14	Gravel	0	0	0.0	16	60	270.6	270.6
19	Coal—n.e.c.	1,670	5,040	201.8	332	606	82.4	182.0
20	Basic chemicals	2,008	6,020	199.8	4,275	23,046	439.1	362.6
21	Pharmaceuticals (10)	2,448	7,635	211.9	1,932	29,456	1,424.7	746.8
22	Crude petroleum	0	0	0.0	4	3	–7.7	–7.7
23	Chemical prods. (5)	7,218	53,025	634.6	11,415	49,264	331.6	449.0
24	Plastics/rubber (9)	3,645	7,822	114.6	15,839	47,052	197.1	181.6
26	Wood prods.	196	262	33.5	779	2,288	193.7	161.5
27	Newsprint/paper	163	328	100.9	26	18	–27.8	83.4
28	Paper articles	102	130	27.5	2,454	4,925	100.7	97.8
29	Printed prods.	5,612	7,450	32.8	2,633	4,721	79.3	47.6
30	Textiles/leather	4,256	1,543	–63.8	26,686	100,327	276.0	229.2
31	Nonmetal min. prods.	421	814	93.3	3,658	16,931	362.8	335.0
32	Base metals	5,236	12,011	129.4	4,336	5,708	31.6	85.1
33	Articles—base metal (8)	7,505	15,577	107.5	13,887	45,351	226.6	184.8
34	Machinery (2)	8,719	17,825	104.4	121,575	744,407	512.3	485.0
35	Electronics (1)	65,644	337,454	414.1	76,750	1,234,412	1,508.4	1,003.9
36	Motorized vehicles (7)	21,272	53,686	152.4	5,636	17,160	204.5	163.3
37	Transport equip. (4)	39,243	133,938	241.3	3,040	13,756	352.5	249.3
38	Precision instruments (3)	1,831	23,618	1,189.9	19,152	254,931	1,231.1	1,227.5
39	Furniture	1,331	1,154	–13.3	3,222	35,431	999.5	703.5
40	Misc. mfg. prods. (6)	4,765	31,387	558.7	6,864	42,232	515.3	533.1
41	Waste/scrap	150	150	0.0	0	0	0.0	0.0
43	Mixed freight	3,208	13,192	311.2	4,687	14,173	202.4	246.6
	Totals	**195,101**	**745,559**	**282.1**	**348,341**	**2,723,755**	**681.9**	**538.4**

Note: Numbers in parenthesis represent the top 10 commodities ranked by total tons for 2035.
n.e.c. = not elsewhere classified

Table 33. Projected FAF Air Cargo Tons per Commodity Ranked by Total Domestic and International Tons.

Code	Commodity	2002		2035		Total % Change
		Total	Rank	Total	Rank	
1	Live animals/fish	5,515	16	8,213	20	48.9
2	Cereal grains	8	34	164	31	2,036.4
3	Other ag. prods.	4,772	17	7,170	22	50.3
4	Animal feed	382	29	1,906	27	399.3
5	Meat/seafood	6,012	15	15,394	17	156.0
6	Milled grain prods.	4,663	18	8,111	21	73.9
7	Other foodstuffs	3,469	22	8,381	19	141.6
8	Alcoholic beverages	1,020	25	1,299	28	27.4
9	Tobacco prods.	82	32	32	34	–61.1
11	Natural sands	1,020	26	250	30	–75.5
13	Nonmetallic minerals	655	28	2,074	26	216.6
14	Gravel	16	33	60	33	270.6
19	Coal—n.e.c.	2,002	24	5,646	23	182.0
20	Basic chemicals	6,283	14	29,065	13	362.6
21	Pharmaceuticals	4,380	20	37,092	11	746.8
22	Crude petroleum	4	35	3	35	–7.7
23	Chemical prods.	18,633	9	102,289	5	449.0
24	Plastics/rubber	19,484	8	54,874	10	181.6
26	Wood prods.	975	27	2,550	25	161.5
27	Newsprint/paper	189	30	346	29	83.4
28	Paper articles	2,556	23	5,055	24	97.8
29	Printed prods.	8,245	12	12,171	18	47.6
30	Textiles/leather	30,942	4	101,870	6	229.2
31	Nonmetal min. prods.	4,079	21	17,744	15	335.0
32	Base metals	9,572	11	17,719	16	85.1
33	Articles—base metal	21,392	6	60,928	9	184.8
34	Machinery	130,294	2	762,232	2	485.0
35	Electronics	142,394	1	1,571,865	1	1,003.9
36	Motorized vehicles	26,908	5	70,846	8	163.3
37	Transport equip.	42,283	3	147,694	4	249.3
38	Precision instruments	20,983	7	278,549	3	1,227.5
39	Furniture	4,553	19	36,585	12	703.5
40	Misc. mfg. prods.	11,629	10	73,619	7	533.1
41	Waste/scrap	150	31	150	32	0.0
43	Mixed freight	7,895	13	27,365	14	246.6
	Totals	**543,442**		**3,469,313**		**538.4**

n.e.c. = not elsewhere classified

Table 34 shows the percent change by FAF region for domestic and international volumes between 2002 and 2035. Significant growth of 6,451 percent is expected for domestic

shipments originating in the Houston area. The overall domestic growth in Houston is expected to be over 1,100 percent, while the other regions are expected to experience modest growth in domestic traffic. All the regions are expected to grow for international air cargo, especially for inbound shipments. Austin and Houston are expected to experience the greatest amount of international air cargo growth between 2002 and 2035.

Table 34. Percent Changes in Air Cargo Tons between 2002 and 2035 by Texas FAF Region.

FAF Region	Domestic % Change			International % Change			Grand Total % Change
	Originating (Outbound)	Terminating (Inbound)	Total	Originating (Outbound)	Terminating (Inbound)	Total	
Austin	669	132	292	358	989	772	682
Dallas	92	337	159	357	986	731	495
Houston	6,451	126	1,113	489	706	598	674
San Antonio	10	91	71	358	985	595	490
Remainder	184	227	206	312	1,616	978	324
Totals	**305**	**247**	**282**	**413**	**898**	**682**	**538**

Table 35 contains the expected regional total tons for each Texas FAF region by commodity. Based on the projected tons, most of the major commodities appear concentrated in the Dallas FAF region. Tables detailing the projected (year 2035) domestic and international air cargo inbound and outbound totals for each FAF region are provided in Appendix D.

Table 36 provides the top five origin-destination pairs for domestic shipments based on the 2035 forecast data. Compared to the top 2002 origins and destinations, the 2035 originating domestic pairs mostly originated from Houston, whereas in 2002 all the top five origins were from the Dallas region. Dallas was the predominant destination into Texas in 2035, whereas the destinations were split between Houston and Dallas in 2002. The destinations from Texas origins are all located in middle America or the East Coast. Domestic shipments to Texas have three origins along the West Coast, whereas the 2002 data contained mostly middle America origins.

Table 35. Projected Total Air Cargo Tons by Texas FAF Zone for Domestic and International Air Cargo Shipments (Tons—Year 2035).

Code	Commodity	Austin	Dallas	Houston	San Antonio	Remainder	Grand Total
1	Live animals/fish	289	4,832	2,920	148	24	8,213
2	Cereal grains	4	91	65	4	0	164
3	Other ag. prods.	243	3,509	3,154	177	87	7,170
4	Animal feed	90	1,364	389	63	1	1,906
5	Meat/seafood	475	11,877	2,374	659	9	15,394
6	Milled grain prods.	24	1,074	6,967	45	1	8,111
7	Other foodstuffs	66	6,841	1,366	76	32	8,381
8	Alcoholic beverages	15	515	710	9	50	1,299
9	Tobacco prods.	1	26	3	2	1	32
11	Natural sands	0	0	0	0	250	250
13	Nonmetallic minerals	37	379	1,613	34	11	2,074
14	Metallic ores	0	42	8	0	10	60
19	Coal—n.e.c.	14	341	276	10	5,004	5,646
20	Basic chemicals	474	7,944	17,585	411	2,652	29,065
21	Pharmaceuticals	1,548	20,065	12,422	1,187	1,869	37,092
22	Fertilizers	0	1	2	0	0	3
23	Chemical prods.	1,413	78,068	20,965	1,335	509	102,289
24	Plastics/rubber	1,508	22,440	24,318	1,236	5,371	54,874
26	Wood prods.	50	1,737	720	42	1	2,550
27	Newsprint/paper	1	18	3	1	322	346
28	Paper articles	159	2,515	2,077	124	179	5,055
29	Printed prods.	151	5,343	2,935	137	3,605	12,171
30	Textiles/leather	2,753	49,188	47,337	1,297	1,295	101,870
31	Nonmetal min. prods.	353	11,250	5,881	227	33	17,744
32	Base metals	186	2,779	8,662	200	5,891	17,719
33	Articles—base metal	2,570	26,716	25,926	822	4,894	60,928
34	Machinery	21,003	433,197	280,532	13,528	13,973	762,232
35	Electronics	58,898	824,434	582,537	30,666	75,330	1,571,865
36	Motorized vehicles	495	38,215	18,111	1,248	12,777	70,846
37	Transport equip.	478	136,269	9,719	623	606	147,694
38	Precision instruments	6,403	131,330	113,886	4,975	21,954	278,549
39	Furniture	1,492	22,603	10,126	741	1,623	36,585
40	Misc. mfg. prods.	1,703	41,312	15,266	995	14,344	73,619
41	Waste/scrap	0	150	0	0	0	150
43	Mixed freight	447	10,024	10,913	199	5,783	27,365
	Totals	**103,344**	**1,896,490**	**1,229,768**	**61,221**	**178,491**	**3,469,313**

n.e.c. = not elsewhere classified

Table 36. Top Five FAF Projected Origin-Destination Pairs for Domestic Shipments (Year 2035).

Rank	Origin	Destination	Total	
			Tons	% Change
Texas Origins				
1	Houston	Kentucky-Louisville (Ky. part)	70,377	21,226%
2	Dallas	Illinois-St. Louis (Ill. part)	53,960	254%
3	Houston	New Jersey-New York (N.J. part)	44,882	6,589%
4	Houston	Illinois-Chicago (Ill. part)	38,330	8,055%
5	Dallas	Arkansas	31,240	160%
		Top five total	**238,789**	**731%**
		Originating total	**476,454**	**305%**
Texas Destinations				
1	Indiana-Indianapolis	Dallas	47,780	943%
2	California-San Jose	Texas-Remainder	17,920	2,069%
3	Oregon-Portland	Dallas	15,059	1,607%
4	Texas-Remainder	Dallas	13,082	454%
5	California-Remainder	Dallas	9,350	327%
		Top five total	**103,192**	**852%**
		Terminating total	**269,105**	**247%**
		Domestic grand total	**745,559**	**282%**

The tremendous growth of the Houston to Louisville pair is all related to the shipment of electronics. This is also true for all the other Houston origins in 2035. The exclusive commodity related to the Dallas to St. Louis (Illinois part) pair and the Dallas to Arkansas pair is transportation equipment. For the air cargo shipments into Texas the growth for the top five pairs is distributed between several commodities. The primary commodity for the Indianapolis, Indiana, to Dallas pair is chemical products, while the San Jose, California, to the remainder of Texas is mostly precision instruments. Miscellaneous manufactured products are the primary commodity for the intrastate movements between the remainder of Texas and Dallas.

Table 37 provides the top five origin-destination pairs for international air cargo volumes for 2035. The origins and destinations in 2035 are very similar to the pairs in 2002. The major international commodities to and from Texas include machinery and electronics.

Table 37. Top Five FAF Projected Origin-Destination Pairs for International Shipments (Year 2035).

Rank	Origin	Destination	Total	
			Tons	% Change
Texas Origins				
1	Houston	Europe	306,210	530%
2	Dallas	E. Asia/S. Asia/Russia	176,400	387%
3	Dallas	Europe	133,407	328%
4	Houston	Mexico	33,698	280%
5	Dallas	Americas (other)	24,335	341%
		Top five total	**674,050**	**417%**
		Originating total	**796,795**	**413%**
Texas Destinations				
1	E. Asia/S. Asia/Russia	Dallas	691,518	987%
2	Europe	Dallas	366,165	983%
3	Europe	Houston	365,525	703%
4	Americas (other)	Dallas	126,590	984%
5	Americas (other)	Houston	69,798	713%
		Top five total	**1,619,595**	**892%**
		Terminating total	**1,926,960**	**898%**
		International grand total	**2,723,755**	**682%**

Related to the FAF International dataset, Table 38 shows the air cargo ports of entry and exit projected levels and expected change between 2002 and 2035. Just as in 2002, all 2035 shipments into or out of the Texas gateways either originate or terminate in Texas. Dallas and Houston are expected to remain the two most active ports of entry/exit in Texas, combining for almost 90 percent of the total tons in 2035. Approximately 75 percent of all the tons through Texas gateways represent inbound shipments that terminate at Texas destinations. The projected air cargo shipments originating in Texas through Texas gateways are expected to experience modest growth compared to the international shipments into Texas through Texas gateways. El Paso and Laredo are expected to see significant growth as ports of entry exceeding 1,500 percent by 2035.

Table 38 also indicates international shipments originating or terminating in Texas but that went through a port of entry/exit outside Texas. Compared to the top five gateways in 2002, the 2035 totals indicate Anchorage, Washington, D.C., New York, and Seattle are still the major gateways. Miami moves into the top five, whereas Los Angeles made up the fifth spot in 2002. The Alaska-Anchorage FAF gateway experiences almost 70 percent of the non-Texas port of entry/exit activity in 2035. In 2002, that percentage was 85 percent, indicating that other

gateways are expected to be utilized for Texas international shipments. Approximately 75 percent of the international air cargo shipments to or from Texas in 2035 is expected to utilize Texas ports of entry/exit.

Table 38. Projected Levels for FAF Ports of Entry/Exit for International Air Shipments Originating or Terminating in Texas (Year 2035).

Ports of Entry/Exit	Originating		Terminating		Total	
	Tons	% Change	Tons	% Change	Tons	% Change
Texas Ports of Entry/Exit						
Austin	16,892	357.6	74,394	985.3	91,286	765.5
Brownsville/Hidalgo	114	120.2	0	0.0	114	120.2
Corpus Christi	0	0.0	5	708.0	5	708.0
Dallas	209,400	328.5	858,942	983.7	1,068,343	733.8
El Paso	8,645	347.1	35,890	1,652.7	44,535	1,018.6
Houston	242,779	278.8	534,434	709.8	777,213	497.5
Laredo	1,165	82.2	14,383	1,539.8	15,548	925.3
San Antonio	23,619	357.3	34,273	985.8	57,892	595.7
Remainder of Texas	313	349.5	307	1,425.8	620	590.8
Totals	**502,927**	**303.9**	**1,552,629**	**881.3**	**2,055,555**	**627.0**
Non-Texas Ports of Entry/Exit						
Alaska-Anchorage	118,427	392.9	345,852	1,000.6	464,279	737.3
Washington, D.C.	99,022	4,024.4	5,525	253.9	104,547	2,538.8
New York-New York	30,971	4,354.2	2,753	854.4	33,723	3,328.0
Washington-Seattle	19,526	550.0	8	770.8	19,533	550.0
Florida-Miami	11,046	10,643.9	422	769.7	11,468	7,475.4
Other	14,878	3,276.4	19,770	1,118.4	34,649	1,579.3
Totals	**293,868**	**858.1**	**374,331**	**971.2**	**668,199**	**918.4**

Examining the FAF Border dataset provides a view to cross-border movements to and from the United States that utilize both truck and air. Table 39 shows the top five FAF ports of entry/exit for "air and truck" shipments based on 2035 tons in the Border dataset. Texas gateways maintain the top four spots, with the New York-Buffalo gateway rounding out the top five. The top five gateways represent 89 percent of the total cross-border tons moved in 2035 compared to only 81 percent in 2002. All of the Texas ports of entry/exit combine for 87 percent of the activity in 2035, up from 74 percent in 2002. This indicates for cross-border "air and truck" movements Texas gateways will play a bigger role.

Table 39. Projected Levels for FAF Border Ports of Entry/Exit (Year 2035).

Ports of Entry/Exit	2002	2035	% Change
Laredo	29,720	129,198	334.7
El Paso	9,540	84,969	790.7
Brownsville/Hidalgo	4,260	20,933	391.4
Texas remainder	3,500	12,961	270.3
New York-Buffalo	6,500	9,122	40.3
Remaining ports	12,390	32,343	161.0
Total	**65,910**	**289,526**	**339.3**

Table 40 examines only the activities through the Texas FAF gateways in the Border dataset for "air and truck" movements. Expected growth is highest for cross-border "air and truck" shipments with Texas destinations. The El Paso FAF gateway is expected to increase in activity by the greatest level, 790.7 percent from 2002 to 2035.

Table 40. Texas FAF Border Ports of Entry/Exit Projected Levels (Year 2035).

Texas Ports of Entry/Exit	Originating (Outbound)			Terminating (Inbound)			Outside of Texas			Total % Change
	2002	2035	% Change	2002	2035	% Change	2002	2035	% Change	
Brownsville/ Hidalgo	2,130	5,116	140.2	690	5,985	767.3	1,440	9,833	582.8	391.4
Dallas	800	1,129	41.2	70	721	929.7	380	198	–47.9	63.8
El Paso	900	4,180	364.4	6,300	72,646	1,053.1	2,340	8,144	248.0	790.7
Houston	10	21	112.0	20	126	528.0	210	674	221.1	242.2
Laredo	5,430	16,604	205.8	1,910	19,735	933.2	22,380	92,860	314.9	334.7
Remainder of Texas	360	1,017	182.6	160	1,271	694.3	2,980	10,673	258.2	270.3
Totals	**9,630**	**28,067**	**191.5**	**9,150**	**100,482**	**998.2**	**29,730**	**122,382**	**311.6**	**417.3**

Table 41 examines the commodities shipped by "air and truck" through Texas border gateways. This table includes shipments that have both origins and destinations located outside the Texas FAF regions. Electronics is expected to remain the top commodity in 2035, experiencing a growth of over 1,000 percent. Machinery, transportation equipment, motorized vehicles, and alcoholic beverages are the other top commodities in 2035.

Table 41. Expected FAF Commodities of Air Cargo Shipments through Texas Border Gateways (Tons—Year 2035).

Code	Commodity	2002	2035	% Change
1	Live animals/fish	360	1,229	241.3
2	Cereal grains	240	109	–54.5
3	Other ag. prods.	360	2,204	512.2
4	Animal feed	30	42	39.3
5	Meat/seafood	30	325	984.3
6	Milled grain prods.	60	149	148.3
7	Other foodstuffs	60	83	38.5
8	Alcoholic beverages (5)	3,450	8,208	137.9
9	Tobacco prods.	10	4	–57.0
11	Natural sands	0	0	0.0
13	Nonmetallic minerals	860	1,731	101.3
14	Gravel	0	0	0.0
19	Coal—n.e.c.	60	196	226.7
20	Basic chemicals (10)	520	2,322	346.6
21	Pharmaceuticals	10	122	1,117.0
22	Crude petroleum	0	0	0.0
23	Chemical prods.	370	1,674	352.3
24	Plastics/rubber (8)	1,090	3,228	196.2
26	Wood prods.	30	17	–42.3
27	Newsprint/paper	20	13	–33.0
28	Paper articles	180	386	114.2
29	Printed prods.	0	0	0.0
30	Textiles/leather	240	264	9.8
31	Nonmetal min. prods.	180	547	203.7
32	Base metals (7)	1,240	4,301	246.9
33	Articles—base metal (6)	2,950	8,063	173.3
34	Machinery (2)	5,910	25,419	330.1
35	Electronics (1)	14,420	158,907	1,002.0
36	Motorized vehicles (4)	5,870	8,671	47.7
37	Transport equip. (3)	9,090	17,958	97.6
38	Precision instruments (9)	330	2,524	664.8
39	Furniture	40	474	1,084.5
40	Misc. mfg. prods.	240	1,286	435.7
41	Waste/scrap	0	0	0.0
43	Mixed freight	260	475	82.8
	Totals	**48,510**	**250,931**	**417.3**

Note: Numbers in parenthesis represent the top 10 commodities ranked by 2035 tons.
n.e.c. = not elsewhere classified

CHAPTER 5. TEXAS AIR CARGO PROFILES

Collectively, the 11 largest airports represented 99.48 percent of all the 2006 cargo activity in the state of Texas by tonnage (see Table 42). Houston Hobby (number 11) represented 0.99 percent, while Midland-Odessa (next on the list at number 12) represented just 0.17 percent.

Table 42. Top 11 Texas Airports by Total Air Cargo Activity, 2006 (Tons).

Rank	City	Name	Inbound	Outbound	Total
1	Dallas/Fort Worth	Dallas/Fort Worth International	481,322.4	408,279.8	889,602.2
2	Houston	George Bush Intercontinental Airport	230,865.0	219,864.3	450,729.3
3	Fort Worth	Fort Worth Alliance	115,795.7	122,134.3	237,930.0
4	San Antonio	San Antonio International	87,210.1	58,185.9	145,396.0
5	Austin	Austin-Bergstrom International	60,648.9	58,436.8	119,085.7
6	El Paso	El Paso International	37,053.4	37,651.0	74,704.5
7	Dallas	Dallas Love Field	17,330.3	17,258.0	34,588.3
8	Harlingen	Rio Grande Valley International	16,778.6	15,356.9	32,135.5
9	Lubbock	Lubbock International	16,095.1	8,995.4	25,090.5
10	Laredo	Laredo International	14,880.2	8,790.2	23,670.5
11	Houston	William P. Hobby	8,969.1	11,482.6	20,451.7
Remainder of Texas			4,601.1	6,106.5	10,707.6
		Totals	**971,036.4**	**1,093,055.4**	**2,064,091.7**

An in-depth analysis of each of these airports reveals a more complete profile of the role of air cargo in the state of Texas. For each of these 11 airports, the following information is provided:

- the 11-year trend (1996–2006) in the inbound, outbound, and total tons of air cargo moved at the airport;
- for calendar year 2006, the distribution of the total cargo activity at each airport by FAA Form 41 service class definitions (scheduled passenger/cargo service, scheduled all-cargo service, non-scheduled civilian passenger/cargo service, and non-scheduled civilian all-cargo service);
- for calendar year 2006, the top five air carriers in terms of the share of total cargo activity at each airport;
- for calendar year 2006, the top five domestic markets (cities) served by air cargo carriers at each airport; and

- for calendar year 2006, the top five international markets (countries) served by air cargo carriers at each airport.

Analysis in this chapter is based on air cargo tonnage data obtained from the FAA and BTS for each year between 1996 and 2006 and compiled into a large database. For each airport, this database was queried to gain additional insights into potential trends in air cargo activities around Texas.

1. DALLAS/FORT WORTH INTERNATIONAL AIRPORT—DALLAS/FORT WORTH

Dallas/Fort Worth International Airport was Texas' most dominant airport in terms of total tons of cargo activity in 2006, accounting for 43.1 percent of all air cargo movements in the state. Between 1996 and 2006, growth in air cargo activity at DFW has been steady, averaging almost 12 percent over the 11-year period (see Table 43). The table also shows a sharp increase in activity of 46 percent between 2000 and 2001, due in large part to the establishment of a UPS Airlines operations hub at DFW in 2001. Slightly more air cargo tons travel inbound than outbound.

Table 43. DFW Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	188,226.06	196,132.49	384,358.55
1997	194,799.84	199,306.71	394,106.55
1998	186,645.35	191,051.17	377,696.52
1999	197,573.25	190,982.03	388,555.29
2000	216,402.83	199,691.29	416,094.11
2001	316,652.79	290,129.53	606,782.32
2002	325,006.28	286,628.37	611,634.65
2003	433,580.24	377,384.42	810,964.66
2004	485,381.67	406,400.25	891,781.93
2005	473,055.84	399,615.20	872,671.05
2006	481,322.45	408,279.78	889,602.23

Table 44 shows that scheduled all-cargo flights accounted for about two-thirds of all air cargo movements at DFW in 2006. In 2006, UPS Airlines had the largest share of all DFW air cargo activity by tons, carrying about one-quarter of all air cargo tons at the facility (see Table 45). American Airlines, which has its major passenger operations hub at DFW, carried over 162,000 tons or about one-fifth of the air cargo at DFW in 2006.

Table 44. DFW Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	99,751.53	97,431.98	197,183.51	22.2
Scheduled all-cargo service	322,290.89	263,779.64	586,070.53	65.9
Non-scheduled civilian passenger/cargo service	53.75	77.53	131.29	<0.1
Non-scheduled civilian all-cargo service	59,226.28	46,990.62	106,216.90	11.9
Total all service classes	**481,322.45**	**408,279.78**	**889,602.23**	**100.0**

Table 45. DFW Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	UPS Airlines	113,727.07	107,183.51	220,910.58	24.8
2	American Airlines	82,033.79	80,305.88	162,339.67	18.2
3	FedEx Express	67,416.60	72,763.00	140,179.59	15.8
4	Eva Airways	36,098.83	19,910.30	56,009.13	6.6
5	Korean Airlines	31,483.84	16,230.05	47,713.89	5.4
-	All other carriers	150,562.32	111,797.04	262,359.36	29.2
	Total all carriers	**481,322.45**	**408,279.78**	**889,602.23**	**100.0**

Memphis, Tennessee, was the largest domestic market served by DFW air cargo, accounting for 15.8 percent of the total air cargo tonnage moved at the airport in 2006, followed by Louisville, Kentucky (see

Table 46). Both Memphis and Louisville are major nationwide air cargo hubs—Memphis, Tennessee, for FedEx Express and Louisville, Kentucky for UPS Airlines. Table 47 indicates a majority of the internationally based air cargo that moved through DFW in 2006 came from the Asian nations of Taiwan, South Korea, and China. Sixty percent of international air cargo tons at DFW traveled in the inbound direction. The United Kingdom is the only top five international market where outbound shipments exceeded the inbound tons.

Table 46. DFW Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	41,726.94	43,460.53	85,187.47	15.8
2	Louisville, Kentucky	42,386.35	35,190.13	77,576.48	14.3
3	Indianapolis, Indiana	16,925.31	19,865.69	36,791.00	6.8
4	Newark, New Jersey	17,580.55	16,169.28	33,749.83	6.3
5	Ontario/San Bernardino, California	13,330.49	16,793.97	30,124.46	5.6
-	All other domestic cities	138,585.83	137,745.49	276,331.32	51.2
	Total domestic	**270,535.47**	**269,225.09**	**539,760.56**	**100.0**

Table 47. DFW International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	Taiwan	62,309.70	32,876.74	95,186.44	27.2
2	South Korea	36,793.52	25,530.75	62,324.27	17.8
3	China	27,627.30	6,907.12	34,534.42	9.9
4	Germany	15,485.84	14,748.35	30,234.19	8.6
5	United Kingdom	10,931.10	14,116.34	25,047.44	7.2
-	All other countries	57,639.22	44,875.39	102,514.61	29.3
Total international		**210,786.98**	**139,054.69**	**349,841.67**	**100.0**

2. GEORGE BUSH INTERCONTINENTAL AIRPORT—HOUSTON

Houston's George Bush Intercontinental Airport moved 450,729.33 tons of air cargo in 2006, representing almost 22 percent of all 2006 air cargo activity in Texas. Between 2002 and 2003, air cargo activity at IAH increased dramatically from 262,799 tons to 417,737 tons, or an increase of almost 59 percent (see Table 48). This increase was driven in part by the expansion of IAH-based activity for two major cargo carriers, FedEx Express and UPS Airlines. Air cargo activity at IAH grew an average of 9 percent annually over the 11-year time period.

Table 48. IAH Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	104,392.44	121,558.02	225,950.46
1997	114,165.58	120,196.95	234,362.53
1998	125,657.16	123,406.24	249,063.39
1999	130,413.49	127,109.80	257,523.29
2000	135,528.43	129,012.08	264,540.51
2001	125,799.08	124,091.89	249,890.97
2002	132,994.21	129,805.53	262,799.74
2003	213,970.93	203,766.26	417,737.19
2004	224,344.62	206,574.22	430,918.84
2005	219,957.59	212,681.29	432,638.88
2006	230,865.04	219,864.29	450,729.33

IAH is a major hub for passenger and freight operations of Continental Airlines, which has its corporate headquarters in Houston. As a result, flights classified as scheduled passenger and cargo service and scheduled all-cargo service had a nearly equal share of air cargo activity at IAH in 2006 (see Table 49). Furthermore, Continental Airlines had the largest share of all air cargo activity at IAH in 2006, carrying 31.8 percent of IAH-based air cargo (see Table 50).

Table 49. IAH Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	117,979.39	99,605.07	217,584.47	48.3
Scheduled all-cargo service	93,293.11	98,327.81	191,620.92	42.5
Non-scheduled civilian passenger/cargo service	52.00	64.28	116.28	0.0
Non-scheduled civilian all-cargo service	19,540.53	21,867.13	41,407.67	9.2
Total all service classes	**230,865.04**	**219,864.29**	**450,729.33**	**100.0**

Table 50. IAH Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	Continental Airlines	78,631.85	64,852.36	143,484.21	31.8
2	FedEx Express	47,322.91	40,031.05	87,353.96	19.4
3	UPS Airlines	35,210.28	27,416.43	62,626.71	13.9
4	KLM Royal Dutch Airlines	12,556.09	12,349.65	24,905.74	5.5
5	Astar Air Cargo	11,708.25	10,777.27	22,485.52	5.0
-	All other carriers	45,435.66	64,437.53	109,873.19	24.4
Total all carriers		**230,865.04**	**219,864.29**	**450,729.33**	**100.0**

The markets served by air cargo based at IAH (Table 51) include the major nationwide air cargo hubs of Memphis, Tennessee (FedEx Express), Louisville, Kentucky (UPS Airlines), and Wilmington, Ohio (ABX Air, although this route was served by Astar Air Cargo in 2006). A majority of the international air cargo activity at IAH was based out of Europe (see Table 52). In 2006, domestic cargo at IAH favored the inbound direction, while international air cargo was slightly higher in the outbound direction.

Table 51. IAH Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	37,136.93	28,661.71	65,798.64	24.6
2	Louisville, Kentucky	25,027.77	20,608.72	45,636.49	17.1
3	Dallas/Fort Worth, Texas	16,096.31	13,526.55	29,622.86	11.1
4	Wilmington, Ohio	9,825.26	9,325.89	19,151.15	7.2
5	Newark, New Jersey	8,908.12	9,580.70	18,488.82	6.9
-	All other domestic cities	45,640.72	42,655.42	88,296.14	33.1
Total domestic		**142,635.11**	**124,358.99**	**266,994.10**	**100.0**

Table 52. IAH International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	United Kingdom	20,461.13	30,735.90	51,197.03	27.9
2	The Netherlands	16,382.88	15,807.28	32,190.16	17.5
3	France	14,266.55	15,047.72	29,314.27	16.0
4	Luxembourg	2,052.26	10,305.72	12,357.98	6.7
5	Germany	7,371.57	4,407.01	11,778.58	6.4
-	All other countries	27,695.54	19,201.67	46,897.21	25.5
Total international		**88,229.93**	**95,505.30**	**183,735.23**	**100.0**

3. FORT WORTH ALLIANCE AIRPORT—FORT WORTH

Fort Worth Alliance Airport (AFW) is located north of Fort Worth, adjacent to the Alliance Global Logistics Hub. In 1997, FedEx opened its Southwest Regional Sort Hub at Alliance Airport. Expansion of air cargo activity at AFW expanded in 2002 and has grown over 90 percent annually since that time, as shown in Table 53.

Table 53. AFW Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	0.00	24.35	24.35
1997	17.49	0.00	17.49
1998	0.00	0.00	0.00
1999	27.67	44.91	72.58
2000	70.10	44.28	114.37
2001	0.00	1.78	1.78
2002	20,542.87	22,424.68	42,967.55
2003	67,176.27	75,182.12	142,358.39
2004	73,997.09	82,643.15	156,640.24
2005	100,797.26	108,396.82	209,194.08
2006	115,795.68	122,134.28	237,929.96

As of 2006, no scheduled commercial air passenger service existed at AFW. As a result, all of the air cargo movements at AFW operated as all-cargo service, as shown in Table 54. The major presence of FedEx Express airlines at AFW is reflected in its 98.6 percent share of air cargo activity at the airport in 2006 (see Table 55).

Table 54. AFW Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	0.00	0.00	0.00	0.0
Scheduled all-cargo service	115,750.27	121,924.74	237,675.00	99.9
Non-scheduled civilian passenger/cargo service	7.44	0.00	7.44	<0.1
Non-scheduled civilian all-cargo service	37.97	209.54	247.51	0.1
Total all service classes	**115,795.68**	**122,134.28**	**237,922.52**	**100.0**

Table 55. AFW Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	114,502.38	120,114.22	234,616.60	98.6
2	Empire Airlines	1,247.89	1,810.52	3,058.41	1.3
3	Atlas Air	0.00	111.07	111.07	<0.1
4	Volga-Dnepr Airlines	0.00	71.88	71.88	<0.1
5	Polet Cargo Airlines	21.95	23.54	45.49	<0.1
-	All other carriers	23.46	3.05	26.54	<0.1
	Total all carriers	**115,795.68**	**122,134.28**	**237,929.96**	**100.0**

One impact of the role of AFW as the Southwest Regional Sort Hub for FedEx Express airlines is the variety of domestic markets that were served by air cargo flights to or from AFW, as shown in Table 56. In 2006, there was a very small amount of international air cargo at AFW, as shown in Table 57. Given the role of Anchorage, Alaska, as a major stopping point between the United States and Asia, it is assumed that a majority of the air cargo traveling between Alliance Airport and Anchorage was based in Asia. The directional balance of air cargo between these two airports favoring the inbound direction also supports this assumption, since international air cargo between the United States and Asia is primarily traveling from Asia to the United States.

Table 56. AFW Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Los Angeles, California	20,841.75	28,179.12	49,020.87	20.6
2	Fort Lauderdale, Florida	16,001.46	19,798.09	35,799.55	15.1
3	Oakland, California	17,198.58	17,199.27	34,397.85	14.5
4	Atlanta, Georgia	9,962.90	7,750.04	17,712.94	7.5
5	Anchorage, Alaska	11,503.86	3,071.04	14,574.90	6.1
-	All other domestic cities	40,621.45	46,041.31	86,662.76	36.2
	Total domestic	**115,770.00**	**122,038.87**	**237,808.87**	**100.0**

Table 57. AFW International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	United Kingdom	21.95	23.36	45.31	37.4
2	India	0.00	34.98	34.98	28.9
3	Turkmenistan	0.00	27.33	27.33	22.6
4	Qatar	0.00	9.57	9.57	7.9
5	Canada	3.72	0.00	3.72	3.1
-	All other countries	0.00	0.18	0.18	0.1
Total international		**25.67**	**95.42**	**121.09**	**100.0**

4. SAN ANTONIO INTERNATIONAL AIRPORT—SAN ANTONIO

In 2006, San Antonio International Airport (SAT) moved a total of 145,395.99 tons of air cargo, as shown in Table 58. Between 1996 and 2000, the total tons of air cargo moved at SAT was around 35,000 tons annually. Starting in 2001, air cargo activity at SAT has grown about 16 percent annually to its 2006 levels. The last 11 years of tonnage data indicate that air cargo at SAT has favored the inbound direction on the order of 60 percent to 40 percent outbound.

In 2006, 86.4 percent of all air cargo movements were made on scheduled all-cargo services, as shown in Table 59.

Table 60 indicates that more than 80 percent of all air cargo tonnage at SAT in 2006 was carried by the two major all-cargo airlines FedEx Express and UPS Airlines. Two commercial passenger airlines, Southwest Airlines and Continental Airlines, were active in the movement of air cargo at SAT in 2006.

Table 58. SAT Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	21,992.84	15,542.41	37,535.25
1997	20,380.94	16,468.97	36,849.91
1998	20,384.41	15,825.49	36,209.90
1999	19,152.76	14,414.77	33,567.54
2000	20,035.81	16,312.80	36,348.61
2001	41,021.09	32,644.12	73,665.21
2002	49,258.78	38,008.95	87,267.72
2003	77,058.18	52,222.85	129,281.03
2004	76,852.46	52,981.75	129,834.21
2005	79,203.53	51,893.19	131,096.72
2006	87,210.09	58,185.90	145,395.99

Table 59. SAT Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	6,969.96	4,206.19	11,176.16	7.7
Scheduled all-cargo service	75,765.57	49,867.21	125,632.78	86.4
Non-scheduled civilian passenger/cargo service	1.12	0.13	1.26	<0.1
Non-scheduled civilian all-cargo service	4,473.43	4,112.37	8,585.80	5.9
Total all service classes	**87,210.09**	**58,185.90**	**145,395.99**	**100.0**

Table 60. SAT Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	43,160.43	24,386.97	67,547.40	46.5
2	UPS Airlines	32,593.96	25,480.24	58,074.19	39.9
3	Astar Air Cargo	4,336.28	3,952.50	8,288.78	5.7
4	Southwest Airlines	2,848.07	1,947.95	4,796.02	3.3
5	Continental Airlines	1,672.74	1,067.10	2,739.85	1.9
-	All other carriers	2,598.61	1,351.14	3,949.75	2.7
Total all carriers		**87,210.09**	**58,185.90**	**145,395.99**	**100.0**

The five domestic cities with the highest share of air cargo movements at SAT are shown in Table 61. More detailed analysis of the 2006 air cargo tonnage data indicates that air cargo flights to Harlingen/San Benito may serve SAT as well. In 2006, international air cargo activity at SAT served three countries, with Mexico accounting for 99.7 percent of these international air cargo tons, as shown in Table 62. Note that most of the air cargo tonnage between SAT and Mexico was traveling from San Antonio to locations in Mexico, suggesting that the airport may be a distribution point for Mexico-bound air cargo from the United States.

Table 61. SAT Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	37,460.93	23,022.08	60,483.01	43.8
2	Louisville, Kentucky	18,083.43	6,428.03	24,511.46	17.8
3	Dallas/Fort Worth, Texas	9,397.66	3,800.70	13,198.36	9.6
4	Harlingen/San Benito, Texas	3,885.03	5,408.90	9,293.93	6.7
5	Rockford, Illinois	6,425.21	651.64	7,076.85	5.1
-	All other domestic cities	11,250.10	12,277.62	23,527.72	17.0
Total domestic		**86,502.36**	**51,588.97**	**138,091.33**	**100.0**

Table 62. SAT International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	Mexico	692.63	6,587.02	7,279.65	99.7
2	The Netherlands	15.10	0.00	15.10	0.2
3	Canada	0.00	9.91	9.91	0.1
Total international		**707.73**	**6,596.93**	**7,304.66**	**100.0**

5. AUSTIN-BERGSTROM INTERNATIONAL AIRPORT—AUSTIN

Austin-Bergstrom International Airport (AUS) is the primary commercial airport serving the state capital, moving a total of 119,085.68 tons of air cargo through the facility in 2006. While AUS mimicked the substantial growth in air cargo activity throughout the state between 2000 and 2003, the total tons of air cargo in 2006 were actually 20,000 tons less than activity levels in 2003–2004 (see Table 63) Note that in 2006, the balance of inbound and outbound air cargo at AUS was nearly equal.

Table 63. AUS Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	10,639.82	8,433.32	19,073.14
1997	12,364.05	9,344.79	21,708.84
1998	12,826.87	10,151.10	22,977.97
1999	15,371.04	11,780.34	27,151.38
2000	20,083.75	16,995.48	37,079.22
2001	22,182.00	18,704.86	40,886.86
2002	33,203.43	28,528.04	61,731.46
2003	69,068.61	65,266.81	134,335.42
2004	69,072.27	64,714.11	133,786.39
2005	63,365.22	59,601.71	122,966.93
2006	60,648.87	58,436.80	119,085.68

Scheduled all-cargo service accounted for 87 percent of air cargo movements at AUS in 2006, with most of the remaining air cargo moving on scheduled passenger and cargo combined service (see Table 64). Approximately half of the air cargo tonnage at AUS in 2006 was carried by FedEx Express, as shown in Table 65.

Table 64. AUS Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	7,248.34	8,200.93	15,449.28	13.0
Scheduled all-cargo service	53,356.86	50,208.09	103,564.96	87.0
Non-scheduled civilian passenger/cargo service	1.88	0.91	2.79	<0.1
Non-scheduled civilian all-cargo service	41.80	26.87	68.66	<0.1
Total all service classes	**60,648.87**	**58,436.80**	**119,085.68**	**100.0%**

Table 65. AUS Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	31,168.09	28,502.38	59,670.47	50.1
2	UPS Airlines	14,135.52	12,479.06	26,614.58	22.3
3	ABX Air	8,032.59	9,223.91	17,256.50	14.5
4	Southwest Airlines	4,138.25	5,137.90	9,276.15	7.8
5	American Airlines	1,234.26	1,241.14	2,475.39	2.1
-	All other carriers	1,940.16	1,852.41	3,792.57	3.2
	Total all carriers	**60,648.87**	**58,436.80**	**119,085.68**	**100.0**

In some respects, there is nothing special or unique about air cargo activity at AUS; rather, its air cargo profile could be considered just about as average as possible. For example, each of the three major all-cargo airlines have operations at the airport, and the major national hubs for each were the three largest markets served by AUS-based air cargo in 2006. Rounding out the top five markets served by AUS air cargo in 2006 were Texas' two largest urban areas, Dallas/Fort Worth and Houston (see Table 66). Only one international market, Mexico, was served by AUS in 2006, with a total of 8,728.57 tons of air cargo between AUS and locations in Mexico (5,937.99 tons inbound and 2,790.57 tons outbound).

Table 66. AUS Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	28,885.06	27,398.44	56,283.50	51.0
2	Louisville, Kentucky	8,090.47	9,649.45	17,739.92	16.1
3	Wilmington, Ohio	8,028.70	9,223.91	17,252.61	15.6
4	Dallas/Fort Worth, Texas	1,331.16	1,481.09	2,812.25	2.5
5	Houston, Texas	1,075.54	1,169.35	2,244.89	2.0
-	All other domestic cities	7,229.95	6,723.98	13,953.93	12.8
	Total domestic	**54,710.88**	**55,646.22**	**110,357.10**	**100.0**

6. EL PASO INTERNATIONAL AIRPORT—EL PASO

El Paso International Airport (ELP) has experienced an 11-year growth in air cargo activity on the order of 30 percent annually, to its 2006 air cargo activity of 74,704.45 tons, as shown in Table 67. The directional split of air cargo at ELP has evolved over the last 11 years from being primarily inbound to nearly equal in 2006.

Table 67. ELP Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	10,350.43	6,870.17	17,220.60
1997	10,530.11	7,168.21	17,698.32
1998	9,750.90	6,763.56	16,514.46
1999	11,271.74	7,379.38	18,651.13
2000	11,429.45	7,558.26	18,987.71
2001	13,707.20	8,201.25	21,908.45
2002	21,632.76	16,517.27	38,150.03
2003	45,767.18	41,609.84	87,377.02
2004	44,589.24	41,878.94	86,468.17
2005	40,688.19	39,421.73	80,109.93
2006	37,053.41	37,651.05	74,704.45

In 2006, more than 90 percent of the air cargo tonnage at ELP was carried on all-cargo operations, as shown in Table 68. FedEx Express carried about 45 percent of these tons, double the share of the second most active carrier at ELP, UPS Airlines (see Table 69). Also note that there were no commercial passenger carriers among the five largest carriers at ELP in 2006.

Table 68. ELP Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	4,031.84	1,921.28	5,953.12	8.0
Scheduled all-cargo service	23,425.31	27,111.89	50,537.20	67.6
Non-scheduled civilian passenger/cargo service	70.60	83.35	153.95	0.2
Non-scheduled civilian all-cargo service	9,525.65	8,534.53	18,060.18	24.2
Total all service classes	**37,053.41**	**37,651.05**	**74,704.45**	**100.0**

Table 69. ELP Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	14,525.46	19,175.03	33,700.49	45.1
2	UPS Airlines	8,899.85	7,936.86	16,836.71	22.5
3	Kitty Hawk Air Cargo	2,959.70	3,949.82	6,909.52	9.3
4	Capital Cargo International	3,527.11	2,759.36	6,286.47	8.4
5	Astar Air Cargo	2,847.56	1,343.35	4,190.92	5.6
-	All other carriers	4,293.73	2,486.63	6,780.36	9.1
	Total all carriers	**37,053.41**	**37,651.05**	**74,704.45**	**100.0**

The largest market served by air cargo at ELP was the FedEx Express international sorting hub of Memphis, Tennessee, as shown in Table 70. One interesting observation from Table 70 is the skewed directional balance for air cargo between ELP and San Antonio and ELP and Albuquerque, New Mexico, reflecting the possibility that one of the major all-cargo carriers flies from their larger hub to San Antonio, then ELP, then Albuquerque, and then returns to the hub. Nearly 90 percent of international air cargo activity at ELP is based in Mexico, with about two-thirds of this tonnage originating in Mexico and arriving at ELP (see Table 71). China, Canada, and Honduras are the other three international cities interchanging air cargo at ELP.

Table 70. ELP Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	14,235.77	16,743.97	30,979.74	42.2
2	San Antonio, Texas	5,760.86	209.75	5,970.61	8.1
3	St. Louis, Missouri	3,437.43	2,241.52	5,678.95	7.7
4	Albuquerque, New Mexico	357.95	5,311.20	5,669.15	7.7
5	Dallas/Fort Worth, Texas	2,263.66	2,359.73	4,623.39	6.3
-	All other domestic cities	10,239.24	10,284.59	20,523.83	28.0
	Total domestic	**36,294.91**	**37,150.76**	**73,445.67**	**100.0**

Table 71. ELP International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	Mexico	687.65	442.91	1,130.56	89.8
2	China	70.84	14.99	85.83	6.8
3	Canada	0.00	42.19	42.19	3.4
4	Honduras	0.00	0.19	0.19	<0.1
Total international		**758.49**	**500.29**	**1,258.78**	**100.0**

7. DALLAS LOVE FIELD—DALLAS

Dallas Love Field (DAL) is the regional airport in Dallas, located a few miles northeast of the Dallas central business district. Between 1996 and 2002, air cargo activity levels at DAL averaged around 15,000 tons annually; after more than doubling in 2003, the air cargo activity at DAL has remained constant at about 35,000 tons per year (see Table 72). For these 11 years, the directional split of air cargo activity at DAL has been approximately equal.

Table 72. DAL Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	4,622.13	8,321.15	12,943.27
1997	4,872.46	8,360.40	13,232.87
1998	5,424.90	8,148.49	13,573.39
1999	5,215.19	7,058.06	12,273.26
2000	4,909.54	6,739.91	11,649.45
2001	4,168.63	5,342.16	9,510.80
2002	7,326.89	8,341.22	15,668.11
2003	19,306.17	20,072.14	39,378.31
2004	19,206.12	18,561.20	37,767.32
2005	17,328.73	17,099.76	34,428.49
2006	17,330.28	17,258.03	34,588.31

Although DAL is the home airport for Southwest Airlines, ABX Air (now owned by DHL) had the largest share of air cargo based at the airport in 2006, as shown in Table 73.

Table 74 indicates that the share of air cargo carried by ABX Air was approximately equal to the percentage of air cargo carried by scheduled all-cargo service in 2006. In a similar fashion, the share of air cargo at DAL carried by its primary tenant for passenger operations, Southwest Airlines, is nearly the same as the percentage of air cargo carried by combined passenger/cargo services.

Table 73. DAL Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	ABX Air	7,390.55	7,588.99	14,979.53	43.3
2	Southwest Airlines	5,906.72	5,215.35	11,122.07	32.2
3	Astar Air Cargo	3,191.77	3,671.48	6,863.25	19.8
4	Express.Net Airlines	595.02	749.33	1,344.35	3.9
5	USA Jet Airlines	204.43	19.41	223.85	0.7
-	All other carriers	41.79	13.47	55.26	0.1
Total all carriers		**17,330.28**	**17,258.03**	**34,588.31**	**100.0**

Table 74. DAL Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	5,907.03	5,216.10	11,123.13	32.2
Scheduled all-cargo service	7,390.55	7,588.99	14,979.53	43.3
Non-scheduled civilian passenger/cargo service	0.00	0.00	0.00	0.0
Non-scheduled civilian all-cargo service	4,032.70	4,452.95	8,485.65	24.5
Total all service classes	**17,330.28**	**17,258.03**	**34,588.31**	**100.0**

Table 75 shows the domestic markets served by air cargo based at DAL in 2006. Given that ABX Air had the highest share of air cargo tonnage at DAL in 2006, it is not surprising that its national hub in Wilmington, Ohio, was the largest market served by DAL in 2006. It is suspected that the remaining domestic markets in Table 75 are served by Southwest Airlines, which continues to operate under Wright Amendment flight restrictions at DAL. Upon the elimination of these restrictions in 2014, Southwest Airlines may assume a larger share of the air cargo activity at DAL. Canada and Mexico were the only two international markets that were served by air cargo at DAL in 2006, with Mexico-based cargo accounting for nearly all of this activity, as shown in Table 76.

Table 75. DAL Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Wilmington, Ohio	9,829.59	10,085.14	19,914.73	57.6
2	El Paso, Texas	1,153.68	1,477.73	2,631.41	7.6
3	Houston, Texas	1,552.43	1,046.46	2,598.89	7.5
4	Albuquerque, New Mexico	747.09	492.37	1,239.46	3.6
5	Austin, Texas	534.62	329.95	864.57	2.5
-	All other domestic cities	3,505.58	3,824.99	7,330.57	21.2
Total domestic		**17,322.99**	**17,256.64**	**34,579.63**	**100.0**

Table 76. DAL International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	Mexico	7.28	1.27	8.55	98.5
2	Canada	0.00	0.13	0.13	1.5
Total international		**7.28**	**1.40**	**8.68**	**100.0**

8. RIO GRANDE VALLEY INTERNATIONAL AIRPORT—HARLINGEN

Rio Grande Valley International Airport (HRL) in Harlingen moved 32,135.52 tons in 2006, as seen in Table 77. Growth in air cargo tons at HRL has been steady, with major growth experienced beginning in 2001. Between 2005 and 2006 the air cargo levels reduced slightly.

Table 77. HRL Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	945.57	819.86	1,765.43
1997	761.32	614.72	1,376.04
1998	832.00	756.08	1,588.08
1999	775.99	832.00	1,607.99
2000	877.99	829.38	1,707.37
2001	3,632.00	3,261.17	6,893.17
2002	6,023.77	4,843.94	10,867.70
2003	11,433.93	8,195.02	19,628.95
2004	18,136.11	14,415.49	32,551.59
2005	18,389.49	14,553.54	32,943.03
2006	16,778.63	15,356.89	32,135.52

Scheduled all-cargo service made up 80.2 percent of the air cargo service, followed by non-scheduled civilian all-cargo service with 15.0 percent and scheduled passenger/cargo service with 4.8 percent (see Table 78). Table 79 shows FedEx Express accounted for over 44 percent of the total air cargo tons in 2006. The other major airlines include UPS Airlines with 29.1 percent and Capital Cargo International with 14.3 percent.

Table 78. HRL Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	838.96	690.88	1,529.85	4.8
Scheduled all-cargo service	13,529.44	12,250.42	25,779.86	80.2
Non-scheduled civilian passenger/cargo service	0.00	0.00	0.00	0.0
Non-scheduled civilian all-cargo service	2,410.23	2,415.59	4,825.82	15.0
Total all service classes	**16,778.63**	**15,356.89**	**32,135.52**	**100.0**

Table 79. HRL Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	6,860.51	7,332.15	14,192.66	44.2
2	UPS Airlines	5,371.25	3,965.66	9,336.91	29.1
3	Capital Cargo International	2,308.18	2,282.76	4,590.94	14.3
4	ABX Air	1,297.68	952.61	2,250.29	7.0
5	Southwest Airlines	838.96	690.88	1,529.85	4.8
-	All other carriers	102.05	132.83	234.87	0.6
	Total all carriers	**16,778.63**	**15,356.89**	**32,135.52**	**100.0**

Memphis, Tennessee, and San Antonio accounted for 82.5 percent of the domestic air cargo tons through HRL in 2006 (see Table 80).

Table 80. HRL Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	9,144.71	8,081.30	17,226.01	53.6
2	San Antonio, Texas	5,408.90	3,885.03	9,293.93	28.9
3	Wilmington, Ohio	1,044.53	708.75	1,753.28	5.5
4	Houston, Texas	444.95	553.39	998.34	3.1
5	Toledo, Ohio	0.00	674.12	674.12	2.1
-	All other domestic cities	725.63	1,453.85	2,179.48	6.80
	Total domestic	**16,768.72**	**15,356.44**	**32,125.16**	**100.0**

Mexico represents the only international country transporting air cargo to HRL, with 10.36 tons in 2006. Almost all of the service between HRL and Mexico involved movements into HRL, 9.91 tons compared to 0.45 tons.

9. LUBBOCK INTERNATIONAL AIRPORT—LUBBOCK

Lubbock International Airport (LBB) moved 25,090.54 tons of air cargo in 2006 (see Table 81). Sixty-four percent of the air cargo tons travel into LBB. LBB experienced very little air cargo activity between 1996 and 2001. Between 2001 and 2002 the air cargo tons grew from 1,414.66 tons to 7,677.87 tons, or just over 440 percent. Between 2002 and 2003 LBB experienced a 236 percent growth from 7,677.87 tons to 25,863.75 tons. Overall between 1996 and 2006, air cargo levels at LBB grew over 2,579 percent or an average annual growth rate of 234 percent.

Table 81. LBB Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	708.22	228.18	936.39
1997	836.09	310.82	1,146.91
1998	932.55	331.55	1,264.10
1999	882.30	321.91	1,204.21
2000	1,069.34	257.45	1,326.79
2001	974.61	440.05	1,414.66
2002	4,477.41	3,200.45	7,677.87
2003	15,560.44	10,303.31	25,863.75
2004	15,505.64	10,967.49	26,473.13
2005	15,525.01	10,109.77	25,634.77
2006	16,095.14	8,995.40	25,090.54

Scheduled all-cargo service made up almost all of the air cargo service in 2006 (see Table 82). FedEx Express was the most prominent airline transporting air cargo through LBB in 2006 representing 76.5 percent, as seen in Table 83.

Table 82. LBB Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	428.96	124.57	553.52	2.2
Scheduled all-cargo service	15,666.11	8,870.46	24,536.56	97.8
Non-scheduled civilian passenger/cargo service	0.08	0.38	0.45	0.0
Non-scheduled civilian all-cargo service	0.00	0.00	0.00	0.0
Total all service classes	**16,095.14**	**8,995.40**	**25,090.54**	**100.0%**

Table 83. LBB Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	FedEx Express	12,832.39	6,358.33	19,190.72	76.5
2	ABX Air	1,577.88	1,314.00	2,891.88	11.5
3	Empire Airlines	1,255.83	1,198.13	2,453.97	9.8
4	Southwest Airlines	426.09	121.38	547.47	2.2
5	American Eagle Airlines	2.87	1.67	4.54	<0.1
-	All other carriers	0.08	1.89	1.96	<0.1
Total all carriers		**16,095.14**	**8,995.40**	**25,090.54**	**100.0**

The major FedEx Express hub located in Memphis, Tennessee, represented the most significant market in 2006 (see Table 84). LBB also appears to transport significant levels between several other Texas markets.

Table 84. LBB Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	10,820.02	3,747.03	14,567.05	58.1
2	Dallas/Fort Worth, Texas	1,550.82	1,419.55	2,970.37	11.8
3	Wilmington, Ohio	1,483.87	1,075.37	2,559.24	10.2
4	Midland/Odessa, Texas	1,322.12	1,222.97	2,545.09	10.1
5	Abilene, Texas	337.86	496.04	833.90	3.3
-	All other domestic cities	580.45	1,034.44	1,614.89	6.50
	Total domestic	**16,095.14**	**8,995.40**	**25,090.54**	**100.0**

10. LAREDO INTERNATIONAL AIRPORT—LAREDO

Laredo International Airport (LRD) moved 23,670.46 tons of air cargo in 2006 compared to only 2,816.46 tons in 1996 (see Table 85). This represents an overall increase of 740.4 percent over the 11-year time period, or an average of slightly more than 67 percent per year. As seen in Table 85, the annual tons between 1996 and 2006 has not produced a steady growth annually but has experienced erratic annual levels before reaching levels greater than 20,000 tons per year starting in 1993. In 2006, almost two-thirds of the air cargo tons were in the inbound direction.

Table 85. LRD Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	1,186.11	1,630.35	2,816.46
1997	1,940.98	3,025.93	4,966.91
1998	3,901.70	5,316.08	9,217.79
1999	3,606.97	2,345.08	5,952.05
2000	6,883.51	2,930.08	9,813.58
2001	1,051.04	344.96	1,395.99
2002	4,186.20	3,064.50	7,250.70
2003	12,671.69	10,855.15	23,526.84
2004	14,578.79	11,292.26	25,871.05
2005	11,681.25	8,404.99	20,086.25
2006	14,880.24	8,790.22	23,670.46

The majority of the air cargo service in 2006 resulted from scheduled all-cargo service (56.7 percent), with non-scheduled civilian all-cargo service accounting for the remainder (43.2 percent), as seen in Table 86. The top three airlines accounted for over 86 percent of the air cargo tons moved through LRD in 2006 (see Table 87). Air Transport International moved 37.3 percent of the air cargo tons, while FedEx Express and UPS Airlines moved 30.2 percent and 19.0 percent, respectively.

Table 86. LRD Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	8.70	0.22	8.92	0.0
Scheduled all-cargo service	8,994.61	4,429.54	13,424.14	56.7
Non-scheduled civilian passenger/cargo service	0.00	0.00	0.00	0.0
Non-scheduled civilian all-cargo service	5,876.93	4,360.47	10,237.40	43.2
Total all service classes	**14,880.24**	**8,790.22**	**23,670.46**	**100.0**

Table 87. LRD Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	Air Transport International	5,457.76	3,364.93	8,822.69	37.3
2	FedEx Express	5,445.37	1,706.57	7,151.94	30.2
3	UPS Airlines	2,662.73	1,840.41	4,503.13	19.0
4	ABX Air	748.98	755.06	1,504.04	6.4
5	USA Jet Airlines	162.74	480.73	643.47	2.7
-	All other carriers	402.66	642.52	1,045.19	4.40
Total all carriers		**14,880.24**	**8,790.22**	**23,670.46**	**100.0**

Three domestic markets account for slightly more than two-thirds of the total air cargo tons at LRD in 2006 (see Table 88). Memphis, Tennessee, was the largest market with over 27 percent of the domestic air cargo tons, followed by Rockford, Illinois, and Louisville, Kentucky, with 23.0 percent and 17.4 percent, respectively. There were only three international countries served by LRD in 2006, with Mexico accounting for two-thirds of the total international tons, followed by Canada with almost one-third (see Table 89).

Table 88. LRD Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Memphis, Tennessee	5,418.96	967.00	6,385.96	27.2
2	Rockford, Illinois	5,159.57	235.79	5,395.36	23.0
3	Louisville, Kentucky	2,283.39	1,800.87	4,084.26	17.4
4	San Antonio, Texas	19.01	1,517.01	1,536.02	6.5
5	Toledo, Ohio	286.46	991.24	1,277.70	5.4
-	All other domestic cities	1,631.62	3,197.10	4,828.72	20.50
Total domestic		**14,799.01**	**8,709.01**	**23,508.02**	**100.0**

Table 89. LRD International Air Cargo, Top Five Countries, 2006 (Tons).

Rank	Country	Inbound	Outbound	Total	% Share
1	Mexico	69.42	38.26	107.68	66.3
2	Canada	9.89	42.73	52.62	32.4
3	Honduras	1.92	0.22	2.14	1.3
Total international		**81.23**	**81.22**	**162.45**	**100.0**

11. WILLIAM P. HOBBY AIRPORT—HOUSTON

William P. Hobby Airport (HOU) in Houston moved 20,451 tons of air cargo in 2006, ranking it as the 11th most active air cargo airport in Texas for 2006. As indicated previously, the 2006 total only represents 0.99 percent of the total air cargo tons moved through Texas airports. Between 1996 and 2006, HOU experienced only an average annual growth of 3.3 percent, going from 14,958 tons to 20,451 tons (see Table 90). After achieving a high of over 25,000 tons in 1998, the annual air cargo ton levels reduced to 15,000 tons in 2001. Between 2001 and 2006 the air cargo levels grew annually.

Table 90. HOU Air Cargo, 1996–2006 (Tons).

Year	Inbound	Outbound	Total
1996	8,051.89	6,906.12	14,958.00
1997	10,235.49	9,202.40	19,437.88
1998	12,219.49	12,867.58	25,087.08
1999	9,934.70	11,139.75	21,074.45
2000	9,579.07	10,443.48	20,022.55
2001	7,260.91	7,911.15	15,172.06
2002	8,045.14	8,405.66	16,450.80
2003	8,152.23	8,704.45	16,856.68
2004	8,692.08	9,632.42	18,324.50
2005	10,022.00	10,276.61	20,298.60
2006	8,969.10	11,482.59	20,451.68

Scheduled passenger/cargo service accounted for almost all of the air cargo tons in 2006 (see Table 91). No tons were moved from scheduled all-cargo service. Table 92 includes the top five airlines transporting air cargo through HOU in 2006. Southwest Airlines accounted for 98.5 percent of the total tons.

Table 91. HOU Air Cargo, by Service Class, 2006 (Tons).

Service Class	Inbound	Outbound	Total	% Share
Scheduled passenger/cargo service	8,961.25	11,473.67	20,434.92	99.9
Scheduled all-cargo service	0.00	0.00	0.00	0.0
Non-scheduled civilian passenger/cargo service	7.85	6.95	14.80	0.1
Non-scheduled civilian all-cargo service	0.0	1.97	1.97	<0.1
Total all service classes	**8,969.10**	**11,482.59**	**20,451.69**	**100.0**

Table 92. HOU Air Cargo, Top Five Airlines, 2006 (Tons).

Rank	Carrier Name	Inbound	Outbound	Total	% Share
1	Southwest Airlines	8,868.79	11,268.72	20,137.51	98.5
2	Delta Airlines	83.96	146.07	230.04	1.2
3	ATA Airlines	7.01	53.68	60.69	0.3
4	Atlantic Southeast Airlines	3.46	4.70	8.16	<0.1
5	AirTran Airways	3.90	0.00	3.90	<0.1
-	All other carriers	1.98	9.42	11.38	<0.1
Total all carriers		**8,969.10**	**11,482.59**	**20,451.68**	**100.0**

Baltimore, Maryland, and Dallas were the largest markets served by HOU air cargo in 2006, accounting for a combined 26.1 percent (see Table 93). The top five accounted for a total of 43.2 percent of the total air cargo tons through HOU in 2006. HOU does not serve international markets.

Table 93. HOU Domestic Air Cargo, Top Five Domestic Cities, 2006 (Tons).

Rank	Domestic City	Inbound	Outbound	Total	% Share
1	Baltimore, Maryland	526.14	2,272.15	2,798.29	13.7
2	Dallas/Fort Worth, Texas	990.72	1,553.42	2,544.14	12.4
3	Los Angeles, California	831.86	533.94	1,365.80	6.7
4	New Orleans, Louisiana	703.32	435.73	1,139.05	5.6
5	Chicago, Illinois	482.99	493.65	976.64	4.8
-	All other domestic cities	5,434.07	6,193.70	11,627.76	56.80
Total domestic		**8,969.10**	**11,482.59**	**20,451.68**	**100.0**

CHAPTER 6. CONCLUSIONS AND FUTURE DIRECTION OFAIR CARGO IN TEXAS

From the outset, this study sought to provide an understanding of the current air cargo activity in Texas. It has been 30 years since the last time an analysis of Texas air cargo was conducted. Since that time, the industry and economy, both nationally and globally, have undergone significant changes. Earlier chapters have provided a sound understanding of where the air cargo activity is in the state, the types of commodities that are being flown and are expected to be flown, and the network of airports across the state that will handle this activity.

Texas' airports play a large role in the movement of goods by air. This includes goods moved within the state, across the country, and internationally to several continents. Most of this is accomplished at the largest of airports in Texas. However, as demand grows, a time will come when other airports will need to be utilized to accommodate some of that demand. This is more likely to occur at airports with existing passenger service but may also occur at a larger, general aviation airport with nearby demand that could be accommodated by the facilities available at the airport. This is less likely if the operator requires facilities for transferring cargo from one aircraft to another. A more likely scenario for a general aviation airport would be a cargo operation supporting a factory or distributor located on the field or one providing feeder services into a larger cargo hub. The following sections offer some thought for consideration as airports consider air cargo in their future. The discussion is by no means intended to be exhaustive.

FREIGHT ANALYSIS FRAMEWORK OBSERVATIONS

This section highlights some of the seminal observations from the data provided in the Freight Analysis Framework. These include overall insights as well as observations regarding commodities, ports of entry/exit, and regional analysis.

Overall

Air and truck make up only 0.03 percent of the total tons for shipments originating or terminating in Texas according to the FAF database. The percentage share for these same shipments is expected to be 0.08 percent in 2035. Very little air cargo, only 7 percent, is moved internationally by truck through border gateways or seaports, according to the FAF Border and Sea datasets.

Sixty percent of the 2002 air cargo moved involved international air movements. More international air cargo terminated in Texas than originated. For domestic shipments in 2002, more tons originated in Texas than terminated. Overall, air cargo inbound and outbound movements were evenly split.

It is expected that air cargo to or from Texas will increase by over 526 percent, or roughly 16 percent per year, between 2002 and 2035. This is mostly driven by the expected 682 percent, or 21 percent annually, increase in international air cargo tons.

Commodities

In 2002 the top 10 commodities for domestic air cargo accounted for 87 percent of total domestic tons. Specifically, electronics accounted for 33 percent of the total, transportation equipment for 20 percent, and motorized vehicles for 11 percent.

For international air cargo, the top 10 commodities also accounted for 87 percent of the total. Machinery led the list with 35 percent followed by electronics at 22 percent and textiles/leather at 7 percent.

In 2035, all of the commodities in the top 10 in 2002 are in the top 10 in 2035. Electronics and machinery remain the top two commodities, with electronics expected to grow by over 1,000 percent and machinery by 485 percent.

Ports of Entry/Exit—International Gateways

All of the international shipments traveling through Texas ports of entry/exit had either an origin or destination located in Texas. Dallas and Houston are the most significant Texas gateways. Together they account for almost 90 percent of the tons through Texas gateways in 2035.

For international shipments originating or terminating in Texas but that went through a gateway outside Texas, the Alaska-Anchorage FAF gateway experienced 85 percent of these tons in 2002 and 70 percent in 2035. International air cargo shipments to or from Texas regions predominately utilize Texas gateways—81 percent versus 19 percent in 2002 and 75 percent versus 25 percent in 2035.

The Austin and Houston FAF regions are expected to experience the greatest amount of air cargo growth between 2002 and 2035. For Houston, significant growth of 6,451 percent is

expected for domestic shipments originating in the Houston area. Austin will experience the greatest level for inbound international tons.

Examining air cargo activity through Mexico and Canada border gateways in the FAF Border dataset, including shipments not originating or terminating in Texas, shows that Texas border ports of entry/exit combine for 87 percent of the activity in 2035, up from 74 percent in 2002. The El Paso FAF gateway is expected to increase in activity by the greatest level, 790 percent from 2002 to 2035. The top commodities include electronics, machinery, transportation equipment, motorized vehicles, and alcoholic beverages.

Regional Analysis

Eighty-five percent of the total 2002 air cargo activity in Texas traveled through the Dallas or Houston FAF regions. Over half of all the tons travel to or from the Dallas FAF region. For domestic shipment volumes in 2035, Houston is the dominant originator and Dallas is the dominant terminator of the projected air cargo tons. The growth of the Houston pairs, located in Louisville, New Jersey, and Chicago, are related to the shipment of electronics. For the Dallas pairs, located in Indianapolis, Oregon, and California, the major commodity contributing to the growth is transportation equipment.

The origins and destinations in 2035 are very similar to the pairs in 2002. The major international commodities to and from Texas include machinery and electronics. Europe and Asia are the major international origins and destinations.

FACILTIES

With an emerging global economy and "disappearing borders" enabling freer and more frequent international trade, air cargo is well suited to play a large role in the shipment of goods to every corner of the world in the years to come. The demand for certain goods will impress upon the air cargo community its role in providing them to the far reaches of the globe. Air cargo will predominantly serve markets requiring time sensitive and value sensitive goods (*30*). These time sensitive products include perishables, animals, emergency items such as drugs, and machinery parts. Value sensitive products include medicines, electronics, chemicals, and fragile goods. These products have already been identified and were shown in greater detail in Chapter 3.

Regardless of the products, air cargo operations require facilities separate from commercial passenger service and general aviation. While these facilities are well known and already exist at the commercial service airports with existing cargo operations, it is important for general aviation airport operators to understand the extent of the needs. Many general aviation airports may be in a position to provide support for package delivery both as an origin-destination market within Texas or nearby states and as a feeder operation for a distribution hub for a larger package carrier. Additionally, some cargo carriers may rely more and more on regional airports for time sensitive package delivery especially as roadway congestion becomes more of a factor. This means the smaller commercial service airports serving smaller urban population centers or general aviation airports outside of the confines of airspace and roadway congestion.

As previously noted, the bulk of air cargo in Texas is handled at the largest passenger service airports. As such, the cargo operations typically benefit from having a large amount of space in which to operate. Ultimately, the space required depends on the type and volume of cargo being processed. Air cargo facilities can generally be categorized as single tenant, multi-tenant, or shell facilities (*31*). The first two are self-explanatory, but a shell facility is one that is typically built on speculation to attract a tenant to the access to the airfield which is a limited and prized commodity. Required airside features typically include the aircraft operating areas, ramp space (size and strength), lighting, drainage, and processing space. These will vary depending on the size of the operation. This also assumes the runway length and strength and airfield design meet the operational requirements of the aircraft being used. If the operation is located at an airport with scheduled passenger service, potential operators would be interested in the site location with respect to the passenger area and the runway ends so as to minimize delays and operational costs.

On the landside, roadway access and parking are critical. Since the cargo ultimately needs to be delivered using the roadway system, suitable access to the road network is important. Adequate parking space for both employees and customers is also important. Other landside factors to consider are utilities, ceiling heights, lift capabilities, interior lighting, refrigeration capabilities, and office space (*31*). Additionally, it would be beneficial for the airport or surrounding environment to have adequate space for not only the cargo operations but also any affiliated businesses. This would include related governmental agencies that may need to be

involved including Customs, wildlife inspection, and security facilities. Foreign trade zone designations are also a consideration in cargo developments. Foreign trade zone designations offer a mechanism for companies to reduce operating costs, and they provide an incentive for using the airport because the products are not subject to the typical Customs and duty processes and payments.

FINANCING

Financing air cargo facilities is also a concern for airports, especially those with little revenue generation capabilities. While some cargo entitlement funding is available for airports meeting a certain threshold of activity, it is not helpful for the smaller airports or those looking to get into the cargo business. The three most common ways to finance an air cargo development are the airport sponsor/owner/operator itself, the air cargo carrier, or a third party developer (*31*). The recommended approach depends largely on the airport and market's individual circumstances. The airport owner has options itself that include using its own capital, issuing airport bonds or other debt instruments, or using federal funding. Again, these options depend on the specific airport and its financial realities.

Issues to consider in the development process includes the users and if they are sharing a facility with others, reversion clauses, building codes, and the handling and storing of hazardous materials. The overall need in terms of facilities will impact the financing in terms of the amount and the ability to pay it back because it will likely dictate who uses it. It is imperative that such a plan is well developed so as to maximize the space's utility, marketability, and overall viability.

FUTURE GROWTH CONSIDERATIONS

The Texas airport system is well developed, and airports across the state are capable of handling the largest of cargo aircraft in terms of airside design characteristics. Much of this is owed to the fact that many airports in the system used to be military facilities. Many of these have been preserved and are being utilized as airports today. They are typically characterized by long and strong runways, if maintained properly through the years, and plenty of space for development.

With air cargo operations so hinged to market demand, future activity is inextricably linked to population and economic growth patterns in the state. In the last six years, the state has

seen robust population growth, especially in its major urban areas. Figure 18 and Figure 19 show the population growth in Texas counties from 1990 to 2000 and 2000 to 2006, respectively.

The metropolitan areas of Dallas/Fort Worth, Houston, and Austin-San Antonio have seen significant growth in the last two decades. The growth patterns shown above are likely to continue. The Dallas/Fort Worth Metroplex is pushing north toward the Red River, and the IH 35 corridor continues to grow steadily. This would indicate that the kinds of market demand that drives air cargo activity are increasing and opportunities would exist for airports well positioned to accommodate it. The valley and border regions have shown impressive growth as well. Airports in these regions are well positioned to capitalize on any air cargo activity related to growth in international trade, specifically with Mexico.

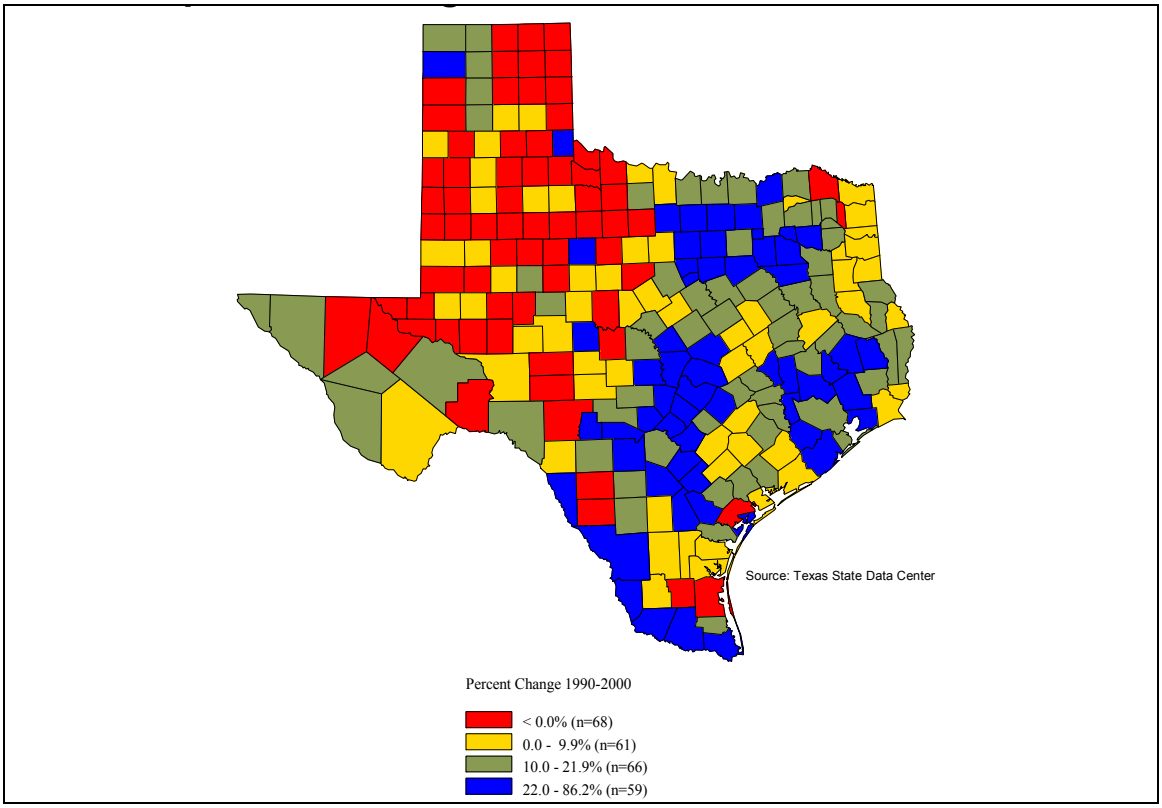


Figure 18. Population Change in Texas Counties, 1990–2000.

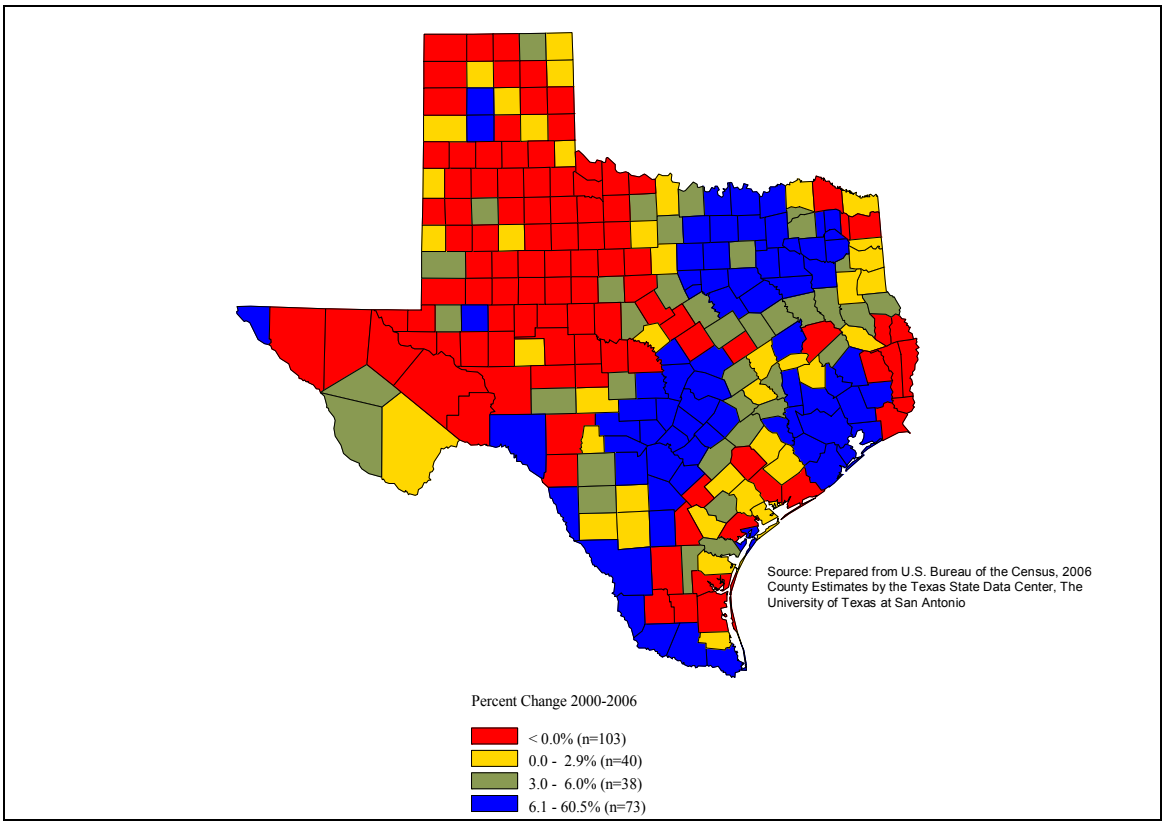


Figure 19. Population Change in Texas Counties, 2000–2006.

General aviation airports in these growth regions with existing facilities and/or the availability of land suitable for developing air cargo facilities should consider a market analysis that would help identify the potential for such operations. Airports should also be mindful that cargo operations are more than those flying the large narrow-body and wide-body jets. There are also feeder aircraft used in cargo operations much like their passenger service brethren. While these may not be as cost-effective or lucrative, they are a start in a field that is difficult for new entrants. In many cases, airports need to be in the right place at the right time when cargo operators come looking for new facilities and services.

LOCATION FACTORS FOR NON-INTEGRATED CARRIERS

In deciding whether or not and where to locate an air cargo facility, businesses may consider many factors along the way. For non-integrated carriers, these have been well summarized by Gardiner and Ison and are noted in Table 94 (*32*). These are factors that are likely to attract or deter cargo operations from locating. These may be applicable to the

integrated carriers, but their operations and networks are large and more complicated, and thus their selection criteria may be of a different scale.

Gardiner and Ison note the significance of existing cargo market demand and passenger service. They also highlight the negative effects congestion and infrastructure deficiencies can have. The authors refer to airside congestion and report that airports without the needed infrastructure will not be selected as a location. Additionally, if general aviation airports are adjacent to residential neighborhoods, aircraft noise concerns, restrictions, and/or ordinances may preclude the airport from being selected. Nonetheless, these points provide a useful framework when contemplating the issues and process associated with attracting air cargo operations (*32*).

Table 94. Factors Influencing Air Cargo Facility Location Decisions.

Pull Factors	Push Factors
• Origin-destination demand • Freight forwarder presence • Passenger airline operations • Presence of partner airlines • Flying time/cost • Location of competitors • Airport charges • Incentives • Airport reputation • Airport advertising	• Bilateral restrictions • Night operations capability • Noise regulation • Infrastructure availability • Congestion

Source: Gardiner and Ison

CONCLUSIONS

Air cargo has experienced significant growth around the world, across the country, and in Texas. Texas' air cargo activity is dominated by the large commercial service areas with several other airports in the state having significant activity. As global economies emerge and grow, new opportunities will exist. It has been well established that the market demand that factors most into air cargo operator is decision making. The availability of passenger service is also an important determinant as it is a potential sign of available cargo capacity and may attract some cargo-related businesses. Air cargo is also a more lucrative operation, and some passenger carriers are placing a greater emphasis on it. Further, air cargo demand is closely correlated with

the gross domestic product. As such, economic growth, whether it is local, national, or global, is a driver of the air cargo business.

Other factors may also help drive air cargo opportunities in the state. Increasing roadway congestion and security concerns may create these opportunities. Questions to pose, in the context of air cargo, include:

- Who benefits from increased security requirements?
- Who benefits from increased roadway congestion?
- What happens to cargo operations at commercial service airports as they approach passenger capacity?
- What happens to cargo operations at commercial service airports as the airspace becomes increasingly congested?
- How important are intermodal connections—highway and rail?
- How will the air cargo industry change in terms of needs and operating networks?
- How will the demand for products and the ability to deliver them around the world change in the coming years?

In conjunction with the assembled Texas air cargo data in this study, these questions begin a discussion that points to the use of other airports for air cargo operations at some point in the future. When, which airports, if they will be ready, and how we will pay for the needed cargo-related improvements are much more difficult to answer. In terms of basic aviation infrastructure and airport locations, Texas appears ready to meet this future need.

APPENDICES

APPENDIX A. AIR CARGO AIRCRAFT.

Utility Aircraft (Maximum Payload of Less than 25,000 lb)
Antonov AN-26, AN-32, AN-72, AN-74
ATR 42-300, 72-200, 72-500
Cessna 208 Caravan
Convair CV-580, CV-5800
Fairchild Dornier Metro III, Expediter I
Fokker F-27-600
Hawker Siddeley HS-748
McDonnell Douglas DC-9-10F
Shorts 330-200, 360-300

Small Standard Body (Payload 25,000 lb–65,000 lb)
Antonov AN-12
BAe146-200, 146-300QT
Boeing 727-100C/QC/F, 727-200F, 727-200ADV F
Boeing 737-200C/QC/F, 737-200-ADV, 737-300SF, 737-700C/QC
Lockheed L-100, L-20, L-30 Hercules
Lockheed L-188F Electra
McDonnell Douglas DC-9-30F
Tupolev TU204-100C, TU204-120C

Medium Standard Body (Payload 65,000 lb–120,000 lb)
Boeing 707-320C
Boeing 757-200F, 757-200SF
Ilyshin IL-76 MD
McDonnell Douglas DC-8-54, DC-8-55F, DC-8-62, DC-8-63, DC-8-73AF
Shorts SC5 Belfast

Medium Wide Body (Payload 80,000 lb–145,000 lb)
Airbus A300-B4, A300-600F
Airbus A310-200F, A310-300F
Boeing 767-200SF, 767-300F
Lockheed L-1011-200F
McDonnell Douglas DC-10-30F

Large Wide Body (Payload 145,000 lb–265,000 lb)
Antonov AN-124
Boeing 747-100SF, 747-200F/SF, 747-300SF, 747-400F, 747-400ERF
Boeing MD-11CF/F
McDonnell Douglas DC-10-30F

Source: Gardiner and Ison

APPENDIX B. FREIGHT ANALYSIS FRAMEWORK COMMODITY DEFINITIONS

Table 95. Freight Analysis Framework Commodity Definitions.

Code	Abbreviation	Commodity Name
1	Live animals/fish	Live animals and live fish
2	Cereal grains	Cereal grains
3	Other ag. prods.	Other agricultural products
4	Animal feed	Animal feed and products of animal origin, n.e.c.
5	Meat/seafood	Meat, fish, seafood, and their preparations
6	Milled grain prods.	Milled grain products and preparations, bakery products
7	Other foodstuffs	Other prepared foodstuffs and fats and oils
8	Alcoholic beverages	Alcoholic beverages
9	Tobacco prods.	Tobacco products
10	*Building stone*	*Monumental or building stone*
11	Natural sands	Natural sands
12	*Gravel*	*Gravel and crushed stone*
13	Nonmetallic minerals	Nonmetallic minerals n.e.c.
14	Metallic ores	Metallic ores and concentrates
15	*Coal*	*Coal*
16	*Crude petroleum*	*Crude Petroleum*
17	*Gasoline*	*Gasoline and aviation turbine fuel*
18	*Fuel oils*	*Fuel oils*
19	Coal—n.e.c.	Coal and petroleum products, n.e.c.
20	Basic chemicals	Basic chemicals
21	Pharmaceuticals	Pharmaceutical products
22	Fertilizers	Fertilizers
23	Chemical prods.	Chemical products and preparations, n.e.c.
24	Plastics/rubber	Plastics and rubber
25	*Logs*	*Logs and other wood in the rough*
26	Wood prods.	Wood products
27	Newsprint/paper	Pulp, newsprint, paper, and paperboard
28	Paper articles	Paper or paperboard articles
29	Printed prods.	Printed products
30	Textiles/leather	Textiles, leather, and articles of textiles or leather
31	Nonmetal min. prods.	Nonmetallic mineral products
32	Base metals	Base metal in primary or semi-finished forms and in finished basic shapes
33	Articles—base metal	Articles of base metal
34	Machinery	Machinery
35	Electronics	Electronic and other electrical equipment and components and office equipment
36	Motorized vehicles	Motorized and other vehicles (including parts)
37	Transport equip.	Transportation equipment, n.e.c.
38	Precision instruments	Precision instruments and apparatus
39	Furniture	Furniture, mattresses and mattress supports, lamps, lighting fittings
40	Misc. mfg. prods.	Miscellaneous manufactured products
41	Waste/scrap	Waste and scrap
43	Mixed freight	Mixed freight
42	*Unknown*	*Commodity unknown*

n.e.c. = not elsewhere classified
Italicized codes = codes not found in FAF for air cargo shipments (10, 12, 15, 16, 17, 18, 25, 42)

APPENDIX C. 2002 AIR CARGO COMMODITIES BY FAF REGION

Table 96. Austin FAF Region 2002 Commodities.

Austin								
Code	Commodity	Domestic			International			Grand Total
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	
1	Live animals/fish	0	0	0	6	198	204	204
2	Cereal grains	0	0	0	0	0	0	0
3	Other ag. prods.	0	0	0	31	113	143	143
4	Animal feed	0	0	0	3	12	15	15
5	Meat/seafood	0	7	7	173	2	175	182
6	Milled grain prods.	0	0	0	10	1	11	11
7	Other foodstuffs	0	0	0	30	8	38	38
8	Alcoholic beverages	0	3	3	10	8	18	21
9	Tobacco prods.	0	0	0	0	2	2	2
11	Natural sands	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	6	5	11	11
14	Gravel	0	0	0	0	0	0	0
19	Coal—n.e.c.	0	0	0	5	5	10	10
20	Basic chemicals	0	4	4	61	22	83	87
21	Pharmaceuticals	23	230	253	41	12	53	306
22	Crude petroleum	0	0	0	0	0	0	0
23	Chemical prods.	0	210	210	162	135	298	508
24	Plastics/rubber	6	83	89	193	167	360	449
26	Wood prods.	0	0	0	8	12	20	20
27	Newsprint/paper	0	0	0	1	0	1	1
28	Paper articles	9	0	9	41	34	74	83
29	Printed prods.	33	5	38	31	45	75	113
30	Textiles/leather	0	11	11	61	678	739	750
31	Nonmetal min. prods.	0	0	0	31	67	98	98
32	Base metals	0	5	5	51	46	96	101
33	Articles—base metal	55	310	365	152	156	309	674
34	Machinery	75	44	119	1,205	2,440	3,645	3,764
35	Electronics	332	684	1,016	923	2,140	3,063	4,079
36	Motorized vehicles	0	24	24	51	79	130	154
37	Transport equip.	16	29	45	61	34	95	140
38	Precision instruments	4	25	29	264	209	472	501
39	Furniture	190	40	230	20	90	111	341
40	Misc. mfg. prods.	0	20	20	51	198	249	269
41	Waste/scrap	0	0	0	0	0	0	0
43	Mixed freight	0	6	6	10	124	134	140
	Totals	**743**	**1,740**	**2,483**	**3,692**	**7,043**	**10,735**	**13,218**

n.e.c. = not elsewhere classified

Table 97. Dallas FAF Region 2002 Commodities.

Dallas								
Code	Commodity	Domestic			International			Grand Total
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	
1	Live animals/fish	0	8	8	99	3,127	3,226	3,234
2	Cereal grains	0	0	0	3	1	4	4
3	Other ag. prods.	0	31	31	668	1,824	2,492	2,523
4	Animal feed	0	0	0	60	228	288	288
5	Meat/seafood	0	1,113	1,113	3,498	35	3,533	4,646
6	Milled grain prods.	0	310	310	358	12	370	680
7	Other foodstuffs	140	1,680	1,820	637	104	741	2,561
8	Alcoholic beverages	0	10	10	211	104	315	325
9	Tobacco prods.	0	0	0	4	31	35	35
11	Natural sands	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	99	71	170	170
14	Gravel	0	0	0	4	0	4	4
19	Coal—n.e.c.	90	0	90	75	70	146	236
20	Basic chemicals	0	500	500	1,214	331	1,545	2,045
21	Pharmaceuticals	575	579	1,154	890	310	1,200	2,354
22	Crude petroleum	0	0	0	0	1	1	1
23	Chemical prods.	110	6,803	6,913	3,358	2,155	5,513	12,426
24	Plastics/rubber	372	664	1,036	3,930	2,686	6,617	7,653
26	Wood prods.	0	196	196	144	289	433	629
27	Newsprint/paper	0	1	1	22	0	22	23
28	Paper articles	0	3	3	910	496	1,407	1,410
29	Printed prods.	1,228	1,277	2,505	728	692	1,420	3,925
30	Textiles/leather	0	1,154	1,154	1,376	10,834	12,209	13,363
31	Nonmetal min. prods.	23	222	245	698	1,051	1,749	1,994
32	Base metals	760	264	1,024	1,113	785	1,897	2,921
33	Articles—base metal	1,673	1,710	3,383	3,036	2,426	5,462	8,845
34	Machinery	1,466	1,594	3,060	24,409	38,237	62,646	65,706
35	Electronics	38,008	8,564	46,572	18,675	33,582	52,257	98,829
36	Motorized vehicles	13,820	2,749	16,569	1,022	1,253	2,275	18,844
37	Transport equip.	34,824	3,160	37,984	1,335	599	1,934	39,918
38	Precision instruments	702	442	1,144	5,455	3,288	8,743	9,887
39	Furniture	690	139	829	410	1,484	1,894	2,723
40	Misc. mfg. prods.	1,203	1,481	2,684	1,113	3,218	4,330	7,014
41	Waste/scrap	0	150	150	0	0	0	150
43	Mixed freight	52	1,013	1,065	348	1,955	2,302	3,367
Totals		**95,736**	**35,817**	**131,553**	**75,901**	**111,278**	**187,180**	**318,733**

n.e.c. = not elsewhere classified

Table 98. Houston FAF Region 2002 Commodities.

Houston								
Code	Commodity	Domestic			International			Grand Total
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	
1	Live animals/fish	0	0	0	176	1,793	1,969	1,969
2	Cereal grains	0	0	0	0	3	3	3
3	Other ag. prods.	0	0	0	360	1,612	1,972	1,972
4	Animal feed	0	0	0	13	54	67	67
5	Meat/seafood	0	90	90	699	147	847	937
6	Milled grain prods.	0	3,850	3,850	33	68	101	3,951
7	Other foodstuffs	100	0	100	453	251	704	804
8	Alcoholic beverages	0	50	50	127	419	545	595
9	Tobacco prods.	0	0	0	0	35	36	36
11	Natural sands	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	402	51	453	453
14	Gravel	0	0	0	3	1	4	4
19	Coal—n.e.c.	0	0	0	49	116	165	165
20	Basic chemicals	2	490	492	1,676	878	2,554	3,046
21	Pharmaceuticals	351	59	410	278	325	603	1,013
22	Crude petroleum	0	0	0	0	2	2	2
23	Chemical prods.	0	0	0	2,971	2,287	5,258	5,258
24	Plastics/rubber	12	166	178	4,919	3,480	8,399	8,577
26	Wood prods.	0	0	0	127	179	306	306
27	Newsprint/paper	0	1	1	0	1	1	2
28	Paper articles	0	0	0	586	273	859	859
29	Printed prods.	5	1,161	1,166	340	725	1,065	2,231
30	Textiles/leather	0	2,273	2,273	923	11,594	12,518	14,791
31	Nonmetal min. prods.	171	1	172	741	990	1,731	1,903
32	Base metals	1	846	847	1,255	918	2,173	3,020
33	Articles—base metal	369	218	587	4,226	3,490	7,716	8,303
34	Machinery	1,069	0	1,069	33,294	18,348	51,642	52,711
35	Electronics	1,373	6,839	8,212	6,314	9,990	16,303	24,515
36	Motorized vehicles	3	1,623	1,626	576	2,227	2,803	4,429
37	Transport equip.	0	1,023	1,023	628	251	879	1,902
38	Precision instruments	0	387	387	5,049	3,882	8,931	9,318
39	Furniture	0	77	77	402	633	1,035	1,112
40	Misc. mfg. prods.	63	182	245	391	1,723	2,114	2,359
41	Waste/scrap	0	0	0	0	0	0	0
43	Mixed freight	109	280	389	278	1,693	1,971	2,360
Totals		**3,628**	**19,616**	**23,244**	**67,291**	**68,438**	**135,728**	**158,972**

n.e.c. = not elsewhere classified

Table 99. San Antonio FAF Region 2002 Commodities.

San Antonio								
Code	Commodity	Domestic			International			Grand Total
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	
1	Live animals/fish	0	0	0	8	90	98	98
2	Cereal grains	0	0	0	0	0	0	0
3	Other ag. prods.	0	0	0	41	50	91	91
4	Animal feed	0	0	0	5	7	12	12
5	Meat/seafood	0	0	0	243	1	244	244
6	Milled grain prods.	0	0	0	20	0	21	21
7	Other foodstuffs	0	0	0	41	4	44	44
8	Alcoholic beverages	0	0	0	10	4	14	14
9	Tobacco prods.	0	0	0	0	1	1	1
11	Natural sands	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	8	2	11	11
14	Gravel	0	0	0	0	0	0	0
19	Coal—n.e.c.	0	0	0	7	2	9	9
20	Basic chemicals	0	50	50	81	10	91	141
21	Pharmaceuticals	60	32	92	61	9	70	162
22	Crude petroleum	0	0	0	0	0	0	0
23	Chemical prods.	0	25	25	233	60	293	318
24	Plastics/rubber	367	5	372	273	70	343	715
26	Wood prods.	0	0	0	10	9	19	19
27	Newsprint/paper	0	0	0	2	0	2	2
28	Paper articles	0	0	0	61	10	71	71
29	Printed prods.	4	38	42	51	20	71	113
30	Textiles/leather	0	53	53	91	311	402	455
31	Nonmetal min. prods.	0	4	4	41	30	71	75
32	Base metals	9	4	13	71	20	91	104
33	Articles—base metal	0	1	1	202	70	273	274
34	Machinery	6	69	75	1,675	1,092	2,767	2,842
35	Electronics	47	734	781	1,284	952	2,236	3,017
36	Motorized vehicles	0	320	320	71	30	101	421
37	Transport equip.	0	52	52	91	10	101	153
38	Precision instruments	0	57	57	374	90	465	522
39	Furniture	0	84	84	20	40	60	144
40	Misc. mfg. prods.	1	31	32	71	90	161	193
41	Waste/scrap	0	0	0	0	0	0	0
43	Mixed freight	0	20	20	20	50	70	90
Totals		**494**	**1,579**	**2,073**	**5,166**	**3,136**	**8,302**	**10,375**

n.e.c. = not elsewhere classified

Table 100. Remainder of Texas FAF Region 2002 Commodities.

Remainder of Texas								
Code	Commodity	Domestic			International			Grand Total
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	
1	Live animals/fish	0	0	0	7	2	9	9
2	Cereal grains	0	0	0	0	0	0	0
3	Other ag. prods.	0	6	6	36	1	37	43
4	Animal feed	0	0	0	0	0	0	0
5	Meat/seafood	0	0	0	3	0	4	4
6	Milled grain prods.	0	0	0	0	0	0	0
7	Other foodstuffs	20	0	20	2	0	2	22
8	Alcoholic beverages	0	10	10	25	30	55	65
9	Tobacco prods.	0	0	0	0	8	8	8
11	Natural sands	0	1,020	1,020	0	0	0	1,020
13	Nonmetallic minerals	0	10	10	0	0	0	10
14	Gravel	0	0	0	8	0	8	8
19	Coal—n.e.c.	0	1,580	1,580	3	0	3	1,583
20	Basic chemicals	952	10	962	1	0	2	964
21	Pharmaceuticals	244	295	539	6	0	6	545
22	Crude petroleum	0	0	0	0	0	0	0
23	Chemical prods.	70	0	70	45	9	54	124
24	Plastics/rubber	1,665	305	1,970	107	13	120	2,090
26	Wood prods.	0	0	0	0	0	0	0
27	Newsprint/paper	47	114	161	0	0	0	161
28	Paper articles	50	40	90	42	0	43	133
29	Printed prods.	87	1,774	1,861	2	0	2	1,863
30	Textiles/leather	0	765	765	722	97	818	1,583
31	Nonmetal min. prods.	0	0	0	6	4	10	10
32	Base metals	2,670	677	3,347	70	8	79	3,426
33	Articles—base metal	2,796	373	3,169	75	53	128	3,297
34	Machinery	2,759	1,637	4,396	698	177	875	5,271
35	Electronics	3,786	5,277	9,063	833	2,058	2,891	11,954
36	Motorized vehicles	120	2,613	2,733	66	263	329	3,062
37	Transport equip.	0	139	139	30	0	31	170
38	Precision instruments	1	213	214	230	311	542	756
39	Furniture	100	11	111	17	105	122	233
40	Misc. mfg. prods.	1,534	250	1,784	8	2	9	1,793
41	Waste/scrap	0	0	0	0	0	0	0
43	Mixed freight	68	1,660	1,728	83	126	209	1,937
Totals		**16,969**	**18,779**	**35,748**	**3,128**	**3,267**	**6,396**	**42,144**

n.e.c. = not elsewhere classified

APPENDIX D. 2035 AIR CARGO COMMODITIES BY FAF REGION

Table 101. Austin FAF Region 2035 Commodities.

Austin									
Code	Commodity	Domestic			International			Grand Total	
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	Tons	% Change
1	Live animals/fish	0	0	0	18	271	289	289	42
2	Cereal grains	0	0	0	2	1	4	4	1,604
3	Other ag. prods.	0	0	0	75	168	243	243	70
4	Animal feed	0	0	0	8	82	90	90	491
5	Meat/seafood	0	3	3	467	5	472	475	161
6	Milled grain prods.	0	0	0	22	2	24	24	121
7	Other foodstuffs	0	0	0	52	14	66	66	72
8	Alcoholic beverages	0	2	2	6	7	13	15	–29
9	Tobacco prods.	0	0	0	1	0	1	1	–44
11	Natural sands	0	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	18	19	37	37	234
14	Metallic ores	0	0	0	0	0	0	0	22
19	Coal—n.e.c.	0	0	0	4	10	14	14	42
20	Basic chemicals	0	9	9	168	297	465	474	442
21	Pharmaceuticals	141	590	731	540	277	817	1,548	406
22	Fertilizers	0	0	0	0	0	0	0	–6
23	Chemical prods.	0	240	240	769	404	1,173	1,413	178
24	Plastics/rubber	22	451	473	510	525	1,035	1,508	236
26	Wood prods.	0	0	0	12	38	50	50	150
27	Newsprint/paper	0	0	0	1	0	1	1	–27
28	Paper articles	10	0	10	67	82	149	159	91
29	Printed prods.	10	11	20	38	92	131	151	33
30	Textiles/leather	0	1	1	47	2,706	2,752	2,753	267
31	Nonmetal min. prods.	0	0	0	75	279	353	353	261
32	Base metals	0	10	10	107	69	176	186	84
33	Articles—base metal	25	1,598	1,623	449	498	947	2,570	282
34	Machinery	85	85	169	4,424	16,410	20,833	21,003	458
35	Electronics	5,213	672	5,885	5,895	47,118	53,013	58,898	1,344
36	Motorized vehicles	0	32	32	196	267	463	495	223
37	Transport equip.	43	54	97	310	71	381	478	240
38	Precision instruments	43	174	217	2,290	3,896	6,186	6,403	1,177
39	Furniture	120	70	190	135	1,167	1,302	1,492	338
40	Misc. mfg. prods.	0	17	17	175	1,511	1,686	1,703	532
41	Waste/scrap	0	0	0	0	0	0	0	0
43	Mixed freight	0	13	13	8	426	434	447	219
	Totals	**5,713**	**4,029**	**9,742**	**16,892**	**76,710**	**93,602**	**103,344**	**682**

n.e.c. = not elsewhere classified

Table 102. Dallas FAF Region 2035 Commodities.

Dallas									
Code	Commodity	Domestic			International			Grand Total	
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	Tons	% Change
1	Live animals/fish	0	10	10	267	4,555	4,822	4,832	49
2	Cereal grains	0	0	0	75	16	91	91	2,164
3	Other ag. prods.	0	63	63	1,267	2,179	3,446	3,509	39
4	Animal feed	0	0	0	80	1,284	1,364	1,364	374
5	Meat/seafood	0	2,666	2,666	9,153	59	9,212	11,877	156
6	Milled grain prods.	0	420	420	623	31	654	1,074	58
7	Other foodstuffs	780	4,310	5,090	1,606	144	1,751	6,841	167
8	Alcoholic beverages	0	5	5	407	103	510	515	59
9	Tobacco prods.	0	0	0	23	3	26	26	–26
11	Natural sands	0	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	112	268	379	379	123
14	Metallic ores	0	0	0	42	0	42	42	923
19	Coal—n.e.c.	40	0	40	155	146	301	341	45
20	Basic chemicals	0	824	824	3,727	3,394	7,121	7,944	289
21	Pharmaceuticals	455	3,051	3,506	9,762	6,797	16,559	20,065	752
22	Fertilizers	0	0	0	0	1	1	1	–9
23	Chemical prods.	415	52,019	52,433	18,449	7,186	25,635	78,068	528
24	Plastics/rubber	565	1,293	1,857	11,024	9,559	20,583	22,440	193
26	Wood prods.	0	262	262	481	994	1,475	1,737	176
27	Newsprint/paper	0	2	2	16	0	16	18	–21
28	Paper articles	0	10	10	1,251	1,254	2,505	2,515	78
29	Printed prods.	1,259	1,433	2,692	1,322	1,329	2,651	5,343	36
30	Textiles/leather	0	321	321	1,297	47,571	48,868	49,188	268
31	Nonmetal min. prods.	35	673	707	2,788	7,754	10,542	11,250	464
32	Base metals	323	650	973	743	1,063	1,806	2,779	–5
33	Articles—base metal	3,877	4,423	8,300	10,858	7,558	18,416	26,716	202
34	Machinery	2,546	4,178	6,725	117,874	308,598	426,472	433,197	559
35	Electronics	37,952	30,275	68,227	96,581	659,625	756,207	824,434	734
36	Motorized vehicles	22,160	8,780	30,940	2,701	4,574	7,275	38,215	103
37	Transport equip.	103,306	22,937	126,243	8,802	1,224	10,026	136,269	241
38	Precision instruments	5,587	2,422	8,009	39,594	83,727	123,321	131,330	1,228
39	Furniture	440	175	615	1,980	20,008	21,988	22,603	730
40	Misc. mfg. prods.	4,433	11,884	16,317	3,786	21,208	24,994	41,312	489
41	Waste/scrap	0	150	150	0	0	0	150	0
43	Mixed freight	108	3,142	3,250	263	6,512	6,774	10,024	198
	Totals	**184,280**	**156,377**	**340,657**	**347,109**	**1,208,724**	**1,555,833**	**1,896,490**	**495**

n.e.c. = not elsewhere classified

Table 103. Houston FAF Region 2035 Commodities.

Houston									
Code	Commodity	Domestic			International			Grand Total	
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	Tons	% Change
1	Live animals/fish	0	0	0	505	2,416	2,920	2,920	48
2	Cereal grains	0	0	0	0	65	65	65	1,942
3	Other ag. prods.	0	0	0	652	2,502	3,154	3,154	60
4	Animal feed	0	0	0	15	374	389	389	485
5	Meat/seafood	0	80	80	2,008	286	2,294	2,374	153
6	Milled grain prods.	0	6,710	6,710	63	194	257	6,967	76
7	Other foodstuffs	120	0	120	811	434	1,246	1,366	70
8	Alcoholic beverages	0	20	20	323	366	690	710	19
9	Tobacco prods.	0	0	0	1	2	3	3	–92
11	Natural sands	0	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	1,435	178	1,613	1,613	256
14	Metallic ores	0	0	0	6	2	8	8	102
19	Coal—n.e.c.	0	0	0	55	222	276	276	68
20	Basic chemicals	0	2,490	2,490	3,487	11,608	15,094	17,585	477
21	Pharmaceuticals	1,343	91	1,434	3,857	7,131	10,988	12,422	1,127
22	Fertilizers	0	0	0	0	2	2	2	–7
23	Chemical prods.	0	0	0	15,262	5,703	20,965	20,965	299
24	Plastics/rubber	13	168	181	13,510	10,628	24,137	24,318	184
26	Wood prods.	0	0	0	172	548	720	720	135
27	Newsprint/paper	0	3	3	0	0	0	3	106
28	Paper articles	0	0	0	1,422	655	2,077	2,077	142
29	Printed prods.	2	1,101	1,104	330	1,502	1,832	2,935	32
30	Textiles/leather	0	948	948	952	45,438	46,389	47,337	220
31	Nonmetal min. prods.	91	2	93	2,076	3,712	5,788	5,881	209
32	Base metals	1	5,269	5,270	1,989	1,402	3,392	8,662	187
33	Articles—base metal	189	955	1,144	13,775	11,006	24,782	25,926	212
34	Machinery	890	0	890	160,775	118,867	279,642	280,532	432
35	Electronics	230,480	6,829	237,309	121,165	224,063	345,228	582,537	2,276
36	Motorized vehicles	1	10,213	10,214	762	7,135	7,897	18,111	309
37	Transport equip.	0	6,998	6,998	2,212	509	2,722	9,719	411
38	Precision instruments	0	1,612	1,612	44,295	67,980	112,274	113,886	1,122
39	Furniture	0	100	100	2,118	7,908	10,026	10,126	811
40	Misc. mfg. prods.	80	609	690	1,708	12,869	14,577	15,266	547
41	Waste/scrap	0	0	0	0	0	0	0	0
43	Mixed freight	4,470	170	4,640	539	5,734	6,273	10,913	362
	Totals	**237,680**	**44,368**	**282,048**	**396,281**	**551,439**	**947,720**	**1,229,768**	**674**

n.e.c. = not elsewhere classified

Table 104. San Antonio FAF Region 2035 Commodities.

San Antonio										
Code	Commodity	Domestic			International			Grand Total	
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	Tons	% Change
1	Live animals/fish	0	0	0	25	123	148	148	50
2	Cereal grains	0	0	0	3	1	4	4	1,517
3	Other ag. prods.	0	0	0	100	77	177	177	95
4	Animal feed	0	0	0	11	52	63	63	420
5	Meat/seafood	0	0	0	657	2	659	659	170
6	Milled grain prods.	0	0	0	44	1	45	45	117
7	Other foodstuffs	0	0	0	70	6	76	76	72
8	Alcoholic beverages	0	0	0	6	3	9	9	–35
9	Tobacco prods.	0	0	0	2	0	2	2	35
11	Natural sands	0	0	0	0	0	0	0	0
13	Nonmetallic minerals	0	0	0	26	9	34	34	225
14	Metallic ores	0	0	0	0	0	0	0	4
19	Coal—n.e.c.	0	0	0	5	5	10	10	17
20	Basic chemicals	0	50	50	224	136	361	411	191
21	Pharmaceuticals	50	122	172	807	208	1,015	1,187	632
22	Fertilizers	0	0	0	0	0	0	0	–5
23	Chemical prods.	0	76	76	1,101	158	1,259	1,335	320
24	Plastics/rubber	288	10	298	722	216	938	1,236	73
26	Wood prods.	0	0	0	15	27	42	42	124
27	Newsprint/paper	0	0	0	1	0	1	1	–26
28	Paper articles	0	0	0	100	24	124	124	76
29	Printed prods.	1	31	32	63	41	105	137	21
30	Textiles/leather	0	2	2	69	1,226	1,294	1,297	185
31	Nonmetal min. prods.	0	13	13	99	114	213	227	204
32	Base metals	10	10	20	149	31	180	200	92
33	Articles—base metal	0	1	1	597	224	821	822	201
34	Machinery	10	198	208	6,146	7,173	13,319	13,528	376
35	Electronics	182	1,200	1,382	8,210	21,075	29,285	30,666	917
36	Motorized vehicles	0	876	876	274	98	372	1,248	197
37	Transport equip.	0	138	138	464	21	484	623	307
38	Precision instruments	0	115	115	3,248	1,613	4,860	4,975	854
39	Furniture	0	97	97	136	508	644	741	413
40	Misc. mfg. prods.	3	60	63	244	688	933	995	415
41	Waste/scrap	0	0	0	0	0	0	0	0
43	Mixed freight	0	10	10	17	172	189	199	120
Totals		**544**	**3,010**	**3,553**	**23,635**	**34,032**	**57,667**	**61,221**	**490**

n.e.c. = not elsewhere classified

Table 105. Remainder of Texa FAF Region 2035 Commodities.

Remainder of Texas									
Code	Commodity	Domestic			International			Grand Total	
		Originate (Outbound)	Terminate (Inbound)	Total	Originate (Outbound)	Terminate (Inbound)	Total	Tons	% Change
1	Live animals/fish	0	0	0	20	4	24	24	158
2	Cereal grains	0	0	0	0	0	0	0	1,545
3	Other ag. prods.	0	10	10	76	1	77	87	103
4	Animal feed	0	0	0	0	0	1	1	350
5	Meat/seafood	0	0	0	9	0	9	9	157
6	Milled grain prods.	0	0	0	1	0	1	1	99
7	Other foodstuffs	30	0	30	2	0	2	32	49
8	Alcoholic beverages	0	10	10	13	27	40	50	–23
9	Tobacco prods.	0	0	0	0	1	1	1	–93
11	Natural sands	0	250	250	0	0	0	250	–75
13	Nonmetallic minerals	0	10	10	0	0	1	11	4
14	Metallic ores	0	0	0	10	0	10	10	31
19	Coal—n.e.c.	0	5,000	5,000	4	0	4	5,004	216
20	Basic chemicals	2,628	20	2,648	4	1	5	2,652	175
21	Pharmaceuticals	1,241	551	1,792	74	2	77	1,869	243
22	Fertilizers	0	0	0	0	0	0	0	–50
23	Chemical prods.	276	0	276	204	29	232	509	311
24	Plastics/rubber	4,581	432	5,012	314	45	359	5,371	157
26	Wood prods.	0	0	0	0	0	1	1	82
27	Newsprint/paper	95	228	322	0	0	0	322	100
28	Paper articles	60	50	110	68	1	69	179	35
29	Printed prods.	76	3,526	3,602	2	0	3	3,605	93
30	Textiles/leather	0	271	271	620	404	1,024	1,295	–18
31	Nonmetal min. prods.	0	0	0	14	19	33	33	230
32	Base metals	4,150	1,587	5,737	142	13	155	5,891	72
33	Articles—base metal	3,306	1,203	4,509	206	178	385	4,894	48
34	Machinery	6,332	3,502	9,833	2,878	1,262	4,140	13,973	165
35	Electronics	11,254	13,397	24,651	5,801	44,878	50,679	75,330	530
36	Motorized vehicles	160	11,464	11,624	224	928	1,153	12,777	317
37	Transport equip.	0	463	463	143	0	143	606	257
38	Precision instruments	100	13,565	13,665	1,870	6,419	8,289	21,954	2,805
39	Furniture	130	22	152	82	1,389	1,471	1,623	596
40	Misc. mfg. prods.	13,590	711	14,301	30	13	43	14,344	700
41	Waste/scrap	0	0	0	0	0	0	0	0
43	Mixed freight	230	5,050	5,280	63	440	503	5,783	198
	Totals	**48,237**	**61,321**	**109,558**	**12,879**	**56,054**	**68,933**	**178,491**	**324**

n.e.c. = not elsewhere classified

REFERENCES

1. Quilty, Stephen. History, the Regulation of Air Transportation, Airports, and the Federal Aviation Administration. AAAE Accreditation and Certification Programs. 2005.
2. Transportation Development Group. Introduction to Air Freight. www.logisticstraining.com.
3. Allaz, C. The History of Air Cargo and Airmail: From the 18th Century. Christopher Foyle Publishing. Paris. 2004. p. 65.
4. FHWA Freight Management and Operations. Concept of Operations for an ESCM Standard: Concept of Operation for ISO Approved Work Item 24533: Data Dictionary and Message Set for Tracking of Freight and Its Intermodal Transfer International Organization for Standardization. Technical Committee 204, Work Group 7.2. February 27, 2004. Draft v.5a. http://ops.fhwa.dot.gov/freight/publications/concept_ops.htm.
5. Barnett, C. All Aboard? Journal of Commerce.
6. Ihle, T. The Impact of Air Cargo Operations on Airports in the United States. American Association of Airport Executives. June 1999.
7. Parezo, S. Recovery Off-Center. Air Cargo World. August 2002, v. 92, issue 8.
8. FAA Aerospace Forecasts 2005-2006. Air Cargo Traffic. III-15.
9. Hoppin, D. Air Cargo Industry Supply Issues. MergeGlobal. 30th Annual FAA Aviation Forecast Conference, March 18, 2005.
10. Karp, A. Choke Points: Southwest's Reliable Point-to-Point Network Allows the Low Fares Airline to Grow Cargo Even as Domestic Freight Shifts to Trucking. Air Cargo World. September 2005.
11. Boeing. Freighter Reference Guide. Report No. D906Q0819.R1. 2003.
12. FAA Aerospace Forecasts 2006-2017.
13. Page, P. Grounding Air Cargo. Air Cargo World. August 2002, v. 92, issue 8.
14. Sowinski, L. Air Cargo Saves the Bacon. World Trade Magazine. Oct. 7, 2005.
15. Boeing. Freighter Reference Guide. Report No. D906Q0819.R1. 2003.
16. FAA Aerospace Forecasts 2005-2016.
17. Federal Aviation Administration. Report to Congress: A Feasibility Study of Regional Air-Cargo Airports: Including a Case Study of a Regional Air-Cargo Center for the Washington, D.C., Area. August 1991.
18. Boeing World Air Cargo Forecast, 2006-2007.
19. Morton, R. Air on the Rise. Transportation & Distribution.
20. Karp, A. Computing Time-Definite Delivery. Air Cargo World. June 2005, v. 95, no. 6.
21. Tagoe-Ammah, F. Freight Shipments in America: Preliminary Highlights from the 2002 Commodity Flow Survey. Prepared for the U.S. Department of Transportation, Bureau of Transportation Statistics.
22. Tsao, H.-S. The Role of Air Cargo in California's Goods Movement. NEXTOR. Research Report RR-98-5. September 1998.
23. SITA Logistics Solutions. Minneapolis-Saint Paul Air Cargo Study. November 29, 2001.
24. Jedd, Marcia. Firms Seek to Situate Distribution Facilities near Airports to Support Their Own Just-in-Time Manufacturing and Distribution Strategies. Logistics Management & Distribution Report. December 2001, v. 40, no. 12 (S1).

25. Cidell, Julie. The Conversion of Military Bases to Commercial Airports: Existing Conversions and Future Possibilities. Journal of Transport Geography. 2003, v.11, pp. 93-102.
26. Gardiner, J., S. Ison, and I. Humphreys. Factors Influencing Cargo Airlines' Choice of Airport: An International Survey. Journal of Air Transport Management. v. 1, no. 6. pp. 393-399.
27. Congressional Research Service. Air Cargo Security. July 30, 2007.
28. U.S. Department of Transportation, Federal Highway Administration, Office of Operations, Freight Management and Operations. Freight Analysis Framework. http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm. Accessed August 1, 2007.
29. U.S. Department of Transportation, Federal Highway Administration, Office of Operations, Freight Management and Operations. Freight Analysis Framework (FAF) Version 2.2, User Guide Commodity Origin-Destination Database: 2002-2035. November 20, 2006. http://ops.fhwa.dot.gov/freight/freight_analysis/faf/faf2userguide/faf2userguide.pdf. Accessed August 1, 2007.
30. Radnoti, George. Profit Strategies for Air Transportation. McFraw-Hill. 2002.
31. Air Cargo at an Airport: A Study of Its Components and Prevailing Issues. American Association of Airport Executives Management Paper (67543). November 2003.
32. Gardiner, J.R., and S.G. Ison. Factors Influencing Non-integrated Airlines' Choice of Airports. Transportation Research Board. 2007 Annual Meeting CD-ROM.