CAMBRIDGE SYSTEMATICS

Baltimore/Washington International Airport Air Cargo Assessment

final

report

prepared for

Maryland Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

Economic Development Research Group

November 2003

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About This Report

About This Report

This study was performed under contract to the Maryland Department of Transportation (MDOT). Its goal was to support the development and implementation of air cargo strategies for Baltimore/Washington International Airport (BWI), by providing information and analysis addressing:

- The role and future of air cargo in the overall goods movement system.
- The origins and destinations of air cargo traffic through Maryland, and the critical modes and routes that provide air cargo collection and distribution within the larger Maryland intermodal transportation system.
- The potential niche markets that could be diverted or attracted to BWI, focusing on markets that provide economic benefit to the State of Maryland and effectively utilize the State's intermodal transportation system.
- The economic benefit and justification of BWI air cargo activities for the State of Maryland and its producers, shippers, and consumers, focusing on key commodities.

This report is organized into five major sections, along with five appendices:

- Section 1: Role of Air Cargo in the Nation's Freight Movement System;
- Section 2: BWI Air Cargo Activity and Market Potential;
- Section 3: Statewide Impacts of BWI Air Cargo Operations;
- Section 4: Interviews with Key Stakeholders;
- Section 5: Recommendations;
- Appendix A: Interview Pool from MAA Air Cargo Directory (Shipper);
- Appendix B: Interview Pool from Reebie Associates' *Freight Locator* Database (Freight Forwarder);
- Appendix C: Interview Guide/Questionnaire;
- Appendix D: Interview Results from Martin Associates; and
- Appendix E: Glossary of Terms.

1.0 Role of Air Cargo in the Nation's Freight Movement System

1.0 Role of Air Cargo in the Nation's Freight Movement System

1.1 Introduction

Over the past decade, air cargo has been the fastest-growing segment of the nation's freight movement system. Domestic growth has been fueled by the rapid expansion of integrated door-to-door carriers such as Federal Express and for United Parcel Service (UPS). International growth has been supported by trade in high-value, time-sensitive goods as part of international supply chains.

The unique role of air cargo in the national freight system, its future prospects, and the implications for Baltimore/Washington International Airport (BWI) and the State of Maryland, are discussed below.

1.2 Evolution of the Intermodal Freight Transportation System

Four general eras describe the evolution of the nation's freight system. Three are characterized by the development and maturation of a single transportation technology, while the fourth is characterized by the emergence of information and communication technologies to manage and utilize all modes of transportation and offer unprecedented levels of customer service.

- **The "Sail Era" (18th Century) –** The colonial economies of the 18th Century were built on water transport. At the time of the American Revolution, it cost as much to move a ton of goods 30 miles inland as to move it across the Atlantic. The speed of land travel was essentially the speed of a horse, and travel to the interior took weeks. As a result, two out of three settlers lived within 50 miles of the Atlantic coast, and waterborne trade (coastal U.S. and trans-Atlantic) dominated the freight system. Baltimore was a key trading center and one of the nation's leading ports.

- **The "Rail Era" (19th Century) –** The introduction of rail technology in the mid-19th Century freed business and settlement from the need to locate near sea, river, and canal ports. Within a matter of decades, railroads opened much of the interior of the country. East-west rail routes were built to follow development of the Midwest, and after the Civil War, to solidify political and military control of the West. North-south

rail routes were slower to develop because the railroads could not compete effectively with water transport for coastal trade. Dense urban centers grew at major inland rail hubs and at seaport cities, such as Baltimore, that benefited from the new mode of transportation.

- **The "Truck Era" (20th Century) –** The development of truck and highway technologies in the early 20th Century freed business and settlement again, this time from the need to locate near rail lines and terminals. The interstate highway system – of grids, corridors, and beltways – allowed production and consumption centers to develop on newly accessible and relatively inexpensive land outside of urban centers. Long-haul trucking captured a large share of east-west freight traffic from railroads and much of the north-south freight traffic from coastal steamers and river barges. While rail and water continued to serve some traditional markets – principally bulk commodities and long-haul merchandise on routes of 400 to 600 miles or more in length – trucks were the only way to serve the new suburban and ex-urban markets, and trucking became the dominant mode of freight transportation. Trucking also created door-to-door links between these markets and the new – and rapidly developing – air freight industry. In 1960, the nation's expenditure for air freight was $354 million; by 1999, it was more than $25 billion, with domestic shipments of less than 10,000 pounds accounting for more than $16 billion (source: Eno Foundation, Transportation in America 2000).

- **The "Integration and Information Era" (21st Century) –** The global economy of the 21st Century is being built on the integration of national economies into seamless global supply chains, and on the integration of different modes of international and domestic transport into seamless transportation connections; this integration is made possible and supported by advanced information technologies that allow for management, coordination, and security of complex logistics chains across transportation modes and across international borders. The collapse of the Communist bloc, the integration of the European Union, and the emergence of global initiatives such as the North American Free Trade Agreement (NAFTA) reduced trade barriers. At the same time, the rapid emergence of two technology systems – containerization (to efficiently link marine cargo with trucks and double-stack trains) and air freight (to meet a new market for time-sensitive, high-value commodities) – made international trade more reliable, secure, and cost-effective than ever before. The result has been an explosion of global trade in all directions – north, south, east, and west – that continues unabated today. At the same time, there is continued rapid growth in domestic freight movement, especially in the areas of time-sensitive delivery of express packages handled by integrated air-truck carriers such as Federal Express and UPS.

Within this evolutionary perspective, air cargo as a freight mode emerges as the newest, the fastest growing, and the most interdependent on other modes and on efficient information flow. The market niche it has gained, and its prospects for the future, are discussed below.

1.3 Modal Specialization and the Air Cargo Market

The evolutionary perspective shows how various modes within the nation's intermodal freight transportation system – water, truck, rail, and air – have developed to meet specific market niches and service requirements. Each freight mode offers certain advantages and disadvantages in terms of cost, speed, reliability, visibility, and security. This allows shippers, intermediaries, and customers to purchase the types of freight services that best fit their specific shipping needs.

Figure 1.1 shows the spectrum of freight transportation services – from waterborne transportation to orbital space travel – with the approximate cost per pound and key service characteristics. For example, package and express shippers favor air and truck because these modes offer the fastest and most reliable door-to-door service for lightweight shipments. The cost is high, but customers are willing to pay for the high quality of service. In contrast, shippers of bulk commodities like coal, grain, and petroleum prefer to use water or rail. These modes offer less speed and reliability, but provide transportation at a far lower unit cost, which makes these commodities affordable across the nation. Each mode has a variety of subspecialties. For example, rail offers intermodal service (containers and trailers in premium scheduled services), unit train service (full trains carrying a single bulk commodity), and carload service (trains carrying a mix of commodity types and railcar types).

There are several sources and types of freight data available to assess the current performance of the goods movement system and its component modes. One source is the "TRANSEARCH" database developed by Reebie Associates. The TRANSEARCH database includes all domestic moves by truck, air, rail, and water. Using TRANSEARCH data for 2000, Figure 1.2 on the following page compares average length of domestic freight trips by mode, and Figure 1.3 compares the average value per ton of domestic freight handled by each mode. The figures clearly illustrate the important niche role of air cargo in moving very high-value, relatively lightweight cargo over longer distances.

According to TRANSEARCH data for 2000, the nation's freight system moved 14 billion tons of domestic freight valued at $11 trillion over 4.5 trillion ton-miles in 2000 (see Figure 1.4).

- Trucks moved 78 percent of the nation's domestic freight tonnage, generated 60 percent of its ton-mileage, and accounted for 88 percent of its dollar value, the highest percentage in each category.

- Rail moved 16 percent of total domestic freight tonnage. It generated a higher share (28 percent) of ton-mileage because it tends to handle longer distance moves, but a lower share (six percent) of total value because it tends to handle a mix of higher value containerized and lower value bulk commodities.

Figure 1.1 The Freight Transportation "Service Spectrum"

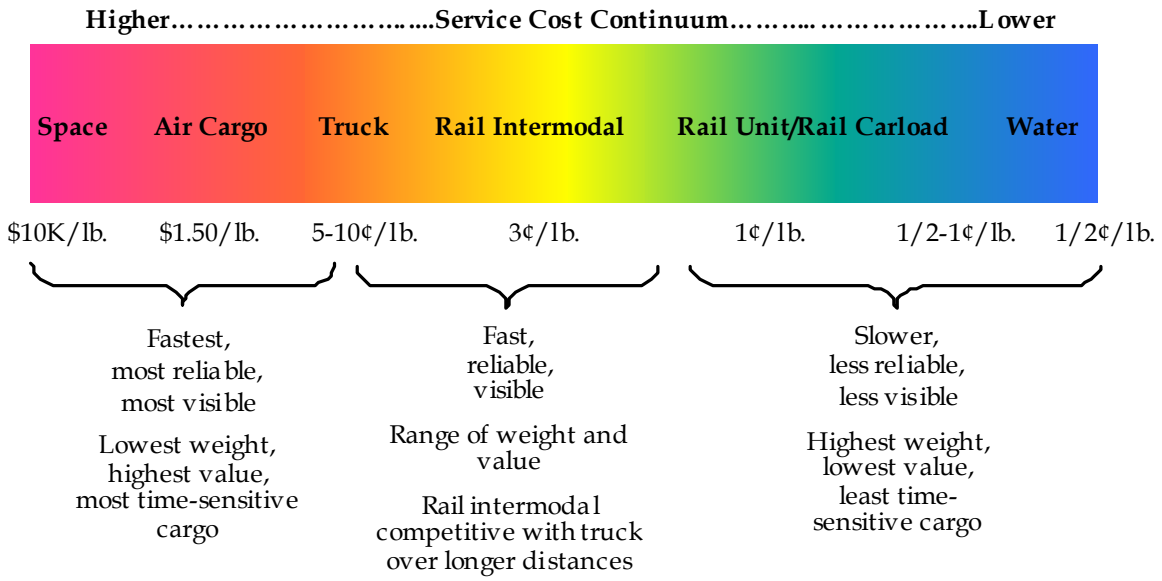
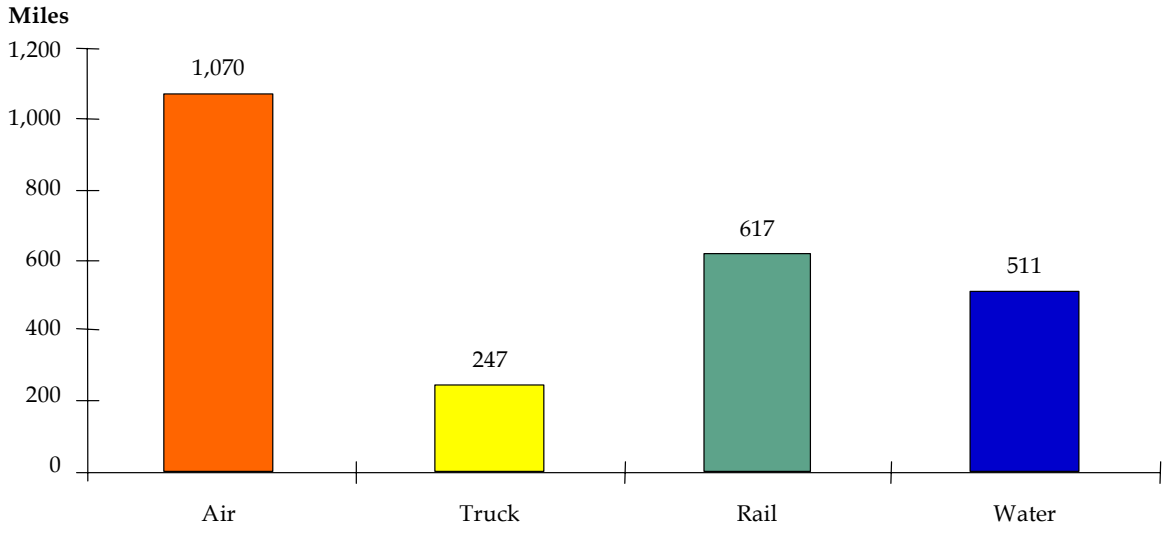


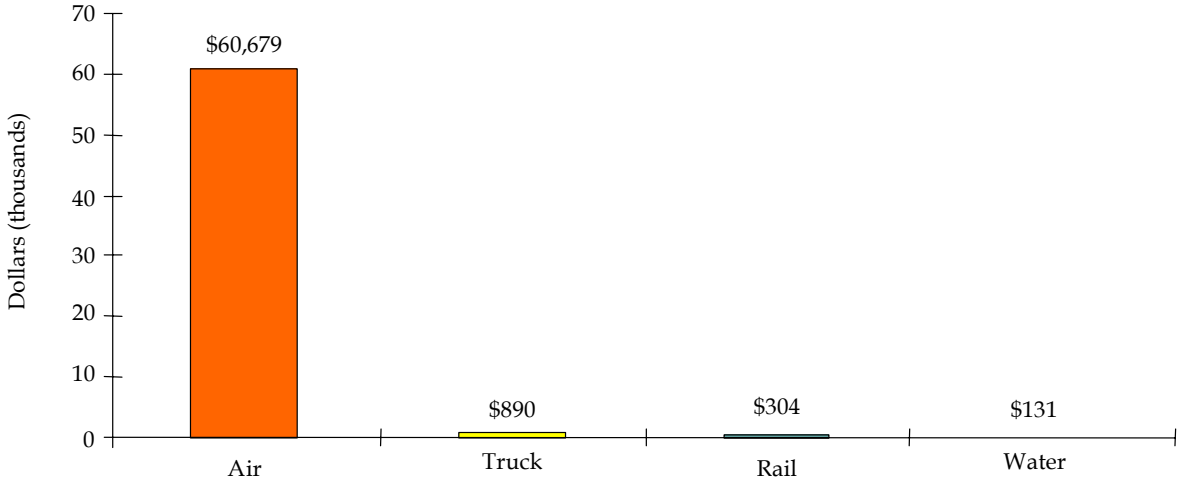
Figure 1.2 Average Length of Domestic U.S. Freight Trips by Mode in Miles

Year 2000



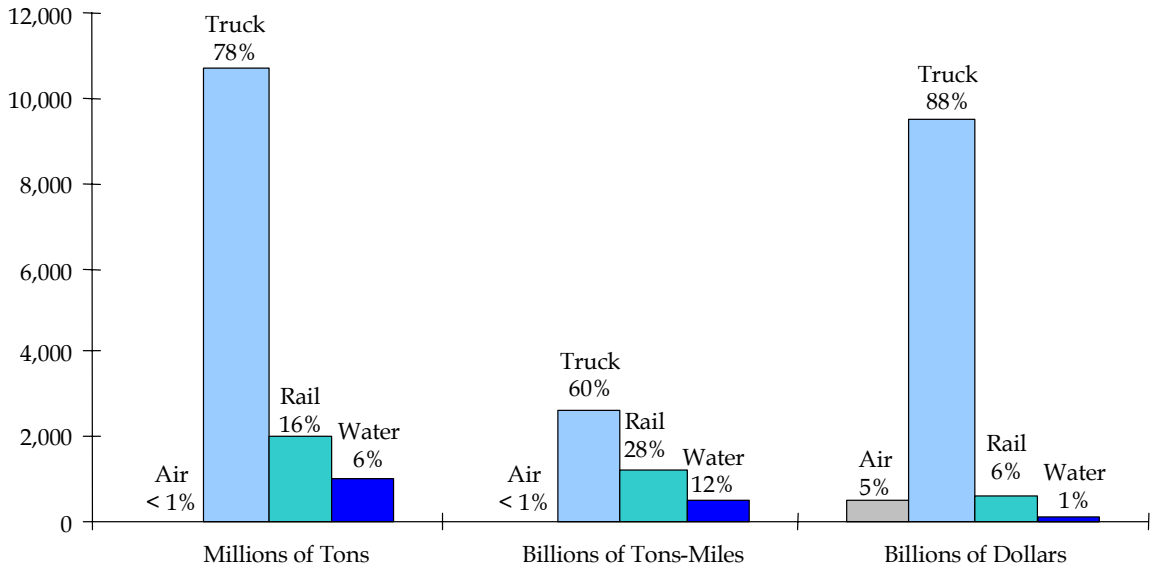
Source: Reebie Associates' TRANSEARCH and U.S. DOT Freight Analysis Framework Project.

Figure 1.3 Average Value Per Ton of Domestic U.S. Freight
Year 2000



Source: Reebie Associates' TRANSEARCH and U.S. DOT Freight Analysis Framework Project.

Figure 1.4 U.S. Domestic Freight Movement
Year 2000



Source: Reebie Associates' TRANSEARCH and U.S. DOT Freight Analysis Framework Project.

- Water (e.g., river barges, and coastal and lake steamers) moved six percent of total domestic freight tonnage. Like rail, it generated a higher share (15 percent) of ton-miles and a lower share (just one percent) of value because domestic waterborne commerce tends to specialize in long-distance moves of lower value bulk commodities.

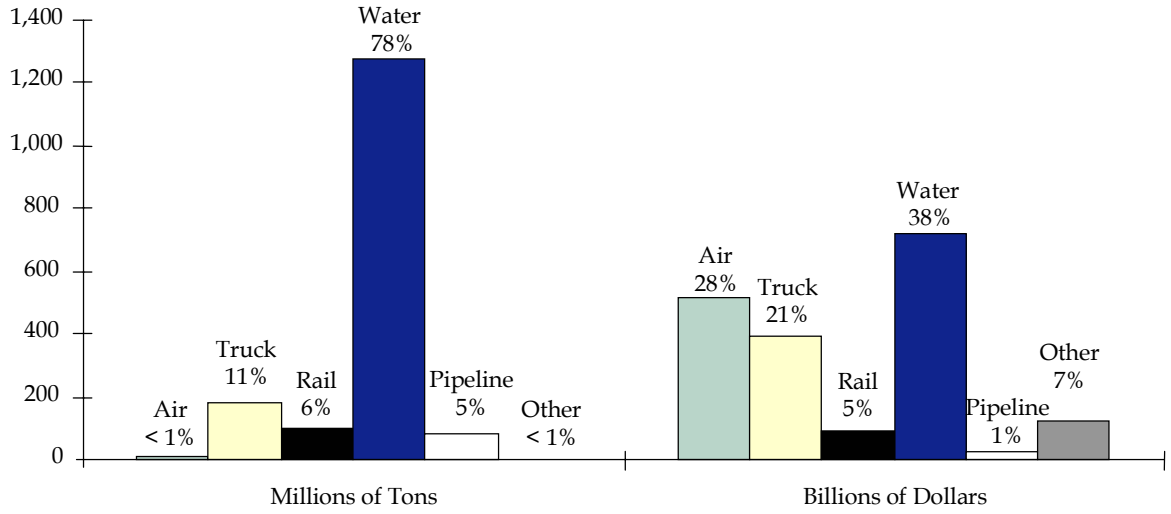
- Although air freight accounted for less than one percent of domestic tonnage (around 8.6 million tons) and less than one percent of ton-miles, it accounted for a disproportionately high five percent of total value (around $532 billion).

For international cargo, air freight fills a similar niche. It represents less than one percent of U.S. international trade tonnage (around six million tons), but almost 28 percent of international trade value (around $519 billion), as shown on Figure 1.5. Air cargo dominates other modes on a value-per-ton basis, as shown on Figure 1.6.

The specialized role of air cargo can also be assessed in terms of ton-miles, revenue-ton miles (RTMs) or revenue-ton kilometers (RTKs). Including these measures, the major U.S. air cargo markets in 2001 can be broadly described as follows:

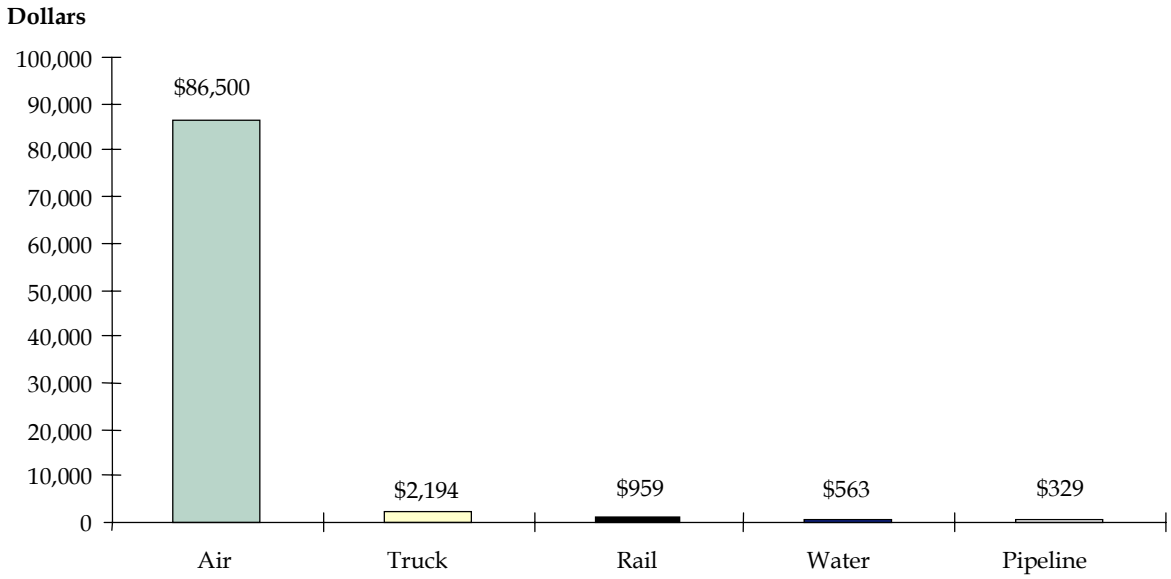
- The U.S. domestic market is sized at around $532 billion and 8.6 million tons. The international market is somewhat smaller at around 6.2 million tons, but is approximately the same value, at around $519 billion.
- U.S. flag carriers control the domestic U.S. market, but account for just 34 percent of U.S. international tonnage.
- The domestic market is dominated by all-cargo carriers, which account for almost 72 percent of RTMs. The situation is different for international cargo, where all-cargo carriers account for only 25 percent of RTMs. The U.S. share (34 percent of total) is split evenly between all-cargo and passenger carriers, but the non-U.S. share is heavily weighted to passenger carriers (belly cargo and freighters).
- The U.S. domestic market is dominated by the express business, a specialty of the all-cargo integrated carriers. Express represents 61 percent of domestic RTMs; of the remainder, 20 percent is freight on scheduled services, 15 percent is mail, and four percent is freight on chartered services. International markets are far more diversified – documents and packages account for no more than 16 percent of RTMs in any major trading market.
- The U.S. international market consists of trade with four major world geographic regions – Canada, Latin America (including Mexico, Central America, South America, and the Caribbean), Europe, and Asia. U.S. air cargo trade with Canada represents around 340,000 tons and 560,000 RTMs, which is a relatively modest market – less than four percent of U.S. international RTMs. Trade between North America and Latin America represented around 1.1 million tons; trade between North America and Europe was around 2.5 million tons; and trade between North America and Asia was around 2.3 million tons.
- North American international air cargo trade lanes are not balanced – imports account for 60 percent of Latin American traffic, 58 percent of Asian traffic, and 56 percent of European traffic.

Figure 1.5 U.S. International (Transborder and Overseas) Freight Movement, 2001



Source: U.S. DOT, Bureau of Transportation Statistics.

Figure 1.6 Average Value Per Ton of U.S. International Freight, 2001



Source: U.S. DOT, Bureau of Transportation Statistics.

Table 1.1 U.S. Air Cargo Market Volumes, 2001

	Domestic	International
Value ($ billions) and Tons (millions)	$532 billion, 8.6 million tons (TRANSEARCH 2000)	$519 billion, 6.2 million tons (U.S. DOT Bureau of Transportation Statistics, 2001)
Revenue Ton-Miles, U.S. large carriers	13,934,000,000 71.7% all-cargo carriers, 28.3% passenger carriers (Federal Aviation Administration)	14,547,000,000 50.7% all-cargo carriers, 49.3% passenger carriers (Federal Aviation Administration)

Source: TRANSEARCH database; U.S. DOT Bureau of Transportation Statistics; Federal Aviation Administration; *Overview of Air Cargo Service Development at BWI Airport* by SH+E.

Table 1.2 U.S. Air Cargo Market Characteristics, 2001

	Domestic U.S.	International, North America – Latin America	International, North America – Europe	International, North America – Asia
Tons	~ 8,600,000	1,102,000 60% import, 40% export	2,457,000 56% import, 44% export	2,303,000 58% import, 42% export
Commodities	By RTKs: 61% Express 20% Scheduled 15% Mail 4% Chartered	By Tonnage: *Import* 23% fish 20% flowers 13% fruits/vegetables 9% apparel 9% document/package *Export* 16% document/package 11% office/computer 7% electrical machinery 6% office machine parts 6% motor parts	By Tonnage: *Import* 9% document/package 9% industrial machinery 7% electrical machinery 7% manufactured 5% vehicles *Export* 13% document/package 7% electrical machinery 6% industrial machinery 6% office/computer 6% manufactured	By Tonnage: *Import* 20% office/computer 13% apparel 12% electrical machinery 9% manufactured 8% telecom equipment *Export* 12% document/package 8% electrical machinery 8% office/computer 7% fruits/vegetables 6% manufactured
Leading Origins and Destinations (by Tonnage)	Within U.S.	16% Mexico 15% Brazil 15% Colombia 13% Chile 6% Peru 35% other	22% UK 21% Germany 13% France 10% Italy 9% Netherlands 25% other	28% Japan 26% China/Hong Kong 11% Taiwan 9% Korea 7% Singapore 19% other

Source: Boeing Aerospace, *World Air Cargo Forecast 2002-2003*.

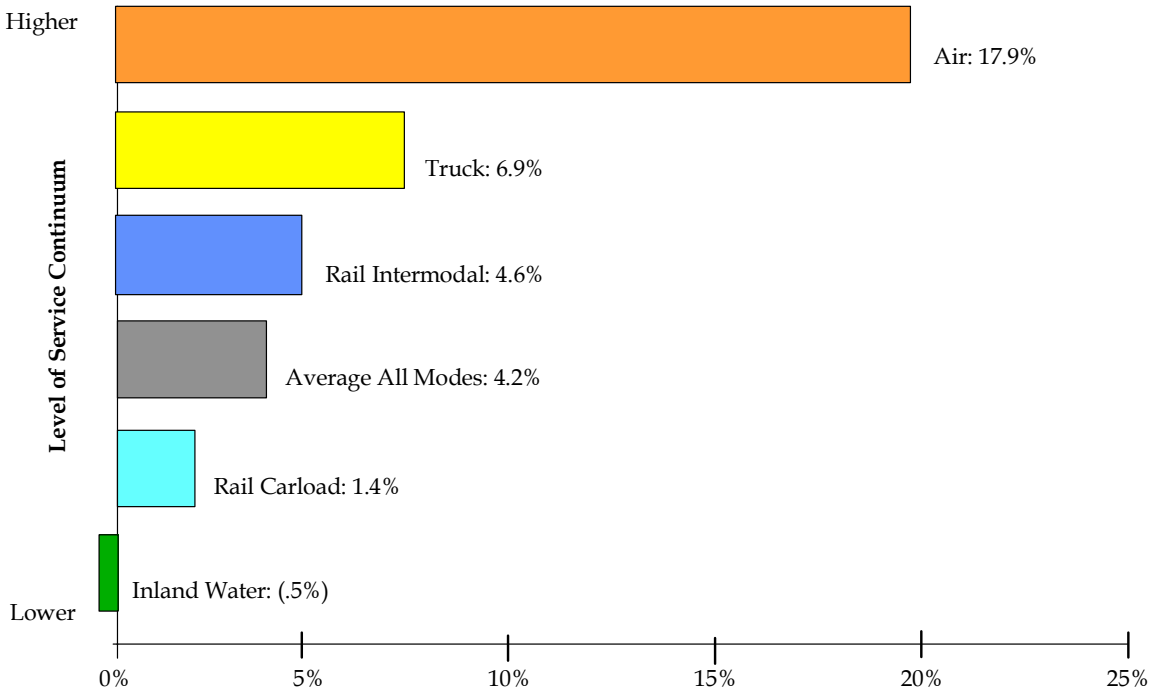
1.4 Changing Market Requirements

Different segments of the freight transportation market are growing at different rates. The demand for "high-value" types of services is growing much faster than the demand for "low-value" types of services. Customers are demanding greater speed, reliability, and visibility, and are willing to pay more for it.

Domestic Markets

Looking at TRANSEARCH data for domestic traffic by all modes over the past decade, air cargo tonnage grew at a reported rate of 18 percent per year. Trucking and rail intermodal, which also handle relatively high-value, time-sensitive shipments, grew at healthy rates (6.9 percent and 4.6 percent, respectively), but nothing like air cargo. The lowest priced modes – rail carload and water, which were the backbone of the 18th and 19th Century freight systems – are still preferred for longer-haul and bulk shipments, and grew the least.

Figure 1.7 Compound Annual Growth Rates for Domestic Tonnage, 1990-2000 – Highest for Modes with Best Service, Highest Cost



Source: Reebie Associates' TRANSEARCH and U.S. DOT Freight Analysis Framework Project.

Forecasts for all domestic freight modes developed by DRI-WEFA (now Global Insight) for the U.S. DOT Freight Analysis Framework project. Global Insight expects a compound annual growth rate of 5.3 percent for domestic air cargo tonnage – more than twice as high as the growth rate in any other mode.

Table 1.3 Domestic Freight Tonnage Growth Forecasts by Mode, 2000-2020

	Tons (2000) (Millions)	Tons (2020) (Millions)	Percent Change	CAGR
Truck	10,700	17,296	62%	2.4%
<500 miles	*9,339*	*15,188*	*63*	*2.5*
>500 miles	*1,361*	*2,108*	*55*	*2.2*
Rail	2,009	2,891	44	1.9
Water	1,054	1,470	39	1.7
Air	9	25	181	5.3
Total	**13,772**	**21,682**	**57**	**2.3**

Source: Global Insight, for U.S. DOT Freight Analysis Framework Project.

Other assessments of domestic air cargo growth are somewhat less optimistic, but still very positive. According to Boeing:

- Between 1990 and 2000, domestic truck and air cargo tonnage grew at the same rate – about 5.2 percent annually. Measured in RTKs, domestic air cargo grew at around 3.5 percent annually between 1990 and 2001. (This is substantially less than the historic growth reported by TRANSEARCH, and reflects different methods of handling the data. However, these growth rates still exceed those of other transportation modes.)

- Since 1980, growth in the domestic U.S. market has been fueled almost entirely by the express business. In 1980, express represented less than five percent of domestic RTKs; today, it represents more than 60 percent of domestic RTKs. Over the same period, RTKs associated with other domestic market segments – mail, express, scheduled freight, and chartered freight – have remained relatively flat.

- Domestic air cargo tonnage declined by 9.2 percent in 2001. This was largely because of a general slowdown in high-value sectors (principally electronics) that are heavy users of air cargo, combined with the effects of the September 11th attacks.

- Despite this recent slowdown and suggestions that the express market may be maturing, Boeing anticipates that the domestic market will recover and grow (in terms

of RTKs) at an annual average percentage of 4.3 percent (base case) between 2001 and 2021. This would more than double the domestic freight business by 2021. They offer a low forecast of 3.4 percent and a high forecast of 5.3 percent.

Additionally, the Federal Aviation Administration's (FAA) Aerospace Forecast for Fiscal Year (FY) 2003 notes the following for large U.S. air cargo carriers:

- In terms of RTMs, domestic traffic continued to decline in FY 2002 – down 5.9 percent overall – with all cargo carriers down 2.8 percent and passenger carriers down 13.6 percent. FAA attributes this differential effect to security regulations put in place for passenger aircraft after September 11th, along with general cutbacks in passenger aircraft operations.

- FAA expects that domestic traffic will recover and actually grow faster than passenger traffic, at a rate of 3.9 percent annually (in RTMs) for the period 2003-2012. The equivalent compound annual growth rate from a year 2001 base is 3.1 percent. This is slightly less than Boeing's low forecast, but is reasonably close.

- The growth rate for all-cargo carriers will be higher than for passenger carriers – 4.4 percent for the all-cargo carriers versus 2.4 percent for passenger carriers (in RTMs, 2003-2014), or 3.8 percent for the all-cargo carriers versus 1.1 percent for passenger carriers (using a year 2001 base). The share of the domestic market handled by all-cargo carriers is forecast to increase from 74.0 percent in 2002 to 78.3 percent in 2014.

For domestic air cargo, the overall picture is one of continued growth and expansion, at a rate that substantially outpaces growth in other domestic freight modes. Forecasts suggest that domestic air cargo traffic will grow by 50 percent over the coming decade.

Table 1.4 Domestic Market Outlook

	Compound Annual Growth Rates, RTKs/RTMs (2001 Base)	Equivalent Revenue Ton-Miles
Year 2001	n.a.	13,934,000,000
Boeing 2002-2021 Forecast (estimated at year 2014)	Low = 3.4% Base = 4.3% High = 5.3%	Low = 21.5 billion Base = 24.1 billion High = 27.3 billion
FAA Forecast, 2002-2014 (large U.S. carriers only)	Total = 3.1%	Total = 20.8 billion
	All-cargo carriers = 3.8% Passenger carriers = 1.1%	All-cargo carriers = 16.3 billion Passenger carriers = 4.5 billion

Source: Boeing, Federal Aviation Administration.

International Markets

Among all modes, domestic air cargo looks to benefit from the highest growth rates over the next 20 years. But international air cargo is forecast to grow at even higher growth rates, and will soon outstrip domestic air cargo in terms of value.

International market forecasts developed by Boeing suggest the following:

- **North America – Europe Trade.** Between 1991 and 2001, air cargo imports from Europe grew at 7.9 percent per year, while exports to Europe grew at 3.3 percent per year (measured in tons). Imports have exceeded exports since 1996. After growth of 8.8 percent in 1999 and 2.5 percent in 2000, air cargo between North America and Europe declined by 10.9 percent in 2001, reflecting the technology downturn and the attack of September 11th. However, the market appears to be stabilizing; it should benefit from low interest and inflation rates, and from a weaker dollar supporting exports. Between 2001 and 2021, imports from Europe are forecast to grow at a base rate of 6.7 percent annually, with a high rate of 8.3 percent and a low rate of 5.2 percent. Exports to Europe are forecast to grow at a base rate of 6.2 percent annually, with a high rate of 7.7 percent and a low rate of 4.8 percent.

- **North America – Asia Trade.** Between 1991 and 2001, air cargo imports from Asia grew at 7.1 percent per year, while exports to Asia grew at 6.0 percent per year (measured in tons). Imports have exceeded exports since 1981. Following double-digit growth in 1999 and 2000, air cargo between North America and Asia declined dramatically by 15.9 percent in 2001; again, this is attributed to the technology downturn and the attack of September 11th. However, as with the European trade, this market is forecast to recover, driven largely by expanding production in China and Southeast Asia, and a weakening dollar that should encourage more balance between exports and imports. Between 2001 and 2021, imports from Asia are forecast to grow at a base rate of 7.4 percent annually, with a high rate of 7.6 percent and a low rate of 7.3 percent. Exports to Asia are forecast to grow at a base rate of 7.6 percent annually, with a high rate of 9.1 percent and a low rate of 6.1 percent.

- **North America – Latin America Trade.** Between 1991 and 2001, air cargo imports from Latin America grew at 5.2 percent per year, while exports to Latin America grew at 3.1 percent per year (measured in tons). Imports have exceeded exports since 1981. Air trade declined 10.9 percent in 2001. Like the other markets, this one is forecast to recover, as Latin American economies continue to expand. Between 2001 and 2021, imports from Latin America forecast to grow at 6.5 percent annually and exports at 6.2 percent annually.

- **United States – Canada Trade.** Between 1991 and 2001, transborder air cargo between the United States and Canada grew at 7.1 percent annually (measured in RTKs) – almost double the growth rate for U.S. domestic cargo. Between 2001 and 2021, transborder air cargo is expected to continue growing faster than the domestic air cargo of either country – at a base rate of 7.1 percent annually, with a high rate of 8.9 percent and a low rate of 3.8 percent – reflecting continued expansion of NAFTA trade, and

the increasing use of Canadian airports as gateways to Europe and Asia by U.S. shippers.

International air cargo data from the FAA's Aerospace Forecast for FY 2003 suggests the following for large U.S. air cargo carriers:

- International traffic continued to decline in FY 2002 – down 2.2 percent in RTMs – which is less than the decline in domestic traffic. All-cargo carriers saw a decline of just 0.2 percent, while passenger carriers saw a decline of 8.0 percent.

- FAA forecasts that international air cargo traffic will grow at a rate of 5.8 percent annually (in RTMs) for the period 2003-2014, or 5.2 percent from base year 2001, which is somewhat more conservative than the low end of the Boeing forecast ranges.

- As with domestic traffic, the growth rate for all-cargo carriers will be higher than for passenger carriers, but the difference will not be as dramatic – 6.3 percent for the all-cargo carriers versus 5.2 percent for passenger carriers (period 2003-2014), or 6.1 percent for the all-cargo carriers versus 4.2 percent for passenger carriers (year 2001 base). The share of the domestic market handled by all-cargo carriers is forecast to increase from 53.6 percent in 2002 to 56.6 percent in 2014.

For international air cargo, the overall forecast is for recovery and strong growth by both all-cargo and passenger carriers, with traffic expected to nearly double over the next decade.

Table 1.5 International Market Outlook

	Compound Annual Growth Rates, RTMs/Tons (2001 Base)	Equivalent Tons and RTMs
Boeing 2002-2021 Forecast (Tons, all carriers, estimated at year 2014)	Canada = 7.1% Latin America Import = 6.5% Latin America Export = 6.2% Europe Import = 6.7% Europe Export = 6.2% Asia Import = 7.4% Asia Export = 7.6% Total = 6.9%	Base Year 2001 = 6,200,000 tons Forecast Year 2014 = 21,800,000 Tons
FAA Forecast to Year 2014 (RTMs, large U.S. carriers only)	5.2% All-cargo carriers = 6.1% Passenger carriers = 4.2%	Base Year 2001 = 14.5 billion RTMs Forecast Year 2014 = 28.1 billion RTMs All-cargo carriers = 56.6% Passenger carriers = 43.4%

Source: Boeing, Federal Aviation Administration.

Emerging Issues

Several important trends and "risk factors" may affect the realization of these forecasts, including:

- **Relationship of air cargo to gross domestic product (GDP).** Since 1976, the U.S. GDP has doubled, while air cargo revenue ton-miles have more than tripled. (Prior to year 2001, air cargo growth was on track to nearly quadruple). All future forecasts are based on the assumption that this trend will continue – e.g., that in the face of relatively conservative forecast growth in GDP, air cargo growth will continue at a faster rate. This would clearly be affected by major structural changes in global trade relationships. It would also be affected by changes in the domestic express market – while e-commerce is creating new demand for air cargo to fulfill orders, it the Internet is also reducing the need for express shipping of documents. Available forecasts are appropriate for planning purposes, so long as the downside potential is recognized.

- **Contraction of services by U.S. passenger air carriers.** The economic health of the U.S. passenger industry continues to decline. Passenger traffic fall-offs from September 11th and its aftermath have pushed several carriers to the financial brink. The result is that major carriers have cut back on their schedules. In year 2002, more than 1500 flights were cut by Continental, US Airways, Delta, United, and Northwest, as their respective stock prices fell by 50 percent to 100 percent. These carriers represent five of the top six passenger carriers for air cargo; American, the sixth, has also cut capacity. Interestingly, Southwest – a relatively minor player in the air cargo market – did not cut any flights in 2002. Current events (the war in Iraq, fear of air travel because of SARS, etc.) have further depressed air passenger travel; additional cutbacks are occurring, and serious questions about the long-term financial health of the passenger carriers remain unresolved, so further cutbacks are likely. If these cutbacks are sustained over the long-term, planners should expect higher-than-forecasted air cargo growth for the all-cargo carriers, reduced air cargo growth for the passenger carriers, and more domestic cargo being diverted to pure trucking companies.

- **Continuing integration of air and truck delivery.** Boeing observes: "The U.S. transportation landscape continues to evolve, as shippers avail themselves of a wide variety of service types. Combination carriers are using fewer wide-body aircraft on domestic passenger services, resulting in a reduction in available air cargo capacity. To offset the lost capacity and offer service comparable to that of pure cargo carriers, combination carriers have substituted scheduled 'truck flights' for air connections. Currently, more than 500 city pairs in the United States and Canada are served by such alternative transport operations." (Source: Boeing World Air Cargo Forecast, 2002/2003). Boeing's forecasts account for these "truck flights" as they are being used to offset the loss of passenger wide-body aircraft; as passenger carriers continue to cut back their schedules, there may be even more of these "truck flights" offered to remain competitive with all-cargo carriers and trucking companies.

1.5 Air Cargo Gateways

Domestic and international air cargo moves through a variety of U.S. gateways. Two issues – which gateways are preferred for existing air cargo markets and which gateways will be preferred to accommodate future growth in air cargo markets – are central to planning for cargo operations at BWI.

Distribution of Air Cargo Operations

The leading North American air cargo airports (by tonnage) are shown on Figure 1.8 and Table 1.6. Generally, the coastal airports are leaders in handling international tonnage (JFK for Europe, Miami for Latin America, Los Angeles for Asia, etc.) while the inland airports are leaders in handling domestic tonnage for integrated carriers (Memphis for Federal Express, Louisville for UPS, Indianapolis for Emery, etc.). Anchorage is a special case, as much of its tonnage is the result of aircraft stopping over to refuel.

Figure 1.8 Location of Leading Air Cargo Gateways, 2001

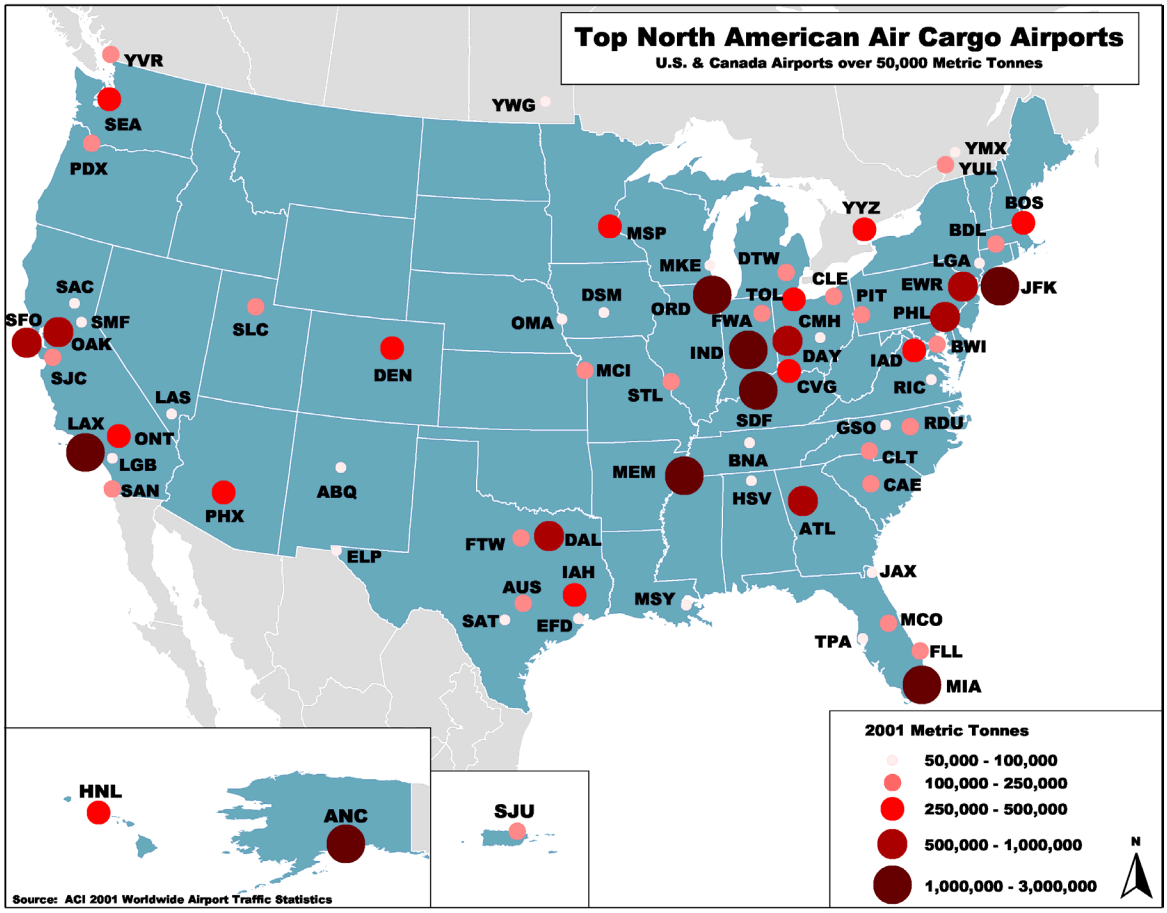


Table 1.6 Leading Air Cargo Gateways and Tonnages, 2001

U.S. and Canada Airports of More Than 50,000 Metric Tons

Rank	Airport Code	Airport Name	State or Province	2001 Metric Tons
1	MEM	Memphis International	TN	2,631,631
2	ANC	Ted Stevens Anchorage International	AK	1,873,750
3	LAX	Los Angeles International	CA	1,774,402
4	MIA	Miami International	FL	1,639,760
5	SDF	Louisville International-Standiford Field	KY	1,468,837
6	JFK	John F. Kennedy International	NY	1,430,727
7	ORD	Chicago O'Hare International	IL	1,299,628
8	IND	Indianapolis International	IN	1,115,272
9	EWR	Newark International	NJ	795,584
10	DAL	Dallas Love Field	TX	784,085
11	ATL	The William B. Hartsfield Atlanta International	GA	739,927
12	SFO	San Francisco International	CA	636,006
13	OAK	Metropolitan Oakland International	CA	593,634
14	PHL	Philadelphia International	PA	536,270
15	DAY	James M. Cox Dayton International	OH	532,306
16	ONT	Ontario International	CA	419,039
17	SEA	Seattle-Tacoma International	WA	400,499
18	BOS	General Edward Lawrence Logan International	MA	395,126
19	DEN	Denver International	CO	358,631
20	MSP	Minneapolis-Saint Paul International/World-Chamberlain	MN	339,676
21	IAH	George Bush Intercontinental Airport/Houston	TX	337,842
22	HNL	Honolulu International	HI	337,631
23	IAD	Washington Dulles International	VA	330,914
24	YYZ	Toronto	ON	323,000
25	CVG	Cincinnati/Northern Kentucky International	KY	321,917
26	TOL	Toledo Express	OH	303,492
27	PHX	Phoenix Sky Harbor International	AZ	283,337
28	PDX	Portland International	OR	242,967
29	DTW	Detroit Metropolitan Wayne County	MI	240,763
30	YVR	Vancouver	BC	228,672
31	**BWI**	**Baltimore/Washington International**	**MD**	**225,083**
32	MCO	Orlando International	FL	223,545
33	SJU	Luis Munoz Marin International	PR	218,903
34	SLC	Salt Lake City International	UT	216,590
35	FTW	Fort Worth Meacham International	TX	208,228
36	FLL	Fort Lauderdale/Hollywood International	FL	181,907
37	CLT	Charlotte/Douglas International	NC	177,654

Gateway Preference Factors

Factors that attract air cargo to certain gateways generally include:

- **Carrier Mix.** Airports that accommodate major passenger airlines that also handle large amounts of air cargo will, by definition, be significant air cargo hubs. Likewise, airports that serve as hub facilities for major integrated carriers are reported as major gateways. Airports that do not specialize in major freight-carrying passenger lines, or that do not feature extensive operations by integrated carriers, will generally have lower volumes.

- **Services and Routes.** Shippers (or their forwarders) will generally tend to use the closest airport that provides the needed frequency of service to their desired destinations. If the nearest airport does not offer the needed service, a more distant gateway will be used, despite the higher cost of the truck move (also known as "drayage").

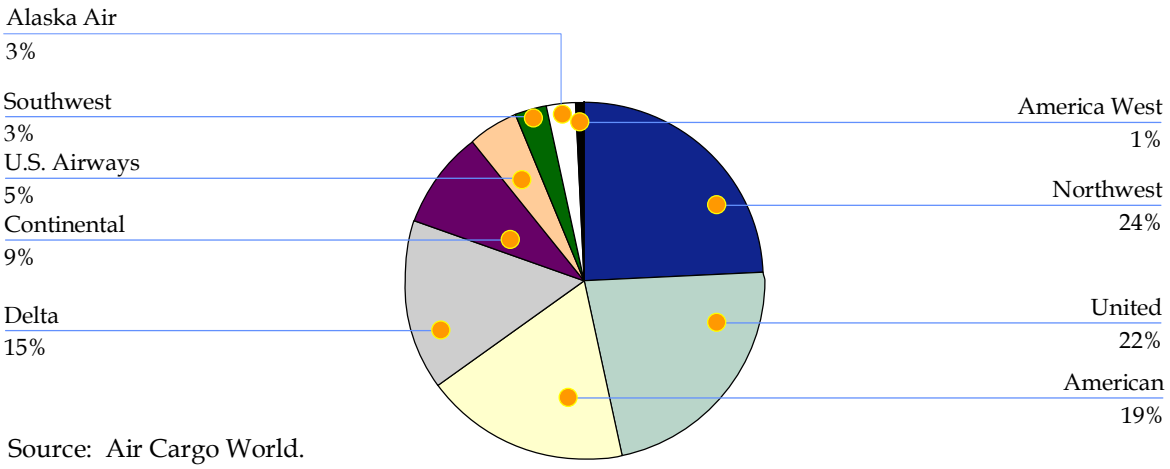
- **Airside Capacity.** Obviously, airports must offer sufficient capacity for the number of operations and type of aircraft involved in air cargo carriage.

- **Transfer and Warehousing.** Sufficient space must be available for the transfer and interim storage of cargo between truck and aircraft.

- **Specialized Facilities.** The availability of facilities for handling specialized types of cargo – perishables, hazardous materials, live animals, etc. – is essential for certain markets. The availability of space for value-added processing (final assembly and packaging of parts, etc.), or the availability of longer-term storage, may be important factors.

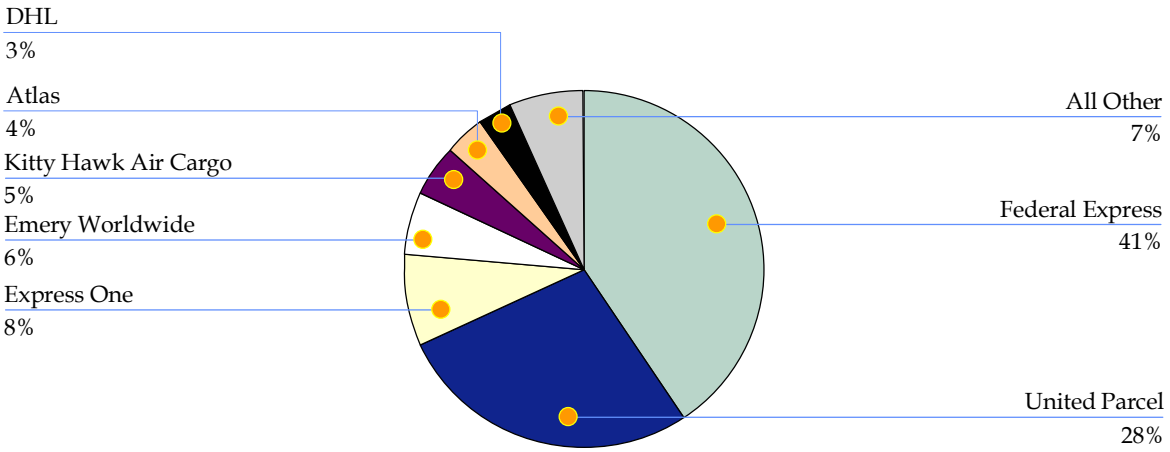
- **Truck Connections.** The "first mile" pick-up and "last mile" delivery of air cargo is almost always by motor vehicle – truckload, less-than-truckload, delivery van, etc. There is almost no interchange of air cargo with rail or water, because the relatively poor transit time and reliability offered by those modes is incompatible with the basic service requirements – high speed and high reliability – that cause a shipper to use air in the first place. Good highway access is important to the overall speed and reliability of the end-to-end move. This is vital for integrated carriers such as Fed Ex and UPS, and increasingly important for passenger carriers that utilize "truck flights" between major domestic city pairs.

Figure 1.9 Share of Cargo Revenue by U.S. Passenger Airlines, 2002



Source: Air Cargo World.

Figure 1.10 Share of Tonnage by U.S. All-Cargo Airlines, 2000



Source: Federal Aviation Administration.

Table 1.7 Top 25 World Air Cargo Carriers by Ton-Kilometers, 2001

	Ton-Kilometers, Year 2001
Fed Ex	11,045,328.00
Lufthansa	7,081,000.00
UPS	5,958,329.00
Singapore	5,884,463.00
Korean	5,571,000.00
Air France	5,117,000.00
KLM	4,464,287.00
Japan Airlines	4,190,263.00
British Airways	4,033,000.00
China Airlines	4,030,141.00
Nippon Cargo	3,925,574.00
Cathay Pacific	3,887,087.00
Cargolux	3,768,075.00
EVA	3,279,012.00
United	2,801,563.00
Northwest	2,789,996.00
American	2,561,406.00
Martinair	2,395,169.00
Asiana	2,382,846.00
Delta	2,311,180.00
Malaysia	1,837,426.00
Swissair	1,793,704.00
Thai International	1,670,203.00
Quantas	1,572,069.00
Air Hong Kong	1,550,338.00

Source: SH+E, *Overview of Air Cargo Service Development at BWI.*

Implications for Baltimore/Washington International Airport

Within this broad national context, there are a number of important issues for cargo operations at BWI:

- To what extent will BWI share in the overall forecasted growth of the nation's domestic and international air cargo markets? What are BWI's advantages and disadvantages – in terms of carrier mix, services and routes, capacity, specialized facilities, and transportation connections – with respect to competing gateways?

- What are the economic benefits to the State of Maryland of air cargo operations at BWI? What would be the additional benefit of enhancing cargo operations – or the opportunity cost of not doing so?

- What types of cargos could be attracted to BWI in the future, and what types of physical or service improvements might be needed to make this happen?

2.0 BWI Air Cargo Activity and Market Potential

2.0 BWI Air Cargo Activity and Market Potential

2.1 Introduction

This section of the assessment of BWI air cargo operations examines and describes the composition and distribution of air cargo activity at the airport. Opportunities for increased market share are also described and discussed. The primary sources referenced in this discussion are the TRANSEARCH database, for domestic flows and the MISER database, for international flows.

The data confirm the findings of prior studies in identifying a large share of Maryland origin-destination air cargo that uses airports other than BWI. This "market leakage" to peer airports is attributable to time and service considerations much more than access or cost. Capturing some share of this leakage – either in domestic or international services – represents a meaningful market opportunity.

2.2 Current Activity at BWI

Volumes and Trends

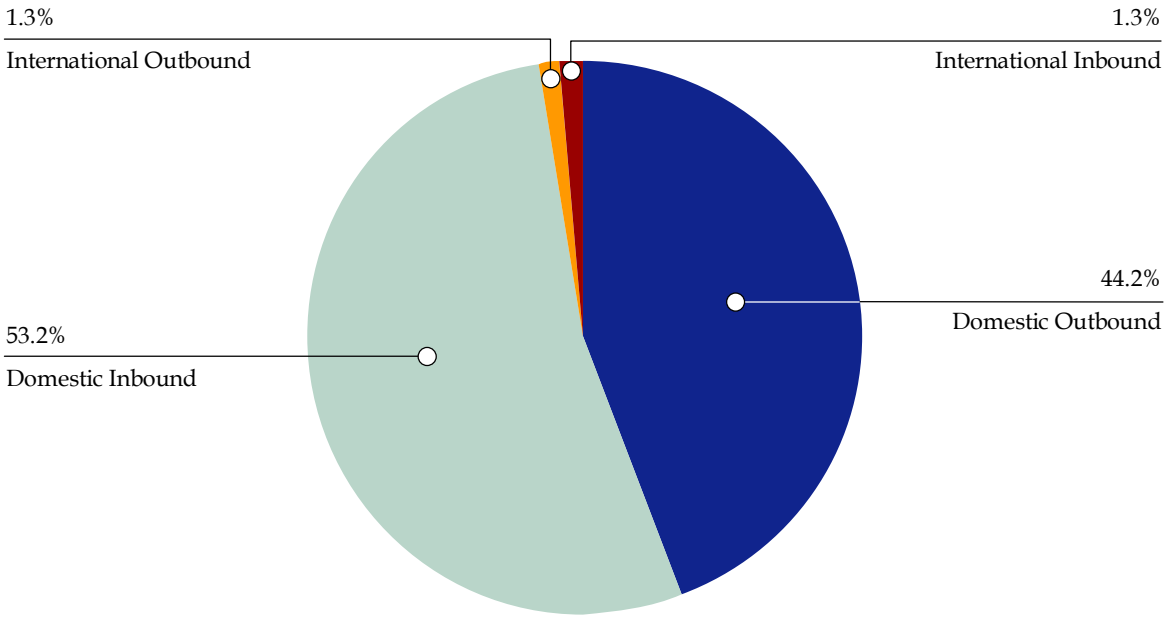
In year 2001, BWI ranked 31st among North American (U.S. and Canadian) airports in air cargo tonnage (freight and mail), handling 225,083 metric tons (Source: Airports Council International). In year 2002, BWI air cargo grew to 251,000 metric tons (Source: BWI). Inbound traffic slightly exceeded outbound traffic. Domestic inbound and outbound accounted for 97.4 percent of all traffic – international traffic accounted for just 2.6 percent.

Table 2.1 Air Freight and Mail Tonnage (Metric) through BWI, 2002

	Domestic	International	Total
Outbound	111,121	3,316	114,435
Inbound	133,718	3,191	136,912
Total Cargo	**244,839**	**6,507**	**251,346**

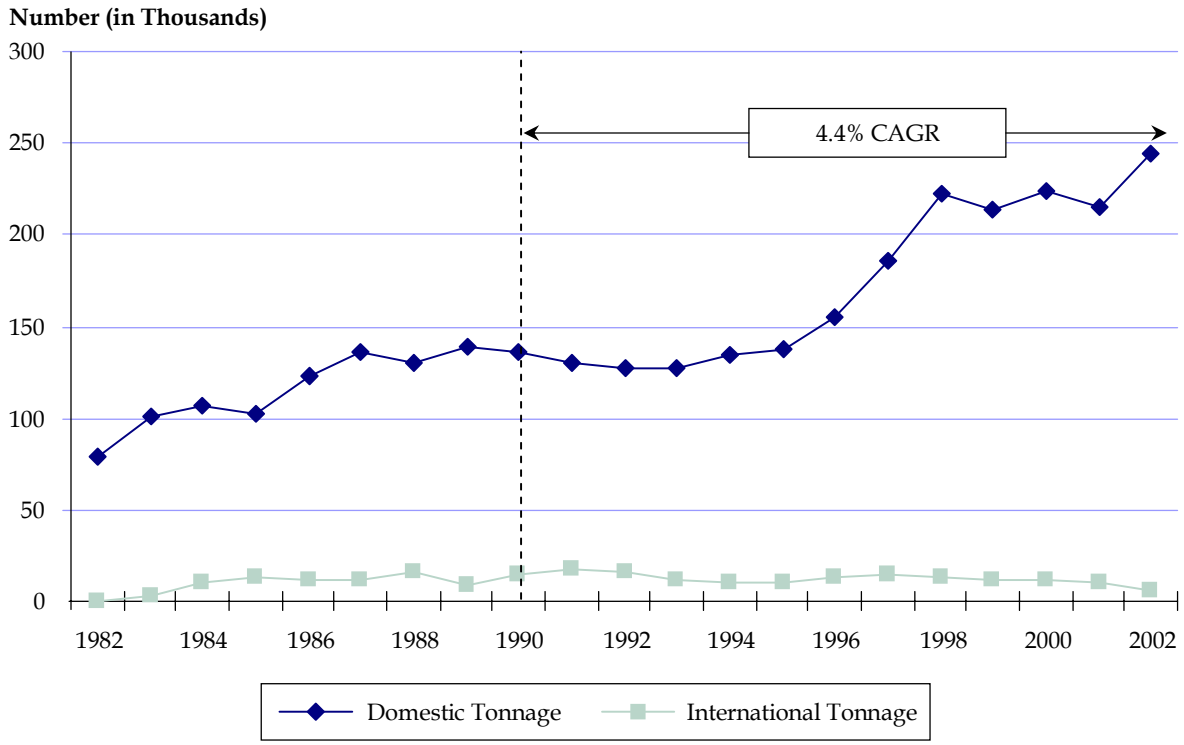
Source: BWI Airport.

Figure 2.1 Distribution of Air Cargo Tonnage through BWI
2002



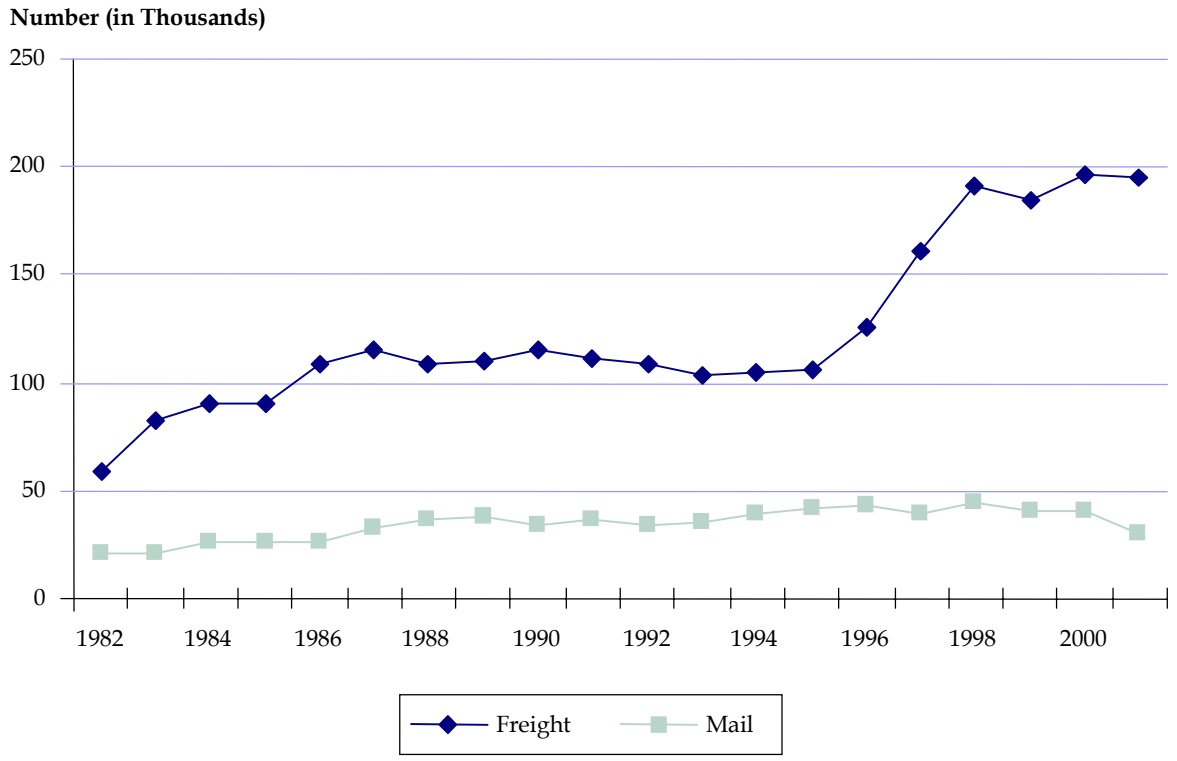
For the period 1982-2002, total BWI air cargo has grown at an average rate of 5.9 percent annually. Domestic cargo has grown at 5.8 percent; international cargo has actually grown faster on a percentage basis, at 11.6 percent annually, but this rate applies to a far smaller base of traffic. Since 1990, total BWI air cargo has grown at 4.4 percent annually – slightly below the national growth rate (5.2 percent) stated by Boeing for that period – and all of this growth has been domestic, as the international market has actually declined by 50 percent.

Figure 2.2 Growth in BWI Air Cargo Tonnage (Metric)
1982-2002



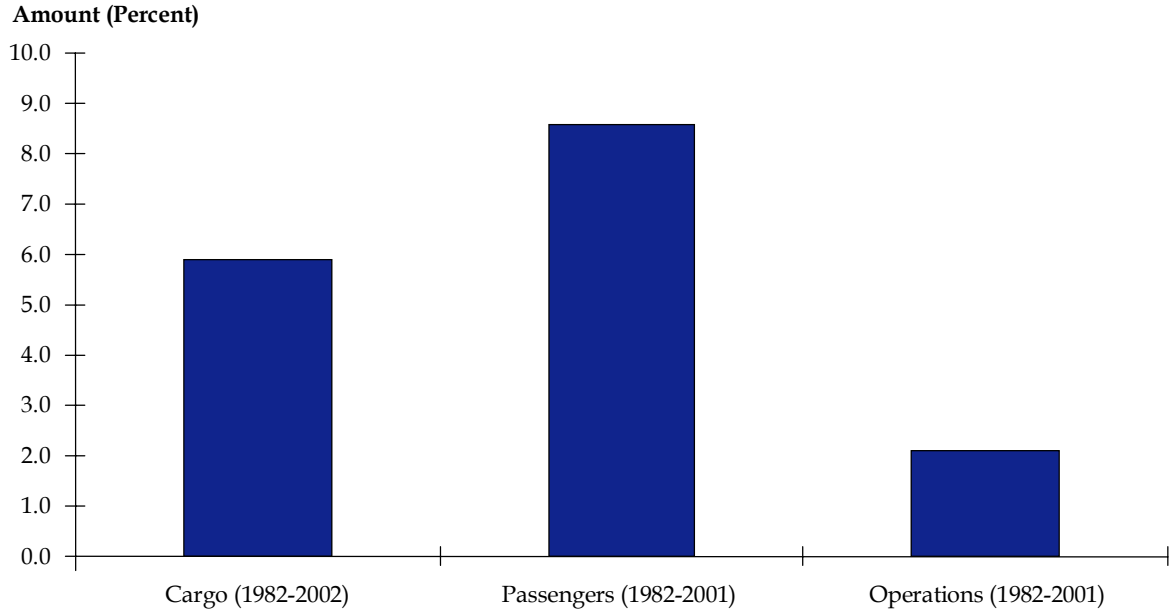
Of all air cargo tonnage, freight currently accounts for around 86.6 percent while-mail accounts for 13.4 percent. Since 1982, freight has grown at 6.5 percent annually while-mail has grown at 2.0 percent annually.

Figure 2.3 Growth in BWI Freight and Mail Tonnage (Metric)
1982-2001



Over the same period (1982-2001), passenger traffic grew by 8.2 percent annually – from 4.6 million in 1982 to 20.4 million in 2001. Interestingly, total operations have grown by only 2.1 percent annually.

Figure 2.4 Annual Growth Rates for BWI Tonnage, Passengers, and Operations



Commodities and Origin-Destination Flows

Domestic

Domestic cargo accounted for 97.4 percent (244,836 metric tons) of the BWI tonnage in year 2002 and 95.6 percent (215,082 metric tons) in year 2001.

As shown in Table 2.2, for outbound domestic flows, mail, and other contract traffic is the number one cargo by type. Other leading commodity types include machinery, transportation equipment, electrical equipment, printed materials, and other products.

Table 2.2 Outbound Domestic Commodities by Share of Tonnage, 2001

Product	Outbound
Mail or contract traffic	43.6%
Machinery	14.7
Transportation equipment	12.6
Electrical equipment	9.7
Printed matter	5.5
Fabricated metal products	2.9
Instruments, photo equipment, optical equipment	2.9
Pulp, paper or allied products	2.1
Rubber or miscellaneous plastics	1.6
Miscellaneous manufacturing products	1.5
Food or kindred products	1.5
Clay, concrete, glass or stone	0.5
Leather or leather products	0.4
Petroleum or coal products	0.4
Lumber or wood products	0.1

Source: Reebie and Associates, 2002.

The share of inbound domestic traffic by major commodity class in year 2001 is shown in Table 2.3. For inbound domestic flows, mail and other contract traffic is the number one cargo by type. Other leading commodity types include machinery, chemicals, transportation equipment, electrical equipment, printed materials, and other products.

Table 2.3 Inbound Domestic Commodities by Share of Tonnage, 2001

Product	Inbound
Mail or contract traffic	33.6%
Machinery	11.3
Chemicals or allied products	10.2
Electrical equipment	8.8
Transportation equipment	8.6
Printed matter	6.1
Fabricated metal products	4.1
Instruments, photo equipment, optical equipment	3.2
Rubber or miscellaneous plastics	3.0
Miscellaneous mixed shipments	2.3
Pulp, paper or allied products	1.9
Apparel or related products	1.8
Miscellaneous manufacturing products	1.3
Farm products	1.3
Food or kindred products	0.8
Fresh fish or marine products	0.5
Clay, concrete, glass or stone	0.5
Textile mill products	0.2
Leather or leather products	0.2
Primary metal products	0.1
Furniture or fixtures	0.1
Petroleum or coal products	0.1

Source: Reebie and Associates, 2002.

Origins and destinations served by the leading cargo carriers at BWI are listed in Table 2.4.

Table 2.4 Origins and Destinations of Scheduled Services by All-Cargo Carriers at BWI, August 2001

Airline	Type	Market	Flights per Week	Aircraft
Airborne	Integrator	Wilmington	5	D9F
DHL	Integrator	Cincinnati	5	72F
		Harrisburg	5	CNA
		Wilkes-Barre/Scranton	5	CNA
Emery	Integrator	Dayton	5	ABF
		Hartford	5	ABF
Fed Ex	Integrator	Memphis	12	ABF
		Indianapolis	7	72F
		Newark	10	CNA
		Salisbury	10	CNA
Kitty Hawk	Traditional	Charlotte	4	72F
		Fort Wayne	4	72F
UPS	Integrator	Louisville	8	ABF

Source: SH+E, "Overview of Air Cargo Service Development at BWI."

International

International cargos accounted for just 2.6 percent (6,507 metric tons) of BWI's total air cargo tonnage in year 2002. The figure was slightly higher at 4.4 percent (10,000 metric tons) in year 2001; of this, freight represented 9,986 metric tons, while-mail constituted 14 metric tons.

The distribution of outbound international freight by commodity class is shown in Table 2.5. The leading commodity classes include chemical products, electrical machinery, industrial machinery, organic chemicals, and plastics. Preparations of cell growth media are the single largest export by tonnage from BWI, reflecting its important role in serving Maryland's biotech industries.

Table 2.5 Outbound International Commodities by General Classification, 2001

Code	Commodity	Metric Tons	Share
38	Miscellaneous chemical products	346,939	10.9%
85	Electric machinery, etc.; sound equipment; television equipment; parts	255,580	8.0
84	Industrial machinery, including computers	213,784	6.7
28	Inorganic chemicals, precious and rare earth metals, and radioactive compounds	166,881	5.2
39	Plastics and articles thereof	111,235	3.5
88	Aircraft, spacecraft, and parts thereof	96,291	3.0
33	Essential oils, etc.; perfumery, cosmetics, etc.	94,048	3.0
90	Optic, photo, etc.; medic or surgical instruments, etc.	93,697	2.9
98	Special classification provisions	69,760	2.2
48	Paper and paperboard and articles (including paper pulp articles)	47,114	1.5
21	Miscellaneous edible preparations	46,160	1.5
22	Beverages, spirits, and vinegar	45,407	1.4
73	Articles of iron or steel	37,070	1.2
87	Vehicles, except railway or tramway, and parts, etc	34,883	1.1
49	Printed books, newspapers, etc.; manuscripts, etc.	31,285	1.0

Source: MISER database.

The distribution of inbound international freight by commodity class is shown in Table 2.6. The leading commodity classes include industrial machinery, essential oils (perfumes, etc.), fish and crustaceans, vegetables, electrical machinery, and apparel. These import commodities consist for the most part of consumer products.

Table 2.6 BWI Inbound International Commodities by General Classification, 2001

Code	Commodity Class	Metric Tons	Share
84	Industrial machinery, including computers	1,984,633	17.8%
33	Essential oils, etc.; perfumery, cosmetics, etc.	945,203	8.5
3	Fish, crustaceans, and aquatic invertebrates	646,942	5.8
7	Edible vegetables and certain roots and tubers	510,195	4.6
85	Electric machinery, etc.; sound equipment; television equipment; parts	364,846	3.3
61	Apparel articles and accessories, knit or crochet	305,234	2.7
62	Apparel articles and accessories, not knit, etc.	296,433	2.7
42	Leather art; saddlery, etc.; handbags, etc.	253,053	2.3
90	Optic, photo, etc.; medic or surgical instruments, etc.	240,264	2.2
95	Toys, games and sport equipment; parts and accessories	212,455	1.9
39	Plastics and articles thereof	185,071	1.7
98	Special classification provisions	181,404	1.6
87	Vehicles, except railway or tramway, and parts, etc.	148,663	1.3
63	Textile art, needlecraft sets, etc.	128,687	1.2
64	Footwear, gaiters, etc. and parts thereof	128,666	1.2
	All other	1,357,722	12.2
	Total	**11,128,865**	**100.0%**

Source: MISER database.

According to SH+E, around 75 percent of U.S. international cargo is carried by passenger lines; at BWI, scheduled international service is offered only by the passenger lines (not by the integrators or traditional all-cargo lines). The origins and destinations of international passenger flights currently offered through BWI are summarized in Table 2.7.

Table 2.7 BWI International Flight Origins and Destinations

International Destinations	Operations per Week	Aircraft	Wide-body Operations per Week
Toronto, Ontario	66	DH1, ERJ	
Freeport, Bahamas	18	717, 727	
San Juan, Puerto Rico	16	738, 757	
London, U.K.	14	767, 777	14
Calgary, Alberta	14	757, 733, 735, 320	
Montego Bay	14	310	14
Reykjavik, Iceland	12	752	
Cancun, Mexico	10	320, 757	
Shannon, Ireland (connecting to Dublin)	10	330	10
Punta Cana, Dominican Republic	6	320	
Accra, Ghana	2	D10	2
Total Weekly Flights	**182**		**40**

Source: BWI Online Flight Schedule by OAG Flight Engine (OAG Worldwide Limited).

SH+E notes that Fed Ex also provides 33 international flights per week (to London, Paris, Toronto and Montreal) from its Newark hub; Fed Ex offers 10 flights per week between BWI and Newark. SH+E also notes that UPS provides 28 international flights per week (to East Midlands, Paris, Hamilton Ontario and Montreal) from its Philadelphia hub; UPS operates no direct flights from BWI to Philadelphia, and their Philadelphia services are presumably accessed by truck from Maryland.

Carriers and Facilities

According to SH+E, integrated carriers account for 84 percent of air cargo tonnage at BWI, passenger carriers account for 13 percent, and traditional all-cargo carriers account for three percent. Fed Ex alone accounts for more than two-thirds of the airport's tonnage. Carrier volumes are summarized in Table 2.8.

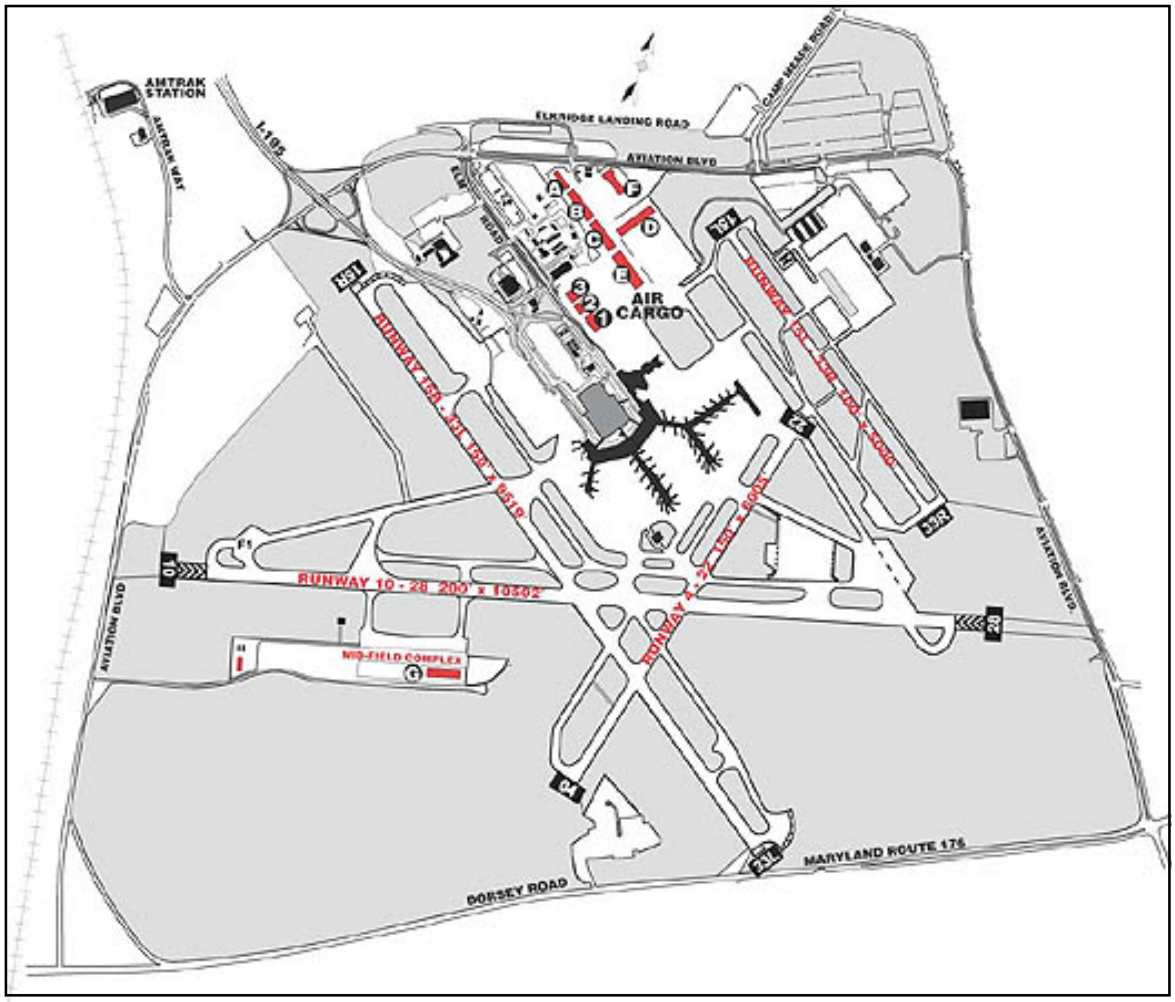
Table 2.8 Air Cargo Carrier Volumes (Metric Tons) at BWI, 2002

Type	Airline	Volume	Share
Integrated	All	211,131 (estimate)	84%
	• Fed Ex	170,137	68
	• UPS	19,337	8
	• Emery	12,365	5
	• DHL	7,317	3
	• Airborne, BAX Global	1,975 (estimate)	1
All-Cargo	All	7,540 (estimate)	3%
Passenger	Total	32,675 (estimate)	13%
	• Southwest	9,106	4
	• All Other Domestic	17,062 (estimate)	7
	• All International	6,507	3
Total	**All Carriers**	**251,346**	**100%**

Sources: BWI Airport "Top Five Cargo Carrier" Monthly Reports (January 2002 – December 2002) and SH+E, "Overview of Air Cargo Service Development at BWI."

BWI provides 10 cargo buildings with 414,906 square feet (sf) of warehouse space, including 24,000 sf of cold storage, in three clusters – five in the North Cargo Area, three along Elm Road, and one in the Mid-Field Cargo Complex. BWI offers direct nose-in access for 15 freighters, and its air cargo ramps accommodate up to 24 aircraft. BWI is the only U.S. Fish and Wildlife Service inspection gateway in the Mid-Atlantic, and has permanent assigned staff from Customs, the Department of Agriculture, and the Food and Drug Administration. BWI has a foreign trade zone with 70,000 sf on-airport and 100,000 sf off-airport.

Figure 2.5 Location of BWI Air Cargo Facilities



Source: BWI web site.

Table 2.9 Users of BWI Air Cargo Facilities

Complex	Building	User
North Cargo Area	A	Maryland Aviation Administration
	B	American Trans Air Delta Airlines Miami Aircraft Support Northwest Airlines Southwest Airlines
	C	Southwest Airlines U.S. Postal Service
	D	British Airways FedEx United Parcel Service U.S. Airways Catering World Airways Worldwide Flight Services, Inc.
	E	BAX Global FedEx U.S. Postal Service
	F	CJ International Emery Air Freight FedEx Glenair Freight Company International Association of Machinists & Aerospace Workers Laing International Meadows Transportation Mid-Atlantic Trade Services Odyssey Transport Samuel Shapiro & Co. U.S. Customs U.S. Fish & Wildlife
Elm Road Area	1	United Airlines U.S. Airways
	2	Air Canada Air Jamaica America West Continental Airlines Frontier Airlines Icelandair Signature Flight Support World Airways
	3	Airborne Express American Airlines
Mid-field Cargo Complex	G	Kitty Hawk Air Cargo

The Mid-field Cargo Complex (MCC) is under a privatized lease agreement with Aviation Facilities Company; Building G currently provides 59,453 sf, and the full buildout plan for the Mid-field Cargo Complex provides for a total of 358,000 sf. The 1995 Air Cargo Complex Evaluation recommended developing all-cargo operations at the MCC, rather than belly cargo services, because of the distance from aircraft at the passenger terminals.

The North Cargo and Elm Road Cargo areas, which provide 355,453 sf, are not planned for further development. These areas could potentially be impacted by proposals to develop new passenger concourses F, G, H and I at some point in the future; these concourses are not identified as near-term projects prior to 2006 (source: BWI web site).

2.3 Market Growth and Potential

A review of previous studies and the TRANSEARCH and MISER data obtained for this study suggest five types of potential market opportunities for BWI:

- Natural growth in the markets that BWI currently serves;
- Domestic air cargo that moves to or from the State of Maryland, but is handled through airports other than BWI;
- Domestic cargo currently shipped by truck to and from the State of Maryland that could be moved by air;
- International cargo services that include a "domestic leg" through BWI; and
- International cargo that is moving to or from the State of Maryland, but is handled through airports other than BWI.

A sixth market opportunity exists – capturing additional domestic traffic from adjoining states that is currently handled through other airports. This could boost volumes through BWI, but at the likely expense of additional truck vehicle miles traveled on Maryland's highways, and has not been considered in this analysis.

The following analysis is concerned primarily with estimating the relative size of these markets, without addressing issues of potential benefit (discussed in Section 3.0) or strategic importance (discussed in Section 5.0).

Natural Growth in BWI Markets Currently Served

The Draft BWI Air Cargo Facilities Inventory provides a compendium of alternative forecasts of future cargo demand through BWI (all apparently prepared before September 11, 2001). The Inventory suggests a set of consolidated forecasts to serve as a reasonable

upper bound for facilities planning purposes. The corresponding Compound Annual Growth Rate is 5.2 percent.

Table 2.10 BWI Air Cargo Forecasts (Metric Tons)

	Belly Haul			All-Cargo			Total		
	Mail	**Freight**	**Total**	**Mail**	**Freight**	**Total**	**Mail**	**Freight**	**Total**
2000									236,043
2005	34,103	41,114	75,217	11,982	215,848	227,830	46,085	256,962	303,047
2010	40,695	63,930	104,625	16,732	272,546	289,278	57,697	336,476	394,173
2015	46,821	96,931	143,752	22,034	343,664	365,698	68,855	440,595	509,450
2020	49,950	144,233	194,183	26,843	432,699	459,542	76,793	576,932	653,725

Source: Draft BWI Air Cargo Facilities Inventory.

For purposes of the economic evaluation presented in Section 3.0 of this report, a slightly lower growth rate (4.8 percent) has been utilized. This was based on the selection of less aggressive forecast components from the Inventory, and is intended to ensure that the economic benefits of air cargo activity are conservatively stated.

It is important to emphasize that this growth rate is substantial. It is consistent with national and world forecasts – even a bit more conservative – and suggests that BWI will need to accommodate two and one-half times as much cargo in the year 2020, based on forecasted growth in its current markets.

Domestic Air Cargo Leakage to Other Airports

Maryland's air cargo shippers have good access to several first-class airports besides BWI – primarily Dulles, Philadelphia, Newark, and JFK. A significant amount of Maryland's domestic inbound and outbound air cargo is shipped through these other airports. The TRANSEARCH database was used to estimate the amount of this "domestic cargo leakage."

TRANSEARCH typically reports a specific commodity class known as air cargo drayage, which is based on a model estimation process that matches known quantities of domestic air cargo with most likely landside origins and destinations. The air cargo drayage data indicate that almost 80,000 metric tons of domestic air cargo originating or terminating in the State of Maryland is actually handled through other "peer" airports. This is equivalent to about one-third of BWI's total air cargo tonnage in year 2001.

Table 2.11 Air Cargo Gateways for Domestic Air Cargo with Origins or Destinations in Maryland

(Metric Tons), 2001

	Newark (EWR)	Dulles (IAD)	Kennedy (JFK)	Philadelphia (PHI)	Total of Peer Airports
Outbound Air Cargo (drayed from Maryland)	43	30,227	0	8,639	38,909
Inbound Air Cargo (drayed to Maryland)	24	36,259	0	4,778	41,061
Total	**67**	**66,486**	**0**	**13,417**	**79,970**

Source: TRANSEARCH, Air Cargo Drayage data.

There are several caveats that should be remembered in interpreting this data. First, as noted earlier, these are modeled estimates rather than actual counts. Second, TRANSEARCH reports only about two-thirds of the air cargo drayage tonnage that would be expected given the actual volume of domestic air cargo moving through BWI, and the findings may be too low as a result. Third, tonnage associated with the drayage of domestic cargo to JFK is not represented in the database. Finally, the data does not provide any insight into the specific commodity types associated with this tonnage. Still, the data is generally consistent with known logistics patterns, and is useful in getting an order-of-magnitude sense of this market.

Overall, these figures indicate that Dulles is the main competitor to BWI for Maryland domestic air cargo. Dulles is readily accessible for Maryland domestic shipments to/from the Washington, D.C. metropolitan area and the I-270 corridor. Philadelphia is another competitor, which can effectively draw from certain areas in Maryland via I-95. For many destinations, Newark and JFK are too distant to effectively compete for Maryland domestic cargo, because comparable domestic service is available at more convenient airports (BWI and Dulles). However, BWI and Dulles lack frequent wide-body service to destinations in the west that JFK offers. Thus, the JFK and Newark figures may be understated somewhat.

This data is generally consistent with the logistics activity reported by Fed Ex. Fed Ex accounts for more than two-thirds of all BWI air cargo movements, and is the single largest influence in determining how BWI serves the Maryland market. Fed Ex serves about 75 percent of the Maryland domestic market through BWI and the remainder through peer airports:

- About 20 percent through Dulles (from the I-270 corridor and Eastern Shore below the I-495 Beltway).
- About five percent through Philadelphia (from Cecil County).
- A small amount through Pittsburg (from Cumberland).

Fed Ex also exchanges a substantial amount of cargo between its BWI and Dulles distribution hubs. To fill a plane out of Memphis, it will often put Maryland cargo on a Dulles plane and truck the Maryland cargo to its hub at BWI for local market distribution; or it will put Virginia cargo on a BWI plane and truck the Virginia cargo to Dulles for local market distribution. TRANSEARCH reports that of the 66,486 tons of Maryland cargo that "leaked" to Dulles, 24,291 tons (37 percent) were coming from or going to Anne Arundel County (where BWI is located). Most of this cargo is probably related to airport-to-airport exchanges.

To some extent, the business that BWI loses from domestic cargo leakage is offset by business it gains through "reverse leakage" – cargo with an origin or destination in other states that is served through BWI. The data suggests that in the process of airport-to-airport exchanges with Dulles, BWI gains roughly as much cargo through reverse leakage as it loses through leakage. The airport-to-airport cargo should be excluded from estimates of the market potential associated with domestic cargo leakage.

Table 2.12 Market Potential Associated with the Capture of "Domestic Cargo Leakage"

(Metric Tons) – 2001

	Newark (EWR)	Dulles (IAD)	Kennedy (JFK)	Philadelphia (PHI)	Total of Peer Airports
Outbound Air Cargo (drayed from Maryland)	43	19,870	0	8,639	28,552
Inbound Air Cargo (drayed to Maryland)	24	22,870	0	4,778	27,672
Total	**67**	**42,740**	**0**	**13,417**	**56,224**

Source: TRANSEARCH, Air Cargo Drayage data.

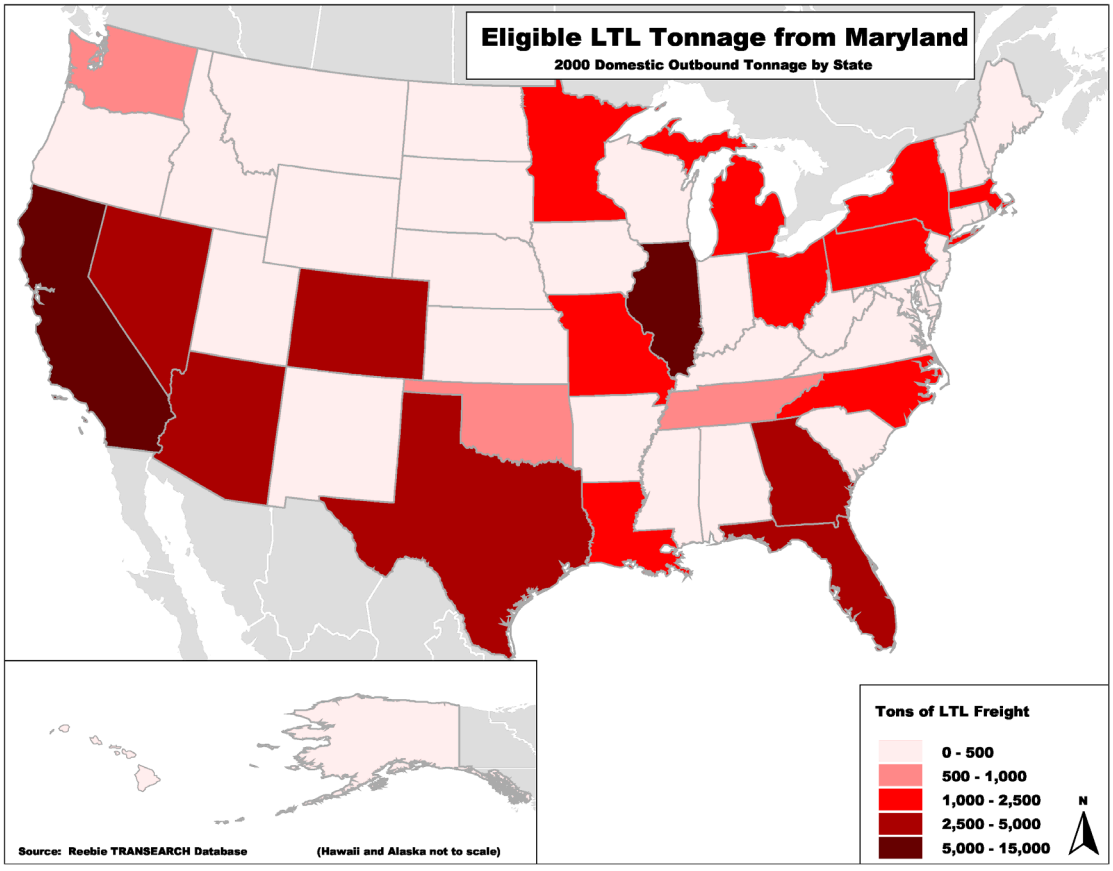
The TRANSEARCH data purchased for this study did not quantify the amount of Virginia, Delaware, or Pennsylvania traffic using BWI (as opposed to Dulles and Philadelphia airports). But clearly, there is substantial overlap and "two-way" leakage among these regions. This illustrates that BWI is not a "stand alone" service provider, but operates in the context of a larger regional air cargo system.

Domestic Truck Moves that Could Be Diverted to Air Cargo

Another finding from the TRANSEARCH data is that a significant amount of cargo moving to and from Maryland from other states in small shipments by truck could potentially be moved by air through BWI.

For this study, a special set of TRANSEARCH data was obtained. Focusing on movements with origins and destinations in the State of Maryland, the data summarizes the volumes associated with commodities currently handled by air ("air cargo eligible") that are currently being handled in small shipments by truck ("less than truckload," or LTL). According to TRANSEARCH, a total of 55,769 tons (50,584 metric tons) of air-eligible cargo is moved by truck from Maryland origins to other U.S. destinations. The leading destination states are California (14 percent), Illinois (10 percent), Texas (nine percent), Florida (eight percent), Missouri (eight percent), and Arizona (six percent). These flows are illustrated in Figure 2.6.

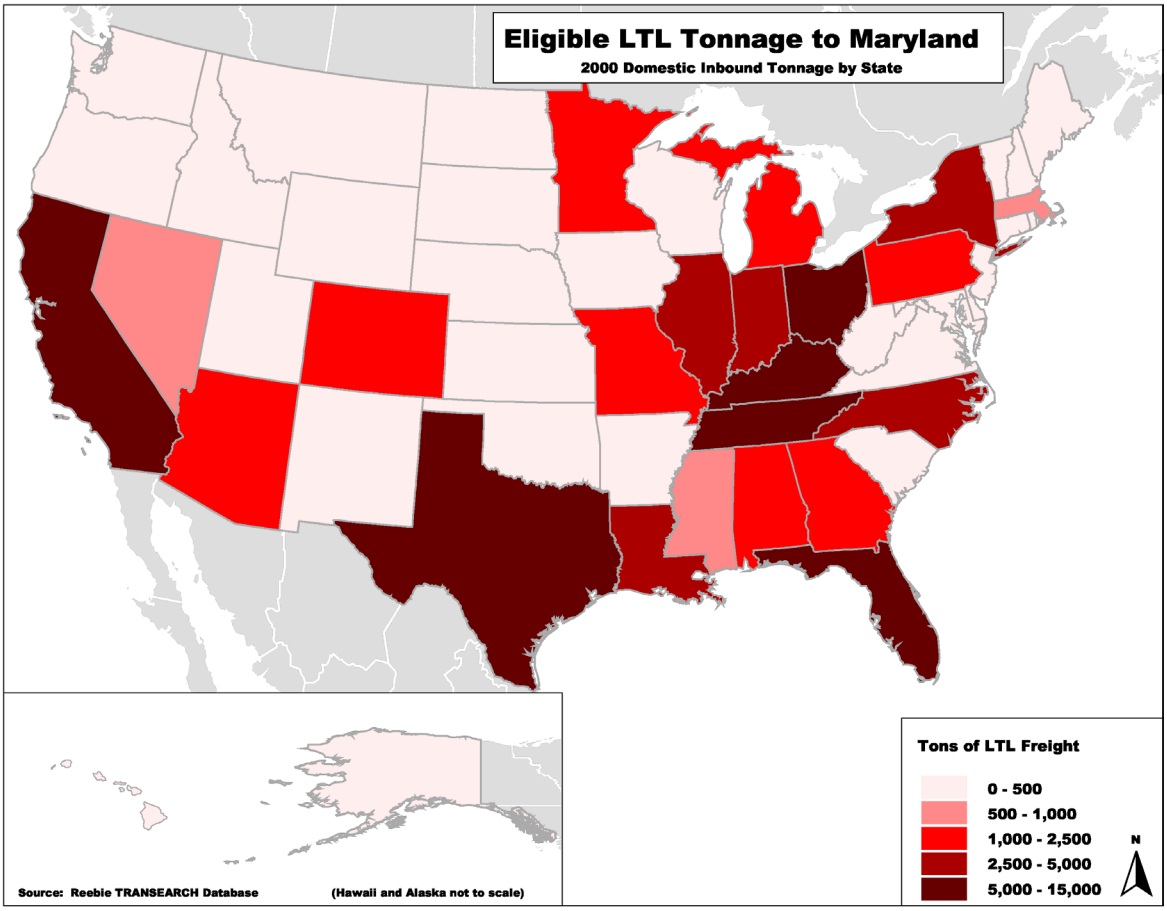
Figure 2.6 Destinations for Air Cargo Eligible Shipments from Maryland
2001



Source: TRANSEARCH.

A total of 87,494 tons (79,354 metric tons) of air-eligible cargo is moved by truck to Maryland destinations from other U.S. origins. The leading origin states are Kentucky (17 percent), California (11 percent), Texas (10 percent), Florida (six percent), Tennessee (six percent), Indiana (six percent), and Ohio (six percent). These flows are illustrated in Figure 2.7.

Figure 2.7 Origins for Air Cargo Eligible Shipments to Maryland
2001



Source: TRANSEARCH.

For outbound air cargo eligible tonnage, the leading commodity types are: mail and contract traffic; machinery; transportation equipment; electrical equipment; and printed matter. For inbound air cargo eligible tonnage, the leading commodity types are: mail and contract traffic; machinery; chemicals; electrical equipment; and transportation equipment. Shares by commodity type are summarized in Table 2.13.

Table 2.13 Summary of "Air Cargo Eligible" Commodities
(Tons) – 2001

	Tons	Share
Outbound Commodities		
Mail or contract traffic	24,306	44%
Machinery	8,204	15
Transportation equipment	7,013	13
Electrical equipment	5,388	10
Printed matter	3,056	5
Inbound Commodities		
Mail or contract traffic	29,417	34%
Machinery	9,915	11
Chemicals or allied products	8,929	10
Electrical equipment	7,685	9
Transportation equipment	7,534	9

Source: TRANSEARCH.

The total air cargo eligible market for BWI is estimated at up to 143,263 tons (129,944 metric tons) – the equivalent of one-half of BWI's current air cargo. This probably includes a substantial amount of traffic that is trucked by the air carriers themselves between Maryland and major hubs outside the region, but the exact amount is unknown.

International Cargo with a "Domestic Leg" through BWI

Many of the shippers and forwarders interviewed for this study (as described in Section 4.0) complained about the perceived lack of good international service through BWI. The fact that international traffic accounts for only three percent of BWI's total tonnage is consistent with their perception. However, BWI does provide additional international service that does not show up in their international cargo statistics, by accommodating a domestic movement (by air or truck) that is directly linked to an international movement through another airport.

For example, Fed Ex handles international cargo through BWI. About two-thirds is moved by air to/from Memphis (for South American markets) and Indianapolis (for Asian markets); but the air movement to/from BWI is counted as domestic tonnage, even though it is part of a larger international logistics chain. The remaining one-third is

trucked to/from Newark Airport (for European markets) and does not count as BWI air cargo at all, even though it depends on handling at BWI facilities.

International Air Cargo Leakage to Other Airports

The leakage of Maryland's international air cargo to airports other than BWI has been documented in recent work by SH+E. According to the MISER database, the State of Maryland generated 22,619 metric tons of international export air cargo in year 2001; yet BWI handled just five percent of this cargo. (MISER does not provide comparable information for Maryland import air cargo.) More than 38 percent of all Maryland international export cargo was handled at JFK and another 15 percent was handled at Dulles, as indicated in Table 2.14. New Orleans and Philadelphia handled more Maryland export cargo than BWI, and Newark Airport handled almost as much. Maryland exports "lost" to other airports represented 21,426 metric tons in 2001 – equivalent to almost 10 percent of BWI's total air cargo tonnage in 2001. It is reasonable to assume that Maryland import cargo might show a similar pattern, if the data were available.

The MISER data has some limitations. It captures the international leg of export moves (e.g., reporting the cargo at the airport where the international flight originated), but not the manner in which the cargo actually arrived at those airports (e.g., the first "domestic leg" of these trips). Also, the total volumes reported by MISER are not identical to those reported by BWI. However, the data are very useful in drawing general inferences:

- About 26 percent of Maryland air cargo is being exported from New Orleans, Miami, Chicago, Los Angeles, Anchorage and other airports where the cargo presumably arrived via a "domestic" flight from BWI or another airport, or by truck. Given the distances to these airports, domestic air is considered the most likely connecting mode. Using the Fed Ex service pattern for Maryland as a guide, it is estimated the BWI share at around three-fourths of this amount, or around 20 percent. If this 20 percent "domestic leg through BWI" traffic is added to the five percent of direct international traffic through BWI, then BWI air cargo operations may actually be serving about 25 percent of the export needs of the State of Maryland – substantially better than the five percent figure for direct international service alone. However, the fact that cargo has to move through two airports may result in a reduced level of service or higher cost, in comparison to a direct international service.

Table 2.14 Distribution of International Air Cargo Exports from Maryland, by Airport

(Metric Tons) – 2001

Rank	Airport	Tons	Share
1	JFK International Airport, New York	8,689	38.4%
2	Washington, D.C. (Dulles International)	3,365	14.9
3	New Orleans, Louisiana	2,086	9.2
4	Philadelphia International Airport	1,535	6.8
5	**Baltimore/Washington International**	**1,193**	**5.3**
6	Newark, New Jersey.	984	4.4
7	Miami International Airport, Florida	745	3.3
8	Chicago, Illinois	574	2.5
9	Los Angeles International Airport, California	469	2.1
10	Anchorage, Alaska	433	1.9
11	Alexandria, Virginia (Reagan National)	417	1.8
12	Toledo-Sandusky	292	1.3
13	Cleveland, Ohio	289	1.3
14	Houston Intercontinental Air	247	1.1
15	Buffalo-Niagara Falls, New York	207	0.9
16	Indianapolis, Indiana	204	0.9
17	Champlain-Rouses Point, New York	118	0.5
18	Philadelphia, Pennsylvania	91	0.4
19	San Francisco International Airport, California	76	0.3
20	Memphis, Tennessee	69	0.3
21	Pittsburgh, Pennsylvania	67	0.3
22	Atlanta, Georgia	58	0.3
	All Other	411	1.8
	Total	**22,619**	

Source: MISER database.

- About 67 percent of Maryland air cargo is being exported from JFK, Dulles, Newark, and other airports where the cargo presumably arrived via truck from Maryland. The truck link is clearly the most critical first step in getting Maryland's export cargo to international markets. Some of this truck traffic is consolidated at BWI (such as Fed Ex's moves between BWI and Newark); the total amount that is handled at BWI (versus coming directly from Maryland shippers) cannot be determined, but BWI clearly plays an important role in these moves.

The total market for Maryland international export cargo is described in Tables 2.16 and 2.17. On the basis of value, the most important air cargo export from the State of Maryland is electronic machinery, which accounts for 42 percent of the total value. Industrial machinery, optical equipment and aircraft parts also account for significant percentages; a variety of classifications comprise the remainder. Maryland air exports were worth $82,035 per metric ton in year 2000 – roughly 17 percent more than the national average – which may be attributable to the concentration of Maryland's biotech and knowledge-based industries in the I-270 corridor and elsewhere.

On the basis of tonnage, electrical machinery is also the State's leading air cargo export, accounting for more than 15 percent. Industrial machinery is the second leading export by weight, accounting for nearly 13 percent, and the remainder is a diverse mix of commodity classes.

Comparing Maryland export tonnage with BWI export tonnage, BWI handles more than its "fair share" of chemical products, essential oils and aircraft parts (a ratio > 1 in Table 2.18); and less than its "fair share" of other leading Maryland exports (a ratio < 1 in Table 2.18).

Table 2.15 "First Leg" of International Air Cargo Exports from Maryland
(Metric Tons) – 2001

"First Leg"	Airport for International Flight	Tons of MD Exports	Share of MD Exports
Truck to:	Baltimore/Washington International	1,193	5.3%
Probably Domestic Air to:	New Orleans, Louisiana	2,086	9.2%
	Miami International Airport, Florida	745	3.3
	Chicago, Illinois	574	2.5
	Los Angeles International Airport, California	469	2.1
	Anchorage, Alaska	433	1.9
	Toledo-Sandusky	292	1.3
	Cleveland, Ohio	289	1.3
	Houston Intercontinental Air	247	1.1
	Buffalo-Niagara Falls, New York	207	0.9
	Indianapolis, Indiana	204	0.9
	Champlain-Rouses Point, New York	118	0.5
	San Francisco International Airport, California	76	0.3
	Memphis, Tennessee	69	0.3
	Atlanta, Georgia	58	0.3
	Subtotal	**5,867**	**25.9%**
Probably Truck to:	JFK International Airport, New York	8,689	38.4%
	Washington, D.C. (Dulles)	3,365	14.9
	Philadelphia International Airport	1,535	6.8
	Newark, New Jersey	984	4.4
	Alexandria, Virginia (Reagan National)	417	1.8
	Philadelphia, Pennsylvania	91	0.4
	Pittsburgh, Pennsylvania	67	0.3
	Subtotal	**15,148**	**67.0%**
	All Other	411	1.8
	Total	**22,619**	

Source: Cambridge Systematics analysis of MISER data.

Table 2.16 Value of Maryland Export Market by Commodity Class, 2001

Code	Commodity	Value ($)	Share
85	Electric machinery, etc.; sound equipment; television equipment; parts	717,033,442	42.0%
84	Industrial machinery, including computers	201,885,211	11.8
90	Optic, photo, etc., medic or surgical instruments, etc.	185,059,457	10.9
88	Aircraft, spacecraft, and parts thereof.	141,254,061	8.3
59	Impregnated, etc.; textile fabrics; textile art for industry	65,871,999	3.9
38	Miscellaneous chemical products	44,498,998	2.6
98	Special classification provisions	41,649,925	2.4
39	Plastics and articles thereof	40,405,129	2.4
49	Printed books, newspapers, etc; manuscripts, etc.	34,180,852	2.0
30	Pharmaceutical products	26,681,104	1.6
93	Arms and ammunition; parts, and accessories thereof	19,084,636	1.1
	All other	187,630,458	11.0
	Total	**1,705,235,272**	**100.0%**

Source: MISER database.

Table 2.17 Tonnage of Maryland Export Market by Commodity Class, 2001

Code	Commodity	Metric Tons	Share
85	Electric machinery, etc.; sound equipment; television equipment; parts	3,515	15.5%
84	Industrial machinery, including computers	2,879	12.7
98	Special classification provisions	1,470	6.5
49	Printed books, newspapers, etc.; manuscripts, etc.	1,450	6.4
59	Impregnated, etc. textile fabrics; textile art for industry	1,258	5.6
28	Inorganic chemicals, precious and rare earth metals, and radioactive compounds	1,249	5.5
90	Optic, photo, etc., medic or surgical instruments, etc.	1,121	5.0
39	Plastics and articles thereof	994	4.4
38	Miscellaneous chemical products	858	3.8
48	Paper and paperboard and articles (including paper pulp articles)	609	2.7
88	Aircraft, spacecraft, and parts thereof	555	2.5
33	Essential oils, etc.; perfumery, cosmetics, etc.	491	2.2
2	Meat and edible meat offal	479	2.1
73	Articles of iron or steel	436	1.9
76	Aluminum and articles thereof	424	1.9
30	Pharmaceutical products	350	1.5
29	Organic chemicals	329	1.5
54	Manmade filaments, including yarns and woven fabrics	251	1.1
93	Arms and ammunition; parts and accessories thereof	233	1.0
	All other	36,671	16.2
	Total	**22,619**	**100.0%**

Source: MISER database.

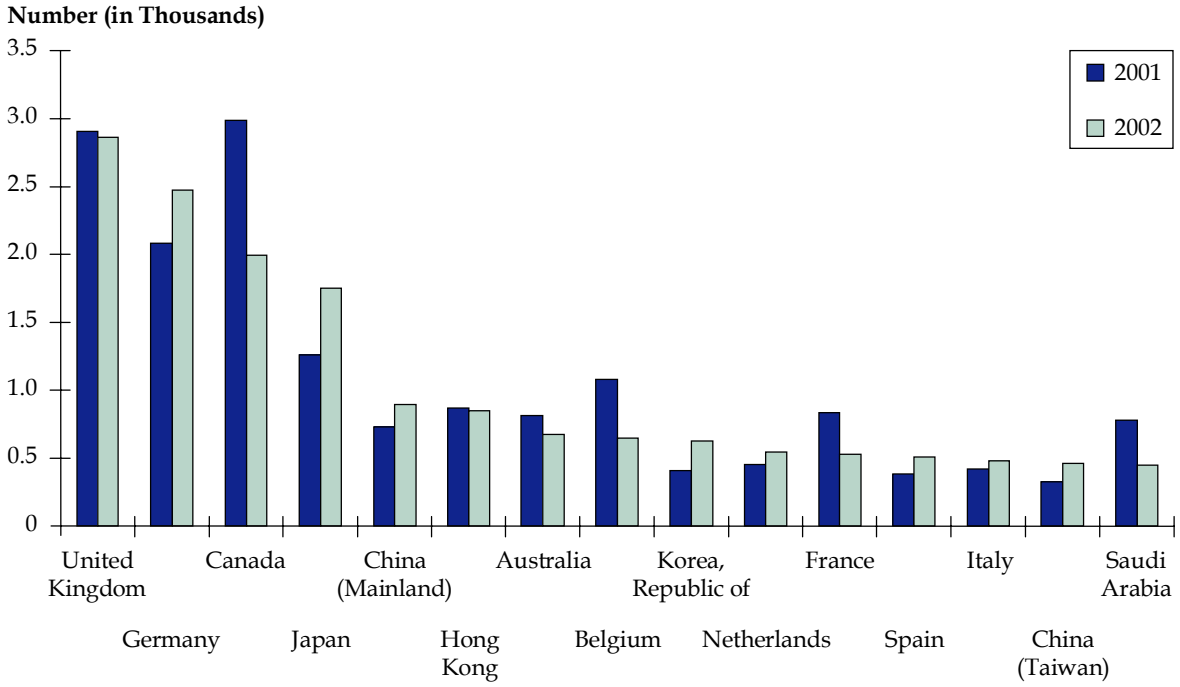
Table 2.18 Comparison of Maryland Export Tonnage and BWI Export Tonnage by Commodity Class, 2001

Code	Commodity Class	Share of MD	Share of BWI
85	Electric machinery, etc.; sound equipment; television equipment; parts	15.5%	8.0%
84	Industrial machinery, including computers	12.7	6.7
98	Special classification provisions	6.5	2.2
49	Printed books, newspapers, etc.; manuscripts, etc.	6.4	1.0
59	Impregnated, etc.; textile fabrics; textile art for industry	5.6	0.0
28	Inorganic chemicals, precious and rare earth metals, and radioactive compounds	5.5	5.2
90	Optic, photo, etc., medic or surgical instruments, etc.	5.0	2.9
39	Plastics and articles thereof	4.4	3.5
38	Miscellaneous chemical products	3.8	10.9
48	Paper and paperboard and articles (including paper pulp articles)	2.7	1.5
88	Aircraft, spacecraft, and parts thereof	2.5	3.0
33	Essential oils, etc.; perfumery, cosmetics, etc.	2.2	3.0
2	Meat and edible meat offal	2.1	0.4
73	Articles of iron or steel	1.9	1.2
76	Aluminum and similar articles	1.9	0.1
30	Pharmaceutical products	1.5	0.7
29	Organic chemicals	1.5	0.4

Source: MISER database.

Fifteen countries accounted for $1.17 billion of all Maryland air exports. Of these, five are on the European continent. The story is quite similar when viewed in terms of shipment weight, the top 15 destinations, of which seven are European, account for nearly three-quarters of all Maryland exports (see Figure 2.8). Europe, then, may represent an opportunity for BWI to increase its share of Maryland-originated air cargo.

Figure 2.8 Leading International Destinations for Maryland Air Cargo Exports



Summary of Market Potential

This section identified the following areas of market potential for BWI:

- Natural growth – from 236,043 metric tons in 2000 to 653,725 metric tons in 2020;
- Domestic cargo leakage – 56,224 metric tons in 2001;
- "Air eligible" less than truckload cargo – 129,944 metric tons in 2001; and
- International cargo leakage – of 21,426 metric tons in 2001.

Section 3.0 of this report provides an estimate of the impacts and benefits associated with air cargo moving through BWI, along with estimates of the benefits associated with different market capture scenarios.

3.0 Statewide Impacts of BWI Air Cargo Operations

3.0 Statewide Impacts of BWI Air Cargo Operations

3.1 Introduction

Baltimore/Washington International (BWI) airport is one of the most significant transfer points for air cargo in the Mid-Atlantic region. According to Airports Council International, BWI supported the creation of more than 600 jobs in the State of Maryland from its air cargo operations – of 85,000 jobs supported by BWI statewide, 12,030 are directly dependent on BWI airport activity with 10,465 jobs generated by commercial airline passenger activity, 961 generated by construction and consulting, and 604 generated by air cargo in 2001.[1]

While Maryland shippers have the ability to use several different airports – primarily Dulles, Philadelphia, Newark, and JFK – many choose to use BWI as their closest and/or lowest price option. The availability of BWI service creates two types of positive impact:

- For many shippers and receivers, BWI is a convenient and efficient means of delivering high-value, time-sensitive goods to destinations in North America and beyond. It creates economic value for these shippers and receivers by providing a transportation service that, if unavailable, would require the use of less convenient or more costly alternatives. Such extra costs would have negative multiplier effects throughout the State's economy.

- BWI air cargo operations also offer a highway system benefit. Shippers and receivers who normally prefer BWI can avoid the need to dray to more distant airports, reducing truck vehicle miles of travel (VMT) and associated negative impacts (congestion, air quality, accidents, etc.). Reductions in truck VMT provide benefits not only to the State of Maryland, but to adjoining states as well.

With freight volumes expected to grow more than 2.5 times their current level by 2020, BWI's contribution to Maryland's economic and transportation well-being could increase significantly over time. This section presents quantitative estimates of the economic value of BWI air cargo operations to the State's shippers and receivers, and explores the relative value of potential improvements to existing services. (A separate parallel study by Martin

[1] Airports Council International-North America, *The Economic Impacts of U.S. Airports, 2002,* Washington, D.C., 2002.

Associates is examining the direct on-airport economic impact of air cargo operations.) It also provides estimates of transportation benefits accruing to Maryland.

3.2 Methodology

Scenarios Evaluated

This study examined the economic and transportation value of air cargo operations at BWI, building upon and expanding from other analyses conducted for the airport. In this study, three separate scenarios were assessed:

- **Scenario 1** is an analysis of the benefit of existing and projected future air cargo operations at BWI. It represents a baseline condition of continuing to accommodate forecasted market growth, without major efforts to further expand that market.

- **Scenario 2** examines the economic and transportation value of diverting Maryland-produced domestic air cargo currently shipped through "peer" airports to BWI instead. This represents a "new domestic market capture" scenario. This scenario is intended to size the market opportunity; Section 5.0 of this report addresses the practical considerations of actually capturing this market.

- **Scenario 3** examines the potential benefits of additional service from BWI to the United Kingdom (UK), which would capture Maryland goods bound for the UK now shipped through "peer" airports. This represents a "new international market capture" scenario.

Evaluation Framework

The purpose of this study is to examine the benefits of BWI's air cargo operations in the broader context of statewide economic benefits. In a typical economic impact study, several types of benefits are considered:

- Jobs created by air cargo activity (direct employment);

- Jobs created by the portion of wages spent locally by employees in the air cargo industry (induced employment); and

- Jobs created by the spending of firms dependent on air cargo activity (indirect employment).

These three types of impacts have been analyzed by Martin Associates for passenger and air cargo operations at BWI. This study has examined and quantified the value of BWI air cargo operations in terms of their impact on the cost of doing business in Maryland and

the economic competitiveness of Maryland firms. Essentially, BWI's accessibility provides logistics cost benefits that reduce business costs and enhance the ability of Maryland firms to compete in the regional and global marketplace. Economic benefits can be measured in terms of business sales, gross regional output, employment, and other economic indicators.

The transportation and the economic analyses used in this study estimate impacts relative to a *baseline scenario.* This scenario represents the forecast levels of future economic activity that would occur in the absence of any change in national policy or investment activity. In each of the three scenarios tested in this study, the baseline scenario is the current trend of the Maryland economy, absent any changes to BWI air cargo operations, apart from natural growth.

Two main factors are considered: 1) transportation impacts; and 2) employment impacts. Each is described below.

Transportation Impacts

This study has examined the impact of shifting shares of BWI air cargo from and to other airports in the area. These shifts create changes in truck travel patterns that can be quantified as changes in travel time costs, fuel, operating and maintenance costs, and safety costs. In the case of shifts in truck delivery patterns that reduce vehicle travel, businesses benefit by devoting fewer of their resources to logistics costs. Lower costs mean that these businesses can offer more competitive products and services and grow to expand both their operations and those of supporting services. Changes in transportation costs affect firms in various ways, however. The reason for this is that each firm relies, to varying degrees, on transportation for the production and delivery of its goods and services.

Changes to transportation costs were estimated as the difference in costs between services from BWI and those from the following "peer" airports:

- Newark International Airport (EWR);
- Dulles International Airport (IAD);
- John F. Kennedy International Airport (JFK); and
- Philadelphia International Airport (PHI).

Employment Impacts

BWI's air cargo operations support hundreds of on-site and off-site jobs directly related to airport activity. The jobs create demand for goods and services, and, as dollars are spent time and time again in the local economy, business sales increase, creating still more new jobs. The on-site and off-site (direct and indirect) impacts are used as an input to the estimation process, and all employment forecasts represent **additional** benefits, above and beyond the estimates of direct and indirect impacts generated by the Martin study.

Impacts Not Included

This analysis does not account for the business attraction or retention implications of improved or curtailed service from BWI. Business attraction means "pull" or "push" BWI services might exert on a firm considering a move to/from Maryland, beyond tax incentives, workforce compatibility, proximity to suppliers, or other considerations firms typically take into account when considering a relocation. In this sense, the analysis is conservative. The analysis does however take into account business attraction or retention implications insofar as they relate to the logistics costs developed in this study.

Economic Model

This study employed a *simulation* model that estimated the effects of changes in costs to business competitiveness, profitability, and expansion. The model system, Regional Economic Modeling Inc. (REMI), has many features that provide a strong theoretical basis for its use:

- It is a dynamic model, as it simulates interactions among sectors of the economy on a year-by-year basis.

- It does not assume a constant relationship between labor and capital inputs, as do input/output models. It estimates substitutions among factors of production in response to changes in relative factor costs.

- It has several feedback mechanisms. Changes in transportation costs among the scenarios being analyzed impact each industry sector and households, causing differences in costs and in competitiveness of industries. In response, business sales increase or decrease, and household income increases or decreases. The REMI model estimates year-by-year consumption, investment, and local government demand, driven by income. The model can also predict exports and imports to other countries depending on the success of its industries, which is dependent on prices. In contrast, input/output models do not simulate the tendency of the economy to adjust to changing demand and supply conditions towards a balance, or equilibrium, between the two.

Data Sources

This study used a variety of data sources for developing the scenarios, including:

- The MISER database, which provides international air cargo flows from/to Maryland by commodity code as well as international flows of Maryland goods from/to peer airports and specific origin/destination countries. The MISER database is maintained by the University of Massachusetts at Amherst.

- The TRANSEARCH database, which provides less-than-truckload (LTL) domestic cargo flows from Maryland counties and BWI by commodity as well as drayed (inter-modal) domestic freight between Maryland counties and peer airports.

- NCHRP 2-21, *Economic Implications of Congestion,* which provided information on costs relating to truck travel.

- The Vehicle Inventory and Use Survey (VIUS), which was used for developing commodity-specific information on truck load factors. The VIUS is a survey of vehicle types and usage conducted by the U.S. Census. For this study, a tabulation of the VIUS database for Maryland vehicles was performed.

- Two previous reports written specifically for BWI: the Martin Associates report *The Local and Regional Economic Impacts of the Baltimore/Washington International Airport* (1999), for on-airport and off-airport (direct and indirect) employment impacts; and the Landrum and Brown report, *Baltimore/Washington International Airport Air Cargo Facilities Inventory* (2002), for air cargo forecasts.

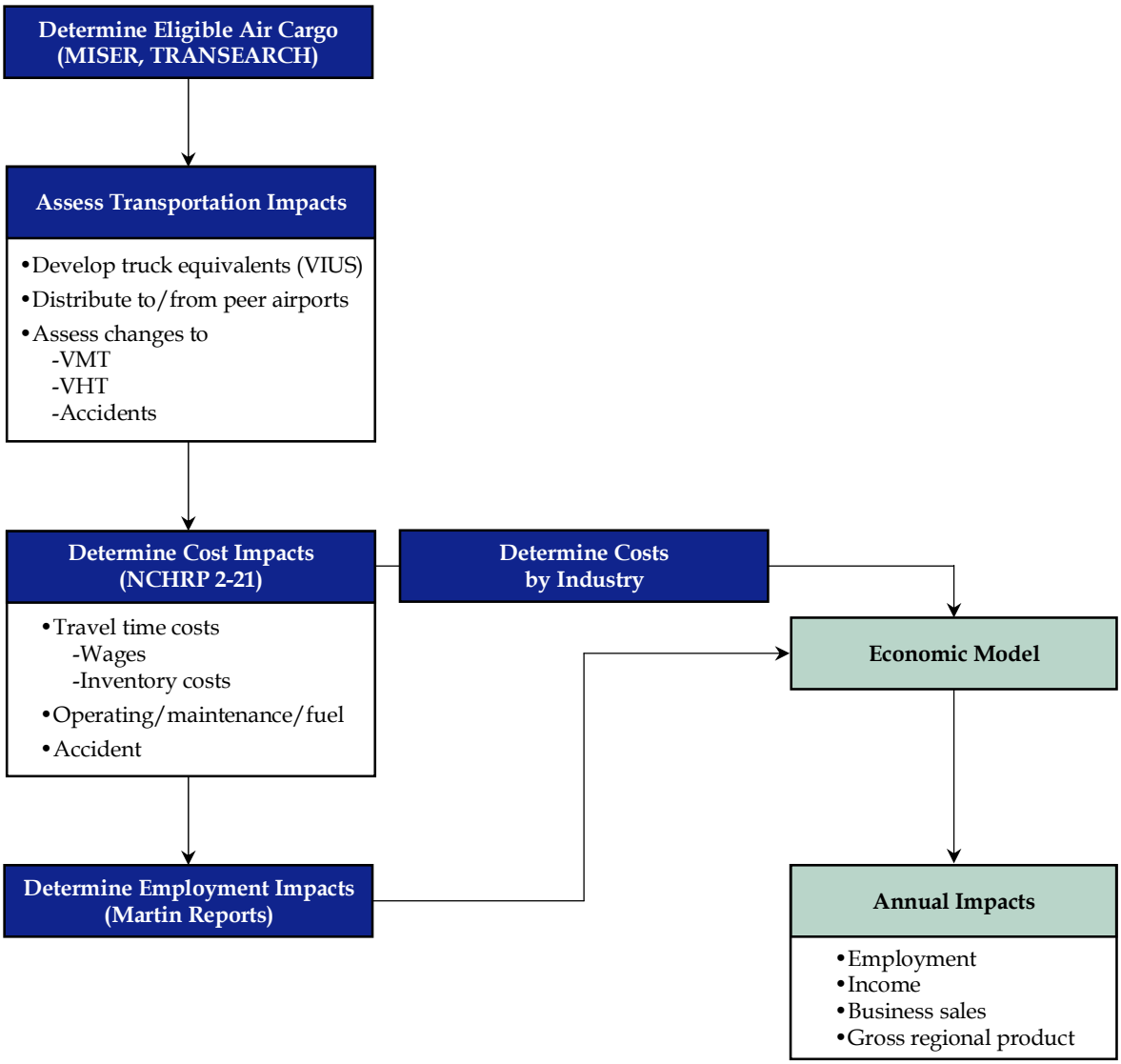
Developing Model Inputs

Figure 3.1 depicts the framework developed for this analysis. For each scenario, the MISER and TRANSEARCH databases were queried to determine the appropriate tonnage and commodity types appropriate for the study. These commodities were redistributed to or from peer airports, based, in part, on information provided from the TRANSEARCH database.

For each Maryland county, central locations were designated and average travel times and distances computed between those points and the airports used in this study. These times and distances were used to compute differences in VMT, vehicle hours traveled (VHT), and accidents between the baseline scenario and the scenario being tested. Using unit costs appropriate for commercial vehicle travel for operating and maintenance, inventory, in-vehicle time, and accidents, changes in business costs by industry were developed for each year from 2001 to 2023.

All scenarios assumed an annual air cargo growth rate of 4.8 percent, consistent with the most conservative estimate available from the 2002 Landrum and Brown report. All cost inputs were converted to constant dollars ($ 1996), as required by the REMI model. Lastly, on-airport and off-airport (direct and indirect) employment impacts were developed from the 1999 Martin report and added to the model inputs. The REMI model uses these employment impacts to assess the ripple effects to the State's economic well-being.

Figure 3.1 Analysis Framework



3.3 Results of Analysis

Scenario 1 – Value of BWI Air Cargo Operations

To estimate the value of BWI air cargo operations as they currently exist, and are forecast to exist in the future, the study evaluated a hypothetical scenario: What if all BWI's air cargo operations were shifted to other "peer" airports? The increased costs and negative statewide economic impacts arising from these costs – which are avoided because BWI exists – represent a baseline measure of its value to the State of Maryland.

It is estimated that in 2001 (Table 3.1), 145 million tons of domestic and international air cargo produced by Maryland firms was flown into BWI, and 167 million pounds of cargo was shipped out of BWI. An estimated 74 percent of all domestic cargo flown through BWI is produced by Maryland firms and can be considered in this analysis of impacts to the State's economy.

Table 3.1 Summary of 2001 Transportation and Employment Impacts, Scenario 1

Total Inbound Pounds (2001) (Millions)	145
Total Outbound Pounds (2001) (Millions)	167
Total Trucks	9,200
Average Distance to BWI from Maryland Counties (Miles)	30
Average Distance to Peer Airports (Miles)	101
Change in Truck VMT (Thousands)	650
Change in Truck VHT (Thousands)	870
Change in Total Operating Costs ($ Thousands)	$22,530
Change in Accident Costs ($ Thousands)	$52
Change in Jobs Related to Air Cargo Operations	890

As mentioned above, domestic and international air cargo was diverted to peer airports based on current LTL shipments to peer airports. The proportions from the database were adjusted, based on a reasonable reallocation of cargo from BWI, and are shown in Table 3.2 below. According to the TRANSEARCH database, which is based on model estimates, the vast majority of domestic-bound drayed goods from Maryland are destined for Dulles (see Section 2.0 of this report). Further, the database indicates that there are no Maryland-produced goods with domestic destinations flown through JFK. However, according to industry experts, both BWI and Dulles lack the wide body planes and levels

of service to capture a significant share of air cargo destined for the Western portion of the United States. These considerations informed the allocations shown below.

Table 3.2 Assignment of BWI Air Cargo to Peer Airports

	Newark (EWR)	Dulles (IAD)	Kennedy (JFK)	Philadelphia (PHI)
Domestic	10%	60%	10%	20%
International	20	25	35	20

Estimated transportation impacts for Scenario 1 in 2003 and 2023 are shown in Table 3.3 below. The 4.8 percent annual increase in air cargo operations results in a more than doubling of air cargo-related truck vehicle miles and hours of travel during the 20-year forecast period, between 2003 and 2023. Vehicle operating costs increase from $33 million to $69 million and accident costs increase from $70 to $160 thousand.

Table 3.3 Results of Transportation Impact Analysis, Scenario 1 ($ 1996)

	2003	2023
Change in Truck VMT (Thousands)	740	1,560
Maryland Portion	*340*	*750*
Change in Truck VHT (Thousands)	990	2,080
Maryland Portion	*450*	*1,000*
Change in Total Operating Costs (Thousands)	25,600	54,190
Change in Accident Costs (Thousands)	60	130

Table 3.4 below presents the economic impact results from the BWI air cargo scenario for model years 2003 and 2023. In this scenario, the loss of all air cargo operations at BWI forces Maryland firms to substitute the services of the peer airports. Jobs that rely directly and indirectly on the air cargo operations create a loss of income and demand for goods and services in Maryland. Additionally, shipper costs increase because of the substitution of more distant airports for BWI. These two factors combine to produce negative impacts on the employment, income, business output, and the region's output as a whole. Lost business sales accumulate to $390 million in 2003, growing to more than $1.1 billion in

2023. Employment above and beyond the on-airport and off-airport losses cited in the Martin report, total 2,100 in 2003, and 3,900 in 2023.

Table 3.4 Results of Economic Impact Analysis, Scenario 1 ($ 1996)

	2003	2023
Employment (Net)	-2,100	-3,900
Gross Regional Product ($ Millions)	$-190	$-640
Income ($ Millions)	$-95	$-390
Business Sales ($ Millions)	$-390	$-1,140

These figures illustrate the potential opportunity costs of not accommodating future air cargo demand at BWI. Conversely, accommodating future air cargo demand at BWI has the opposite effect – substantially reduced traffic and substantially increased employment and income. It should be emphasized that these benefits are associated with the "natural" growth of BWI's existing markets forecast to occur over the next 20 years, and do not assume expansion into new commodities or geographic markets.

Scenario 2 – BWI Captures Maryland Goods Shipped Domestically through Peer Airports

Scenario 2 examined the hypothetical gain to Maryland's economy if all Maryland-produced domestic air cargo was shipped through BWI, instead of through a combination of airports. This is intended to serve as a benchmark of the potential maximum value of capturing this market, without addressing the degree to which this might be achievable.

In 2001, more than 208 million pounds of Maryland goods were shipped domestically through the Newark, Dulles, JFK, and Philadelphia airports. Table 3.5 on the following page presents the distribution of these goods by airport as domestic and international shipments.

In 2001, operating costs savings to shippers in Maryland would have exceeded $8.0 million, and an additional $15,600 in accident costs reductions would have been realized (Table 3.6 on the following page). Estimated transportation impacts for forecast years 2003 and 2023 in Scenario 2 are shown in Table 3.7. Between 2003 and 2023, vehicle operating cost savings increase from $10 million to $22 million, while accident cost savings increase from $18,000 to $40,000.

Table 3.5 Maryland Goods Currently Shipped Domestically through Peer Airports (in Thousands of Pounds)

	Newark (EWR)	Dulles (IAD)	Kennedy (JFK)	Philadelphia (PHI)
Drayed from Maryland[1] (Domestic)	95	66,651	0	19,048
Drayed to Maryland[2] (Domestic)	53	79,950	0	10,536
Drayed from Maryland[3] (Domestic Truck Leg of International Air Exports)	2,170	7,420	19,160	3,386
Total	**2,318**	**154,021**	**19,160**	**32,970**

[1,2] Source: TRANSEARCH, 2002.

[3] Source: MISER, 2001.

Table 3.6 Summary of 2001 Transportation and Employment Impacts, Scenario 2

Total Inbound Pounds (2001) (Millions)	118
Total Outbound Pounds (2001) (Millions)	91
Total Trucks	6,131
Average Distance to BWI from Maryland Counties (Miles)	40
Average Distance to Peer Airports (Miles)	115
Change in Truck VMT (Thousands)	-248
Change in Truck VHT (Thousands)	-330
Change in Total Operating Costs ($ Thousands)	$-8,474
Change in Accident Costs	$-15,600
Change in Direct and Indirect Jobs	650

Table 3.7 Results of Transportation Impact Analysis, Scenario 2 ($ 1996)

	2003	2023
Change in Truck VMT (Thousands)	-580	-1,280
Maryland Portion	*-350*	*-770*
Change in Truck VHT (Thousands)	-770	-1,700
Maryland Portion	*-460*	*-1,020*
Change in Total Operating Costs (Thousands)	-9,790	-21,640
Change in Accident Costs (Thousands)	-18	-40

Table 3.8 below presents the hypothetical economic impact results from the shift of Maryland goods from peer airports to BWI. The reduction in shipping costs realized by Maryland firms, improves their competitive position vis-à-vis other firms in the region, increasing their business and benefiting the State's economy in terms of jobs and income. The increase of direct and indirect jobs increases the demand for goods and services in the State, which induces still more employment creation. Net gains above and beyond the direct and indirect impacts are 480 jobs in 2003 and 960 by 2023. Statewide incomes are forecast to grow from $40 million to $130 million over the 20-year time period. Business sales more than triple over the same period, from $160 to $550 million.

Table 3.8 Results of Economic Impact Analysis, Scenario 2 ($ 1996)

	2003	2023
Employment (Net)	480	960
Gross Regional Product ($ Millions)	$80	$260
Income ($ Millions)	$40	$130
Business Sales ($ Millions)	$160	$550

Scenario 3 – BWI Increases International Service to the United Kingdom

To illustrate the potential benefit of a specific improvement, Scenario 3 assesses the economic benefits of a new service to the UK.

In 2001, more than 13.6 million pounds of Maryland goods were shipped to the UK via peer airports (Table 3.9). These 13.6 million tons represent perhaps one outbound flight per day (14 operations per week) as a new passenger service with belly cargo to the UK. This would basically double the frequency of BWI's current service to the UK. As before, reductions in logistics cost and increased employment required for the new service combine to produce economic benefits. This scenario differs from the other two in that it examines a specific, achievable service and an incremental benefit rather than the impacts of an entire operation or set of services.

Table 3.9 Maryland Goods through Peer Airports to UK (in Thousands of Pounds)

	Newark (EWR)	Dulles (IAD)	Kennedy (JFK)	Philadelphia (PHI)	Total
Maryland Goods Bound for the UK Via Peer Airports	8,441	1,827	2,079	1,210	13,557

Source: MISER, 2001.

The potential benefits of a new service to the UK that induces Maryland shippers sent their goods through BWI rather than through peer airports in shown in Table 3.10 below. Annual logistics costs savings total more than $273, 600.

Table 3.10 Summary of 2001 Transportation and Employment Impacts, Scenario 3

Total Outbound Pounds (2001) (Millions)	14
Total Trucks	374
Average Distance to BWI from Maryland Counties (Miles)	30
Average Distance to Peer Airports (Miles)	175
Change in Truck VMT (Thousands)	-54
Change in Truck VHT (Thousands)	-72
Change in Total Operating Costs ($ Thousands)	$-274
Change in Accident Costs	$-333
Change in Direct and Indirect Jobs	43

Estimated transportation impacts for forecast years 2003 and 2023 in Scenario 3 are shown in Table 3.11 below. Total vehicle operating and accident costs increase from $322 thousand to $700 thousand over the 20-year period.

Table 3.11 Results of Transportation Impact Analysis, Scenario 3 ($ 1996)

	2003	2023
Change in Truck VMT (Thousands)	-80	-170
Maryland Portion	*-50*	*-100*
Change in Truck VHT (Thousands)	-100	-220
Maryland Portion	*-60*	*-130*
Change in Total Operating Costs (Thousands)	-320	-700
Change in Accident Costs (Thousands)	-0.4	-0.9

Table 3.12 presents the economic impacts of the new service. Benefits are much more modest than those presented in Scenarios 1 and 2, yet positive and significant. Over the 20-year analysis period from 2003 to 2023, 20 new jobs are created and $31 million in new business sales are created. During that same period, income gains of $7.0 million are realized as well.

Table 3.12 Results of Economic Impact Analysis, Scenario 3 ($ 1996)

	2003	2023
Employment (Net)	20	40
Gross Regional Product ($ Millions)	$3.3	$15.5
Income ($ Millions)	$2.0	$7.0
Business Sales ($ Millions)	$8.0	$31.0

3.4 Summary of Findings

This study examined the economic value of air cargo operations at BWI. The principal findings of the three analyses conducted are:

- The economic and transportation advantages presented by air cargo operations at BWI are responsible for more than 2,100 Maryland business jobs in 2003, which will increase to nearly 3,900 Maryland business jobs by 2023 under conservative growth assumptions. These jobs are an addition to the estimated 1,200 jobs that are created directly or indirectly by BWI air cargo operations. Without BWI air cargo operations, Maryland shippers would have generated an additional 340,000 miles of truck travel within the state of Maryland, in reaching out-of-state airports; for 2023, this figure would be 750,000 miles.

- If BWI captured Maryland-produced domestic air cargo that is currently being shipped through "peer" airports instead of BWI, the redirection of air cargo would generate economic and transportation benefits. The maximum benefit associated with capturing all of this cargo would be the net addition of 480 off-airport jobs and $40 million in personal income in the State of Maryland in 2003. By 2023, jobs and income would increase by 960 and $130 million, respectively. Truck miles of travel within the state of Maryland would be reduced by 350,000 miles in 2003 and by 770,000 miles in 2023. On average, shippers are closer to BWI than out-of-state airports – hence the net positive benefit – although some shippers are closer to other airports, and shifting them to BWI would actually increase Maryland VMT.

- If BWI initiated a new service to the United Kingdom and captured all Maryland goods now moving to/from the UK via peer airports, there would be modest but positive off-airport employment gains (20 to 40) between 2003-2023 and income gains ($2.0 million to $7.0 million) for Maryland. Transportation cost savings would be realized as well – $320 thousand in 2003, increasing to $700 thousand by 2023.

Tables 3.13 and 3.14 on the following page summarize the benefits associated with the three scenarios.

Table 3.13 Summary of BWI Air Cargo Transportation Benefits

	Truck VMT (Maryland Only) (Thousands)		Truck Operating Cost Savings ($ Thousands)		Related Accident Cost Savings ($ Thousands)	
Scenario	**2003**	**2023**	**2003**	**2023**	**2003**	**2023**
BWI Air Cargo Operations	340	750	$25,600	$54,190	$60	$130
Maryland Goods Shipped Domestically through Peer Airports	350	770	9,790	21,640	18	40
Service to UK	50	100	320	700	0.4	0.9

Table 3.14 Summary of BWI Air Cargo Economic Benefits

	Employment (Net)		Income ($ Millions)		Business Sales ($ Millions)	
Scenario	**2003**	**2023**	**2003**	**2023**	**2003**	**2023**
BWI Air Cargo Operations	2,100	3,900	$95	$390	$390	$1,140
Maryland Goods Shipped Domestically through Peer Airports	480	960	40	130	160	550
Service to UK	20	40	2.0	7.0	8.0	3.0

4.0 Interviews with Key Stakeholders

4.0 Interviews with Key Stakeholders

4.1 Introduction

To further explore the potential opportunities identified in Sections 2.0 and 3.0, a number of Maryland firms involved in the air cargo business – including freight forwarders, shippers, and receivers – were interviewed.

The purpose of conducting interviews was twofold: first, to learn from a few key freight forwarders, shippers, and relevant firms in the region about the prevailing commodities and shipping patterns of BWI air cargo; and second, to learn what actions could be undertaken to better serve existing customers or attract new customers and markets, especially with respect to international air cargo moving through other airports. The survey instrument developed for this task is comprised of a set of questions that seek to define a number of service characteristics at BWI. The survey process and findings are discussed below.

4.2 Methodology

General Process

The freight stakeholder interview process involved two tiers of interviews performed via telephone. The first tier consisted of shippers in the Maryland region that are likely users of air cargo. After initial interviews with shippers, a second tier of interviews was initiated with firms involved primarily in forwarding air cargo between shippers and air carriers. Appendices A and B contain lists of those firms interviewed and the total pool of potential interviewees. Appendix C presents the interview guide.

These interviews were coordinated with a parallel set of interviews being conducted by Martin Associates for a separate study. Martin Associates asked a number of questions on behalf of this study; their findings are reported in Appendix D.

Shipper Interviews

For the first tier of interviews (shippers), shipping firms most likely to use air cargo were identified using the *Freight Locator* database generated by Reebie Associates, which accompanied the TRANSEARCH commodity flow database utilized in the study. Freight Locator provided information on the types of commodities typically shipped and received by certain industries. Shippers were then identified as potential interviewees if their commodities matched up with leading air cargo commodities. To "oversample" from the population of shippers that are most likely to use an international gateway other than BWI, the list of commodities was based on data from the Port Authority of New York and New Jersey's (PANYNJ) *International Air Cargo Statistics Review: New York Customs District, January-October 2002.* This list generally overlaps with international air cargos shipped through BWI and shipped to/from the State of Maryland, according to the MISER database, although there are some differences; the interviews conducted by Martin Associates were specifically targeted to that user population.

Table 4.1 Top International Air Commodities for Shipper Interview Selection

Rank	Commodity Description
1	Machinery
2	Woven Apparel
3	Electrical Machinery
4	Knit Apparel
5	Optical and Medical Instruments
6	Plastic
7	Fish and Seafood
8	Book + Newspaper; Manuscript
9	Footwear
10	Vegetables
11	Pharmaceutical Products
12	Organic Chemicals
13	Special Other
14	Perfumery, Cosmetic, etc.
15	Leather Art; Saddlery; bags

Freight Forwarder Interviews

The shipper interviews revealed that many shipping firms have relatively little exposure to air cargo operations, and are not actively involved in decisions about whether to use BWI or an alternative gateway. Where shippers were unable to answer questions, they typically suggested following up with their freight forwarders. Accordingly, a set of freight forwarders was selected from the Maryland Aviation Administrations' Cargo Directory. In some cases, the interviewees provide services in addition to freight forwarding (Signature Flight Service) or related to, but not specifically to, freight forwarding (a less-than-truckload carrier, for example). In these cases, the nature of the business is described in the individual interview summaries following the summary findings.

4.3 Results

General Findings

Overall findings are based on 24 completed interviews and some additional partial interviews with forwarders and/or carriers.

Type of Traffic

Some survey questions seek to determine mode split information for freight shipments by type of destination (international versus domestic) and by type of carrier (cargo-dedicated or commercial passenger airline). The findings are as follows:

- *Mode Split: International Versus Domestic.* Most forwarders and carriers interviewed move some amount of international cargo. Approximately two-thirds of those interviewed report five to 15 percent of their shipments as international. The remaining one-third report more than 50 percent of their shipments as international.

- *Cargo Dedicated Versus Commercial Cargo.* Most of those interviewed reported using both all-cargo and passenger airline service. Respondents use the major U.S. airlines for belly cargo, including: United, Delta, Southwest, American, US Airways, America West, and Northwest.

Selection of Airport

Several of the survey questions seek to ascertain when and why freight stakeholders utilize BWI for their air cargo needs. Similarly, several survey questions explore the rationale behind using other airports. Generally, the decision-making elements that influence which airport to use are:

- **Flight Availability.** Freight forwarders and their shipping/receiving clients are interested in rapid delivery of their goods and a convenient network of available air destinations. Therefore, frequency of service and destinations served are two factors of paramount importance.

- **Aircraft Availability.** Another factor influencing airport choice is the availability of space aboard frequent flights to key destinations. Wide-body flights help fulfill the demand for space from freight shippers.

- **Client Request.** A shipper or receiver may have a preference for the route, airport(s), and airline(s) used in the transit of goods and therefore will dictate the decision by the forwarder of which airport to use. According to the survey, this is especially true for forwarders not based in the Baltimore/Washington, D.C. region.

- **Priority of Shipment.** This relates to flight availability and aircraft availability. Last-minute shipping decisions often depend on the priority of the shipment. For example, if there is an urgent demand to move a package to continental Europe or Latin America, a forwarder (or shipper) may dray the cargo from the Baltimore area to another East Coast international airport with greater frequency of flights than BWI to avoid multiple aircraft transfers. However, if there is less urgency, and a longer transit time is acceptable (especially for international shipments), the forwarder or shipper may opt to use BWI.

- **Airport Proximity to Shipping Location.** Holding other factors equal, decision-makers use airports that minimize the land-side distance from origin to destination.

- **Cost Is Not the Most Important Factor.** Most interviewees said that cost of service is not nearly as important as level of service and diversity of flights. Schedules dictate routing decisions more than dollars.

Reasons for Using BWI

In addition to questions that determine general factors influencing airport choice, the survey seeks to discover specific reasons for using BWI. For those interviewees using BWI, the primary reasons for doing so include:

- **Interstate Highway Accessibility.** BWI has better accessibility to the interstate highway system than other regional airports, including Dulles International Airport in Northern Virginia. In this sense, BWI is more "trucker friendly" than Dulles.

- **Domestic Strength.** Some respondents indicated that BWI is the superior domestic cargo airport in the region and that Dulles is the superior international airport in the region, based on number of flights and available routes and carriers. BWI, according to respondents, has the superior domestic schedule in the region and is therefore more attractive for U.S. shipments.

- **Daily Flight to/from London.** The availability of a daily non-stop international connection to London on British Airways is important to local businesses. Freight forwarders take advantage of this daily service and the European connections it provides through London's Heathrow Airport.

Constraints to Using BWI

The survey also intends to find means of improving the attractiveness of shipping air cargo through BWI. To that end, several questions ask which circumstances would have to change for freight stakeholders to increase their use of BWI. BWI's constraints to increased air cargo traffic include:

- **Wide-Body Service.** A number of interviewees stated that BWI does not offer enough wide-body flights. Wide-body aircraft can accommodate larger quantities of cargo and include aircraft lines such as the Boeing 767, 777, and 747 series and the Airbus 330 and 340 series.

- **Passenger Service Focus.** A number of interviewees felt that BWI does a better job of accommodating passenger flight operations than air freight operations. Survey respondents hope that as passenger flight service grows, air freight operations should at least keep pace, especially if more of the flights are wide-body. One respondent voiced concern about the growth of Southwest Airlines – which does not fly wide-body aircraft, which offers no international destinations from BWI, and which imposes a weight limit of 150 pounds per piece of cargo.

- **International Service.** Interviewees stated that BWI does not offer enough choices of international services and carriers. Several Maryland area forwarders truck their shipments to JFK and to a lesser degree, Newark and Philadelphia, for international shipments. Similarly, two interviewees based at Dulles reported that the only foreseeable reason for why they would ship something through BWI is if BWI increased its international service. For example, one freight forwarder uses JFK for inbound seafood, because of cutbacks in European cargo service via Icelandair.

- **Ground-Side Problems.** Other forwarders reported problems with poor lift capability and an outdated radar system at BWI as constraints to using the airport. One forwarder complained about the lack of parking space for small trucks and vans when delivering a small package to the luggage/cargo counters within the BWI terminal building.

- **High Brokerage Fees and Rent.** One complained about the prohibitively high brokerage fees at BWI. Another respondent stated that high rent (at Building F) was a disadvantage.

Respondent Recommendations

In addition to describing constraints to using BWI, respondents provided recommendations that would increase the likelihood of their choosing BWI. Those recommendations include:

- **Greater Flight Selection and International Connections.** This is the single most important and widely cited recommendation. Most respondents urged the airport to pursue an international set of flights. Respondents said BWI should pursue a more well-rounded, balanced set of flights and carriers, especially international connections.

- **Improved Freight Dock Access.** One respondent suggested the airport allow all freight to go directly to the freight docks (as opposed to having shipments go over the counter). This change, they said, would significantly simplify delivery for the smaller freight-forwarding operations.

Individual Interview Summaries

The following paragraphs provide narrative summaries of responses to questions in the freight forwarder survey instrument. The paragraphs generally follow the order of questions in the survey instrument.

ACT, Inc.

ACT is a freight forwarder located near BWI, handling both air and ground shipments. Air freight comprises approximately 65 to 70 percent of their operations. International shipments comprise 14 percent of their shipments. ACT uses both cargo planes and belly cargo. The company generally operates out of BWI and cites BWI flight availability as being the most significant factor in that decision. In cases when a flight is not available at BWI, the company drays shipments by truck to Dulles Airport. ACT's BWI location has 14 employees, all of which are directly involved in logistics, shipping, and receiving. ACT estimates its annual volume of shipments at 2.5 million pounds.

AIT Worldwide Logistics

AIT Worldwide Logistics is Chicago-based freight broker operating in the Maryland market. Approximately 30 percent of its shipments are by air. AIT utilizes both cargo-dedicated and belly cargo carriers. Approximately five percent of its shipments are international shipments. Factors that determine which airport AIT uses include: price, destinations, flight availability, the priority of the shipment, and the shipment size. There are 20 employees located at the Maryland location.

Air Schott

Regionally, all of Air Schott's shipments are international and nearly all air shipments are handled out of Dulles. The company's overall operations, however, are mostly trucking (95 percent). The only foreseeable reason for Air Schott to divert cargo to BWI over Dulles is if there were increased international flights at BWI.

All States World Cargo

All States is a New Jersey-based freight forwarder that handles approximately 80 percent air freight and 20 percent truck freight. All States uses both cargo-dedicated and belly cargo carriers. Approximately 50 percent of their shipments are international shipments. Approximately 60 percent of their air shipments go through BWI; the remaining go through Dulles, New York, and Philadelphia. Factors that determine which airport the company uses include space availability, price, and flight availability. The Maryland location employs five people.

Ameristar Jet Charter

Ameristar is an air freight carrier, exclusively flying cargo aircraft. The company operates through BWI infrequently, perhaps once every two months. The decision to go through BWI is purely customer driven. The company employs 30 people at its BWI location.

American Ship Service

American Ship Service is a freight forwarder and carrier that handles ship parts. The company's location in Baltimore is first and foremost intended to serve the port. Approximately 95 percent of their shipments are air shipments coming in from overseas through BWI. The company employs six people at its Baltimore location.

Arden Air Freight

Arden is strictly an air freight carrier that handles freight for approximately 50 forwarders. The company uses both cargo-dedicated and belly cargo aircraft. International shipments comprise about five percent of Arden shipments and most international shipments are outbound. All of its operations are conducted out of BWI. Arden feels that BWI has done a good job of staying on top of growth and has accommodated the upsurge in activity pretty well. Arden's Baltimore location is the company's principal location, but maintains smaller operations within the State. There are approximately 11 employees in the Baltimore location. The interviewee estimated an average weekly shipment of 30,000 to 40,000 pounds.

Associated Global Systems

Global Systems is a freight forwarder that handles about 60 percent air, 30 percent truck, and 10 percent water freight. International freight comprises 10 percent of the company's

shipments. For its air freight, Global Systems uses both cargo planes and belly cargo. The company is located near BWI and uses BWI most often because 1) its customer base is in Baltimore; and 2) flight availability is sufficient. Global Systems would like to see BWI accommodate wide-body service. The interviewed site is the principal location and is the only location in the State. That location employs eight people and has an average annual volume of shipments in the magnitude of billions of pounds.

B&T Air Express

B&T is a freight carrier that handles approximately 40 percent air freight. The remaining 60 percent of its shipments are ocean and truck freight. Most of B&T's air operations use belly cargo. International freight comprises about 15 percent of the company's total shipments. Factors that determine which airport B&T uses include: the location of where freight is coming from, price and rates of airlines, and specific client requests. In addition to going through BWI, the company also drays to JFK. The interviewed location is the company's principal location, employing 20 people.

Coastal Handling and Consolidation

This company is considered a Pick-Up and Delivery (PUD) service. They carry shipments from BWI to their final destinations or pick up shipments from their origins and carry them to an airport. The company's operations are strictly domestic truck freight. The representative interviewed suggested that BWI make all truck freight go directly to the freight docks instead of over the counter. He also felt that there needs to be better communication and precision in regard to when freight is ready to be taken off an aircraft. The interviewed site is the company's principal location and employs 30 people.

Das Air Cargo

Das Air Cargo is a freight carrier that exclusively handles air shipments. All of Das' shipments are international and are carried on cargo-dedicated aircraft. The company typically flies out of BWI, Dulles, and New York. The decision of which airport to use is typically driven by the location of the customer. The representative had no suggestions regarding improvements needed at BWI. The company's principal location is Orlando, Florida. The interviewed location employs only two people and handles approximately 500,000 kilos in an average year.

Emery

Emery is both a freight forwarder and carrier. Air shipments comprise approximately 50 percent of the company's operations. International shipments comprise 12 to 15 percent of its total shipments. Emery utilizes both cargo-dedicated and belly cargo carriers. Emery's representative said that most of its international shipments are handled through JFK, Toronto, and Miami because BWI doesn't have enough international carriers. He also cites BWI's poor lift capability as a great disadvantage that prevents BWI from handling wide-body flights. Emery will use BWI for some of its domestic shipments,

but will truck much of its domestic freight. Emery's corporate office is located in California. The interviewed location is a satellite office that employs 15 people.

Global Express

Global Express is a freight forwarder that handles 80 percent air and 20 percent truck and water shipments. International freight comprises about 40 percent of its shipments. Air freight is shipped in both cargo-dedicated and belly cargo aircraft. Global Express uses both BWI and Dulles. Typically the decision to operation through a particular airport hinges on the following factors: routing, air craft space availability, and flight availability. The Global Express representative had deep concerns about BWI's outdated radar system and its high rent. He also voiced his desire to see wide-body service at BWI. This location is Global Expresses' principal location and employs six people.

KFS

KFS, based in Dallas, is a domestic and international air cargo broker. The company uses cargo agents at Dallas-Fort Worth International Airport to set rates out of all airports, including BWI. From the Maryland region, KFS occasionally ships internationally to London; however, the company uses Dulles more often to service its customers' international shipments in the Washington, D.C., and Maryland region. However, for domestic cargo, the company uses BWI more frequently because the airport has a better schedule of domestic wide-body flights.

Nippon Express

Nippon operates exclusively at Dulles International Airport in the Mid-Atlantic region. Nippon believes that Dulles is sufficient and does not anticipate doing any business at BWI simply because BWI lacks an international flight schedule.

O'Sullivan Brokerage and Logistics

O'Sullivan is a brokerage serving an even split of domestic and international customers through BWI. On an international level, O'Sullivan principally serves Europe and the Far East. Most of its customers use commercial belly cargo. At BWI, the top carriers of O'Sullivan's cargo are United, American, US Airways, and British Airways. O'Sullivan operates at BWI because it has historically served the Maryland market.

Priority Worldwide Service

Priority Worldwide moves more than 75 percent of its cargo by air. At BWI, approximately 70 percent of their business is domestic and 30 percent international. Priority principally uses Signature Flight Support (which serves several airlines at BWI) and Southwest as carriers. The company primarily ships belly cargo on regularly scheduled flights. All-freight carriers, including Kitty Hawk, are expensive. Their overall experience of BWI is negative – they are unhappy with what they see as the airport's emphasis on passenger

operations (principally Southwest), which they view as limiting the airport's commitment to freight. Most Mid-Atlantic international flights go through Newark, Philadelphia, Dulles, and JFK. They noted that US Airways, which they viewed as a good freight carrier, has cut its flights to "next-to-nothing" while Southwest ("not such a good cargo carrier") has increased its flights. They suggested that BWI pursue increased services by carriers with a strong cargo focus.

R.W. Bozel

R.W. Bozel is a refrigerated LTL carrier that specializes primarily in landside origin-to-destination moves. However, the company does serve BWI as a freight forwarder upon request from customers and brokers. The company does not have a regularly scheduled delivery or pick-up at the airport but serves BWI in the case of emergencies. Air cargo is typically time sensitive. The company functions solely as a forwarder; does not arrange flights or air routings. The reason why the company serves BWI is that deliveries can be made faster than from Dulles or Philadelphia to the Maryland market. The company recommends BWI to their customers and has the capacity and desire to increase its drayage of air freight to and from BWI. Of the freight the company moves from BWI, most is domestic. The company employs approximately 100 people at its Maryland location.

SEA-CAP

Based in Elkridge, Maryland, Sea-Cap specializes in the delivery of fresh and frozen seafood products flown to airports in the Northeastern United States. BWI represents approximately five percent of that business. JFK airport is Sea-Cap's primary airport. Much of the seafood the company moves from BWI is destined for the Boston area. The company's top two inbound carriers (irrespective of airport) are Lan Chile and South African. The top origins of seafood are in South America, including Chile, Peru, Ecuador, and Venezuela. The company also moves some European, Canadian, and South African seafood. The airlines the company serves at JFK include Lan Chile, Singapore, Varig, Virgin Atlantic, and South African. Lan Chile flies five cargo-dedicated flights each day into JFK. These airlines do not fly into BWI. Icelandair, which flies directly into BWI from Reykjavik, used to move a lot of fresh and frozen seafood through BWI. Now Icelandair has shifted its delivery to JFK and Boston. Because of the high level of service at JFK, the company picks up seafood at JFK and delivers it to the Baltimore/Washington area. For example, a customer in Arlington, Virginia, picks up its fish at JFK and brings them back to the D.C. area. The company's only carriers at BWI are Southwest and America West, the latter of which links Mexico to BWI and in the next few months will deliver Mexican crab through BWI. Brokers at BWI charge outrageous fees. For example, Shapiro, which "has a kind of monopoly on fish," charges outrageous fees at BWI. Thus, the primary inadequacy of BWI is its lack of direct international flights and the second primary inadequacy is the expense. Dulles and National Airports are difficult to serve because of heavy traffic (especially to and from the company's headquarters in Elkridge, Maryland).

Signature Flight Support – America West, Continental Airlines, Frontier Airlines

Signature Flight Support handles freight operations for a number of commercial airlines. Signature is strictly involved in air freight and uses only belly cargo to ship freight. Approximately half of the company's shipments are international. The respondent feels that BWI is more user-friendly than Philadelphia and Dulles because of its accessibility to the interstate system. However, he also feels that BWI needs to provide more truck parking. He cites many problems with the usability of Building A (located off Aviation Boulevard near the International Terminal). He feels that Building A suffers from being outside of airport parameters. He thinks that BWI needs to relocate its fencing, provide ramps to the warehouse, and install doors that account for aircraft pallets. He also believes that the Midfield facility would benefit from having a tug route to enable easier travel between Midfield and the terminal. Signature Flight Support employs 450 people at its BWI location. Approximately 12 employees work in the warehouse. On average, they handle about eight to 10 million pounds each year.

Southwest Distribution

Southwest Distribution is a newspaper and magazine freight forwarder with locations in Southwest Washington, D.C., and Arlington, Virginia, near Reagan National Airport. Southwest is the primary freight forwarder of the *Washington Post* (and was referred to this study by the *Washington Post*) and principally uses Dulles and National Airports. Their publications cargo is extremely time sensitive and therefore requires flight schedules that will expedite delivery of magazines and newspapers to large urban centers early each morning. Southwest says they do not use BWI because that airport has a weak early morning schedule to large cities to permit timely morning distribution. Southwest says they use National and Dulles airports because they are geographically closer to their warehouse facilities. The company employs 170 to 200 people in the Washington, D.C. area. (Note: Because Southwest Distribution was referred to this study by the *Washington Post* during the initial round of shipper surveys [one of the contacts for that initial round was the *Washington Post*], Southwest does not appear in the appendix among the BWI Cargo Directory listings.)

Swift Air Delivery

Based in Charlottesville, Virginia, Swift Air Delivery dispatches one tractor-trailer each day from Central Virginia to BWI Airport. The truck typically stops at Dulles and continues to BWI using the Capital Beltway around Washington, D.C. Swift functions primarily as an intermediary between shipping/receiving customers and consolidators and therefore does not make the air routing decisions. Most of Swift's freight movement is domestic. Of the cargo Swift moves to forwarders at BWI, 65 percent is flown from BWI and the remaining freight goes through Philadelphia or JFK Airport in New York City. Most of the air cargo Swift moves to BWI are carried by passenger airlines, including Southwest, Continental, United, and others. Swift also shuttles freight between BWI and Dulles. Swift views Dulles as principally an international cargo airport while BWI is a domestic cargo airport. At BWI Swift uses Khune and Nagel as one of their primary forwarders.

Swift serves BWI because 1) their shippers want to move freight through BWI; 2) the consolidators and forwarders are at BWI; and 3) BWI is more trucker friendly and has more space for trucks to ingress and egress than Dulles where truck access is difficult. The facilities and access to BWI are adequate. Cost of shipping through one airport or another is not as important as the level of service. National Airport (DCA) is "out of the cargo picture" for the last 10 years. Swift employs 22 people at its two locations (Richmond and Charlottesville).

Terrapin Express

Terrapin Express is a cartage agent to BWI serving Harford and Cecil Counties in Maryland. Terrapin principally serves DHL and Airborne forwarders at BWI. Terrapin also serves Sully and Unicorn. The company does not make any air routing decisions, but relies on the forwarders for whom they move cargo. Terrapin moves freight to and from BWI because it is close to its market in Harford and Cecil Counties. The only complaint Terrapin has about the airport is the difficulty of parking its vans or small trucks close to luggage offices/counters of individual airlines in the main terminal when making special deliveries of packages. Terrapin only occasionally makes these types of deliveries, but says there is great difficulty in finding a parking place and walking the package to the terminal. Terrapin employs 28 people at its one location.

Turner Transportation Group

Turner Transportation Group typically makes two daily pick-ups and one nightly pick-up at BWI Airport. More than 80 percent of the cargo Turner moves to and from BWI airport is domestic (with an origin or destination in the United States). Approximately 75 percent of the cargo the company moves has an airborne segment of travel to its final destination. More than 80 percent of the cargo Turner moves to and from BWI is generated by BAX with Burlington Northern, and Forward Air as other important brokers/partners. Of the cargo Turner moves to and from Dulles, roughly 90 percent is international and 10 percent is domestic. The principal reasons Turner serves BWI are: 1) the airport's good access (better than Dulles); 2) the freight arrives at BWI (Turner is not making the routing decisions – only draying air cargo); and 3) there are more domestic brokers/agents and carriers at BWI than other regional airports. The company operates 11 tractor/trailer units and has 40 employees. Its only location is at Hagerstown, Maryland.

Interviews Performed by Martin Associates

Results of interviews with area shippers and freight forwarders conducted by Martin Associates generally support the findings of this study. One key difference in the responses is a greater focus by Martin Associates respondents on price and rates in deciding which airport to use. Those interviewees also place greater emphasis on overnight delivery of time-sensitive materials, especially for biotechnology companies shipping freight with special temperature and care requirements. On the subject of airport facilities, several Martin Associates interviewees believe that BWI suffers from a lack of lift

capacity. Finally, on an operational level, two interviewee respondents commented that new Transportation Security Administration (TSA) rules restrict cargo from "unknown" shippers to freight-only flights, which may favor airports with a greater share of freight-only flights. Capsule summaries of these interviews were developed by Martin Associates and are presented in Appendix D.

Conclusions

Freight stakeholders interviewed for this study are, for the most part, highly satisfied with the airport's domestic air cargo service and landside access. They generally give high marks to the range of domestic connections and available aircraft. Interviewees also laud BWI's ability to keep pace with passenger and cargo growth over the last decade and its operation of terminal and cargo facilities.

Interviewees are generally less satisfied with BWI's range of international connections, and they frequently divert transoceanic cargo by truck to other East Coast airports with stronger global schedules. BWI cargo users are also concerned about the lack of sufficient wide-body flights at the airport (although this may be a consequence of the airport's domestic focus).

Overall, the airport's freight users are interested in frequent, reliable, direct service to important domestic and Transatlantic markets. Finally, some interviewees are concerned that the airport's passenger focus will trump freight service, especially as low-cost carriers less interested in freight comprise an increasingly large market share at BWI.

5.0 Recommendations

5.0 Recommendations

5.1 Review of Findings

This study has confirmed the value of BWI to the State's economy, discussed national trends in air cargo operations and presented stakeholders' perceptions of BWI's strengths and weaknesses as an air cargo hub. To recap the major themes and findings of this report:

- *BWI air cargo operations create substantial economic and transportation value for the State of Maryland.* BWI air cargo operations generate over 1,200 direct and indirect jobs within the State of Maryland. By virtue of its location and the high levels of service and accessibility, BWI air cargo operations help Maryland firms compete and grow in the regional and national market place; these accessibility benefits translate into 2,100 additional non-airport jobs for the State's economy. In 2003, air cargo operations are estimated to contribute more than $95 million in income to the State's economy through direct employment and the efficiencies and convenience that BWI provides to Maryland businesses. If BWI did not offer air cargo service, Maryland shippers would generate an additional 340,000 miles of truck travel over Maryland highways in reaching out-of-state airports; this figure would grow to 750,000 miles of truck travel by 2023.

- *National trends suggest continued expansion of domestic and international air cargo traffic.* Despite recent drops in air cargo activity and increased security concerns, the overall outlook for air cargo is for continued growth and expansion in domestic and international markets. Roughly speaking, international air cargo traffic with the Far East, Europe, Canada and Latin America is forecast to grow by six to seven percent through 2021. Correspondingly, the growth forecast for domestic air cargo is around 4.5 percent. Despite the recent downturn, the overall forecast is for recovery and strong growth by both all-cargo and passenger carriers, with traffic expected to nearly double over the next decade.

- *BWI's historic and forecasted air cargo growth is consistent with national trends.* Overall, BWI's growth in air cargo operations places it just below the national average over the 1982-2002 period. BWI's own air cargo growth forecasts, which are also slightly below the national average, suggest that it will need to accommodate two and one-half times as much cargo in year 2020 if it maintains its current market share.

- *BWI is heavily oriented to domestic cargo and the integrated carriers.* Domestic inbound and outbound cargo accounted for 97.4 percent of all traffic – international traffic accounted for just 2.6 percent.

- *Maryland domestic air cargo "leaks" to other (non-BWI) airports.* A significant amount of Maryland's domestic inbound and outbound air cargo appears to be shipped through other airports. Air cargo drayage data indicate that almost 80,000 metric tons of domestic air cargo originating or terminating in the State of Maryland is actually handled through other "peer" airports. This is equivalent to about one-third of BWI's total air cargo tonnage in year 2001. Dulles and Philadelphia are the main competitors to BWI in this market.

- *Maryland international air cargo "leaks" to other airports as well.* BWI processes somewhere between five to 25 percent of Maryland-produced goods destined to and from international destinations. More than 38 percent of all Maryland international export cargo is handled at JFK and another 15 percent is handled at Dulles.

- *Maryland air-eligible cargo travels from coast to coast.* According to TRANSEARCH, a total of 55,769 tons (50,584 metric tons) of air-eligible cargo is moved by truck from Maryland origins to other U.S. destinations. The leading destination states are California (14 percent), Illinois (10 percent), Texas (nine percent), Florida (eight percent), Missouri (eight percent), and Arizona (six percent).

Air cargo shippers, receivers and forwarders have noted some very positive aspects to BWI's air cargo operations, as well as some perceived limitations:

- *BWI is not seen as competitive with other airports for handling international cargo.* BWI is seen as lacking the service destinations and service frequency as compared to Kennedy and other "peer" airports.

- *BWI is not seen as sufficiently focused on air cargo operations.* Shippers view the lack of wide-body plane service, lack of carriers with a strong cargo focus, and perceived operational constraints (inconvenient/inefficient on-airport movement) as indications that BWI is more focused on passenger services, specifically its commitment to Southwest Airlines, which is not seem as a major cargo carrier.

5.2 Strategic Recommendations

Clearly, there are growth opportunities in the air cargo market that BWI could exploit. On the other hand, there are practical limitations to capturing these opportunities, and in some cases the costs of overcoming these limitations may be larger than the benefits that would be achieved. This report does not offer a comprehensive benefit/cost assessment, but it does address the larger underlying issues: is BWI taking positive steps to capture the most attractive opportunities? Are there significant opportunities that could be more vigorously pursued?

Recommendation #1: BWI should continue planning to accommodate the "natural growth" of its existing air cargo markets.

BWI air cargo demand is projected to more than double by 2023 (from 236,000 metric tons in 2000 to 653,000 metric tons in 2023). In year 2023, if BWI does nothing more than retain its anticipated "fair share" of cargo growth, it will keep 750,000 truck miles of travel from being added to Maryland's highways, and support 3,900 additional Maryland business jobs (over and above direct and indirect airport-related jobs).

Accommodating this volume increase will be a substantial challenge. It will require additional warehouse/transfer space and ramp capacity. It will require efficient on-airport haul routes between warehousing and aircraft parking. It will require the preservation of BWI's highway access, and of truck mobility at the larger regional and statewide levels.

BWI's "Draft Air Cargo Facilities Inventory" outlines a program of improvements that will be necessary to accommodate these future levels of air cargo traffic. The plan differentiates between facilities needed for all-cargo aircraft versus belly cargo handling. The benefits of actually making these improvements will ultimately need to be weighed against the costs – the capital costs of facility construction, as well as the opportunity costs of not realizing benefits that may be associated with alternative (non-freight) improvements.

Recommendation #2: BWI should continue to explore opportunities to attract specific niche commodities.

The data sources and analyses used in this study were designed to support a system-level transportation and economic assessment of air cargo opportunities, rather than a detailed assessment of specific commodities. However, some useful commodity-level information has been developed:

- For domestic cargo that is trucked to/from Maryland (year 2001) but could potentially be moved by air, the leading outbound commodities are: mail and contract traffic (24,300 tons); machinery (8,200 tons); transportation equipment (7,000 tons); electrical equipment (5,400 tons); and printed matter (3,000 tons). The leading inbound commodities are: mail and contract traffic (29,400 tons); machinery (9,900 tons); chemicals and allied products (8,900 tons); electrical equipment (7,700 tons); and transportation equipment (7,500 tons). The majority of this tonnage does not require specialized handling facilities or marketing strategies.

- For international cargo, electrical machinery, industrial machinery, printed materials, and textiles represent a relatively high percentage of Maryland's international exports, yet represent a relatively low share of BWI's international export cargo. Gains could be made particularly in these areas, although the associated tonnages are fairly low.

Recently, SH+E's "Overview of Air Cargo Operations at BWI" looked in detail at the demand for specialized handling commodities (perishables, livestock and hazardous materials) using MISER and BWI data. That study offered similar findings: namely, that only a small volume of international exports require specialized handling. Furthermore,

SH+E found that several airports that have recently invested in specialized handling facilities have not been successful in attracting business.

Despite the fact that potential opportunities have not emerged, BWI should periodically reassess these markets as conditions warrant.

Recommendation #3: BWI should continue, and where possible expand, its ongoing efforts to expand domestic markets and service offerings.

If BWI could capture all of the Maryland domestic cargo that leaks to other airports, the maximum benefit in year 2023 would be to keep 770,000 truck miles of travel from being added to the Maryland highway system, while generating 960 additional jobs and around $550 million in additional business sales in Maryland.

In practice, it is unreasonable to expect that a large share of this traffic could, or should, actually be shifted to BWI. BWI is part of a larger multi-state airport system, and many Maryland shippers are well-served through airports other than BWI because of location or service factors. Also, it is important to remember that the integrated carriers control the bulk of BWI traffic, and decisions to route domestic traffic through BWI versus other airports will remain a matter of their internal business logistics. However, some of the Maryland cargo that currently moves through other airports would probably "want" to go through BWI, given the right combination of services and costs.

BWI has already made a number of steps in this direction:

- Pricing. BWI reports that it has an attractive cost structure in place. A continuing commitment to low-cost services should become increasingly attractive, particularly if rates at competing airports increase over time.

- Coordination with integrated carriers. BWI has met with its integrated carriers to identify issues and needs that would facilitate their operations, recognizing that carriers will continue to make routing decisions based on their own internal business objectives and marketing practices.

Other potential opportunities include:

- Coordination with passenger carriers. Domestic passenger flights are dominated by Southwest, with less availability of longer-haul nonstop flights (especially to the west coast) compared to other airports. To the extent that BWI can encourage Southwest to increase service on its longer-haul routes, this would benefit BWI shippers; however, this would have to be driven by demonstrable passenger demand, not freight demand.

- Encouraging a mix of domestic passenger carriers. Several people interviewed for this study were interested in seeing a greater presence by domestic passenger airlines that operate wide-body aircraft and offer long-distance nonstop services. Given the downturn in the air passenger industry, it is unclear whether any of the major belly cargo carriers would want to expand at BWI in the near term, but this is a potential

longer-term opportunity. As noted in SH+E's report, the possibility of cargo revenue might be enough to "tilt" a passenger service in BWI's favor.

- Improving highway access to shippers in the I-270 corridor. According to TRANSEARCH, around 60 percent of Montogmery County air cargo is moving through Dulles. Better highway access to BWI could help attract these shippers, but the effect on truck VMT within the State of Maryland would need to be evaluated.

Recommendation #4: BWI should pursue efforts to improve international service options.

The limitations of BWI's international service and competitive position have been documented in this and other BWI studies. SH+E's "Overview of Air Cargo Service at BWI" suggests that the principal limitation is the lack of international wide-body flights, and that the best way to overcome this is to encourage more such passenger flights, using cargo as one of the attraction factors.

This study tested one limited and reasonably achievable scenario (a doubling of weekly nonstop service to London) and found that the benefit in year 2023 would be to keep 100,000 truck miles of travel from being added to the Maryland highway system, and to generate 40 additional jobs and around $31 million in business sales in Maryland.

Another strategy could be to directly market the integrated carriers. For example, from BWI, FedEx serves international markets by trucking to Newark, flying to Indianapolis, and flying to Memphis. It may be worth exploring their requirements to provide direct international flights from BWI.

5.3 Conclusion

This study confirms and quantifies the significant transportation and economic benefit that the State of Maryland receives from BWI air cargo operations, and suggests four strategies to maintain and substantially increase these statewide benefits over the next 20 years. BWI is already pursuing key elements of these strategies, and the study recommendations are seen primarily as enhancements to initiatives already underway.

Appendix A

Interview Pool from MAA Air Cargo Directory

Appendix A – Interview Pool from MAA Air Cargo Directory

Likely freight forwarders were selected from the listings of the Maryland Aviation Administration's Air Cargo Directory version December 2002. To identify freight forwarders, the study team filtered unlikely freight forwarders from the list, including government agencies, associations, air carriers, and service providers (fumigators, attorneys, etc.). Several other firms were excluded from the interview pool because those firms were targeted by Martin Associates' economic assessment efforts for BWI Airport. After the likely freight forwarders were identified, the study team contacted 84 of the listed firms in the Cargo Directory, resulting in 23 interviews. No scientific sampling method was applied. Many firms were either too busy or unwilling to participate. Thus, the interview success rate was approximately 27 percent of those contacted by telephone. Interviews were carried out during December 2002. The following list shows all firms in the Cargo Directory but specifies whether each firm was contacted and interviewed during the survey process.

BWI Cargo Directory

Contacted	Interviewed	Organization Name	City	State
Yes		Aarid Enterprises CAP	Baltimore	MD
Yes		Active Aero Charter/USA Jet Airlines, Inc.	Belleville	MI
Yes	Yes	ACTS, Inc.	Hanover	MD
Martin Associates		AEI	Glen Burnie	MD
Yes		Air Cargo, Inc.	Annapolis	MD
No		Air Forwarders Association	Alexandria	VA
Yes		Air Foyle, N.A.	Houston	TX
Yes		Air Freight Plus, Inc.	BWI Airport	MD
Yes		Air Jamaica	Jamaica	NY
No		Air Ontario	BWI Airport	MD
No		Air Transport Association of America	Washington	DC
No		Airborne Express	Linthicum	MD
Yes		AirCharter World	Pleasant Hill	CA
Yes		Airline Container Leasing, Inc.	Oceanside	NY
Yes		Airpack, Inc.	Hanover	MD
No		Airports Council International of North America	Washington	DC
Yes	Yes	Airschott	Hanover	MD
Yes	Yes	AIT Worldwide Logistics	Hanover	MD
Yes	Yes	Allstates World Cargo	Glen Burnie	MD
Yes		Amco Brokers and Forwarders, Inc.	Baltimore	MD
Yes		America West c/o Signature Flight Support	BWI Airport	MD
No		American Association of Exporters & Importers	New York	NY
No		American Import Shippers Association	New Rochelle	NY

BWI Cargo Directory (continued)

Contacted	Interviewed	Organization Name	City	State
Yes	Yes	American Ship Service	Baltimore	MD
Yes		Ameriflight Inc.	Burbank	CA
Yes	Yes	Ameristar Jet Charter, Inc.	Addison	TX
No		Animal Transportation Association (AATA)	Houston	TX
No		Antonov Airlines c/o Air Foyle	Luton	England
Yes	Yes	Arden Air Freight	BWI Airport	MD
No		Armstrong Brands, Inc.	W. Seneca	NY
No		ARP Consulting L.L.C.	Washington	DC
Yes	Yes	Associated Global Systems	Hanover	MD
Yes		Atlantic Fulfillment	Baltimore	MD
Yes		Atlantic Nationwide Trucking	Baltimore	MD
Yes		Atlas Air	Purchase	NY
No		Automotive Aftermarket Industry Association	Bethesda	MD
No		Aviation Facilities Company, Inc.	McLean	VA
No		Aviation Leasing Group	Kansas City	MO
No	Yes	B & T Air Express, Inc	Glen Burnie	MD
No		B Von Paris & Sons, Inc.	Savage	MD
No		Baker & Hostetler Counselors at Law	Washington	DC
No		Baltimore Council on Foreign Affairs	Baltimore	MD
No		Baltimore Metropolitan Council	Baltimore	MD
No		Baltimore Quality Assurance	Baltimore	MD
No		Baltimore/Washington Air Cargo Association (BWACA)	Glen Burnie	MD
Yes		Barian Shipping Co., Inc	Woodmere	NY
No		Barthco International, Inc.	Baltimore	MD
No		BAX Global	BWI Airport	MD
No		BDP International, Inc.	Glen Burnie	MD
No		Berry Van Lines	Joppa	MD
No		Bratt International	Baltimore	MD
No		British Airways c/o Worldwide Flight Services	Baltimore	MD
No		Bureau of Alcohol, Tobacco & Firearms	Baltimore	MD
No		B-Way International, Inc.	Joppa	MD
No		BWI Business Partnership	Hanover	MD
Martin Associates		BWI Corporation	BWI Airport	MD
No		BWI Development Council	BWI Airport	MD
Yes		C.H.Powell Co.	Baltimore	MD
No		Caminis Customs Brokers	Timonium	MD
No		Cargo Logistics Group, Inc.	BWI Airport	MD
Yes		Cargolux Airlines International, S.A.	South San Francisco	CA
No		Central Delivery Service	Beltsville	MD
No		Chapman Freeborn Air Chartering	Atlanta	GA
No		Chesapeake Pro Flight	Baltimore	MD
No		Circle International, Inc.	Glen Burnie	MD

BWI Cargo Directory (continued)

Contacted	Interviewed	Organization Name	City	State
Yes		CJ International, Inc.	BWI Airport	MD
Yes	Yes	Coastal Air Handling & Consolidation	BWI Airport	MD
Yes		Continental Airlines c/o Signature Flight Support	BWI Airport	MD
No		D. Lee Kraus & Co. Ltd.	Baltimore	MD
No		D.A.T.E. International, Inc.	Baltimore	MD
Martin Associates		Danzas AEI International	Glen Burnie	MD
Martin Associates		Dartrans, Inc.	Baltimore	MD
Yes	Yes	Das Air Cargo- USA	Laurel	MD
No		Davidson Forwarding	Baltimore	MD
No		DHL Worldwide	Linthicum	MD
No		Distribution By Air	Glen Burnie	MD
No		Dynamic Aviation Group, Inc.	Bridgewater	VA
No		Eagle Global Logistics	Glen Burnie	MD
No		East Hoogewerff, Inc.	Pasadena	MD
No		Eastern Baltimore Area Chamber of Commerce	Baltimore	MD
No		Eastern Packaging Corporation	Glen Burnie	MD
No		Emery Customs Brokers	BWI Airport	MD
Yes	Yes	Emery Worldwide	BWI Airport	MD
No		Esquire Gas Products, Co.	Enfield	CT
Yes		Evirotainer	Irving	TX
No		Exel Global Logistics	Glenn Burnie	MD
No		Expeditors International	Glen Burnie	MD
No		Express Shipping International	Baltimore	MD
No		Federal Aviation Administration (FAA) Security	BWI Airport	MD
No		Federation of International Trade Associations	Reston	VA
Yes		FedEx Corporation	Baltimore	MD
No		Fine Airlines	Miami	FL
No		Florida Foreign Trade Association	Miami	FL
No		Footner & Company, Inc.	Baltimore	MD
No		Forward Air	Glen Burnie	MD
No		Forward Air, Inc.	Folcroft	PA
No		Fritz Companies, Inc.	Hanover	MD
Yes		Frontier Airlines	BWI Airport	MD
No		Gemini Data Systems, Inc.	Coral Springs	FL
Yes	Yes	Global Express Logistics' T/A U.S. Express, Inc.	Hanover	MD
No		GT USA	Hanover	MD
Yes		Guardian International Forwarders	Baltimore	MD
No		HBI Priority Freight	Hanover	MD
Yes		Heavylift Cargo Airlines	Kansas City	MO
Yes		Hilb, Rogal and Hamilton Company of Baltimore	Hunt Valley	MD
Yes		Hobelman International, Inc.	Timonium	MD
No		Home Paramount Pest Control Companies, Inc.	Baltimore	MD
Yes		Hoogewerff (U.S.A.) Inc.	Elkridge	MD

BWI Cargo Directory (continued)

Contacted	Interviewed	Organization Name	City	State
Yes		I.C.A.T. Logistics, Inc.	Hanover	MD
Yes		IAN International, Inc.	Hanover	MD
No		ICC Air Cargo	Farnham	Quebec
No		Icelandair c/o Signature Flight Support	BWI Airport	MD
Yes		Integrated Airline Services, Inc.	BWI Airport	MD
No		Intermodal Association of North America	Greenbelt	MD
No		International Air Cargo Association	Miami	FL
Yes		Jagro Customs Brokers & IFF Forwarders, Inc.	Baltimore	MD
No		Janesville Jet Center	Janesville	WI
Yes		John A. Steer, Inc.	Baltimore	MD
Yes		John S. Connor, Inc.	Hanover	MD
Yes	Yes	KFS, Inc.	DFW Airport	TX
No		Kirkland & Ellis	Washington	DC
No		Kitty Hawk Air Cargo, Inc.	DFW Airport	TX
Martin Associates		Laing International	BWI Airport	MD
Yes		Landstar Express America	Hanover	MD
Yes		Logistics and Transportation Services, Inc.	Baltimore	MD
No		Martinair Cargo	Boca Raton	FL
No		Maryland Aviation Administration	BWI Airport	MD
No		Maryland Department of Transportation	BWI Airport	MD
Yes		Maryland Food Center Authority	Jessup	MD
Yes		Maryland Messenger Service, Inc.	Baltimore	MD
No		Maryland Office of International Business (DBED)	Baltimore	MD
No		Maryland Port Administration	Baltimore	MD
No		Maryland/Israel Development Center	Baltimore	MD
No		Mercantile	Baltimore	MD
No		Messenger Courier Association of America	Washington	DC
No		Mid-Atlantic Freight, Inc.	Greensboro	NC
Yes		Mid-Atlantic Trade Services, Inc.	BWI Airport	MD
No		National Association of Foreign Trade Zones	Washington	DC
No		National Defense Transportation Association (NDTA)	Alexandria	VA
No		National Fisheries Institute	Arlington	VA
Yes	Yes	Nippon Express USA, Inc.	Sterling	VA
No		Northwest Airlines	BWI Airport	MD
Martin Associates		Olimpex International, Inc.	Linthicum	MD
Yes	Yes	O'Sullivan Brokerage & Logistics, Inc.	Hanover	MD
Yes		Pacific Air Cargo	Los Angeles	CA
Yes		Panalpina, Inc.	Baltimore	MD
Yes		Pegasus Air Express, Inc.	BWI Airport	MD
Yes		Pilot Air Freight	Glen Burnie	MD
Yes		Pride International, Inc.	Baltimore	MD
Yes	Yes	Priority Worldwide Services	Glen Burnie	MD
Yes		Pro Cargo	Joppatowne	MD

BWI Cargo Directory (continued)

Contacted	Interviewed	Organization Name	City	State
Yes	Yes	R.W. Bozel Transfer, Inc.	Baltimore	MD
No		Ribis, Jones & Maresca, P.A.	Largo	MD
No		Roanoke Trade Services, Inc.	Hunt Valley	MD
Martin Associates		Samuel Shapiro & Co., Inc.	Baltimore	MD
No		Sandler, Travis & Rosenberg, P.A.	Baltimore	MD
Yes		Schenker International, Inc.	Hanover	MD
Yes	Yes	SEA- CAP Inc.	Elkridge	MD
Yes		Seabridge International	Baltimore	MD
No		Semmes, Bowen & Semmes	Baltimore	MD
Yes	Yes	Signature Flight Support	BWI Airport	MD
No		Southwest Airlines	BWI Airport	MD
Yes		Special Transport, Inc.	Glen Burnie	MD
Yes		Specialty Packaging and Mailing, Inc.	Baltimore	MD
No		Suburban Maryland International Trade Association	Olney	MD
Yes	Yes	Swift Air Delivery	Charlottesville	VA
Yes		Tailwind International, Inc.	Addison	TX
Yes		Taylor Delivery Service	LaVale	MD
Yes		Team Worldwide	Hanover	MD
No		Teqflor, Inc.	Coral Gables	FL
Yes	Yes	Terrapin Express	Joppa	MD
Yes		The Belt's Corporation	Elkridge	MD
Yes		Tidewater Express	Crisfield	MD
Yes		TLI/International, Inc.	Hanover	MD
Yes		TNT Express Worldwide	Houston	TX
Yes		Tower Group International	Glen Burnie	MD
No		Trade Winds Airlines	Greensboro	NC
Yes		Transoceanic Shipping Co., Inc.	Baltimore	MD
Yes		Transworld Shipping Service, Inc.	Baltimore	MD
Yes	Yes	Turner Transportation Group, Inc.	Hagerstown	MD
Yes		U&C Overseas	Glen Burnie	MD
No		U.S. Association of Importers of Textiles	New York	NY
No		U.S. Customs Service	BWI Airport	MD
No		U.S. Department of Agriculture	Annapolis	MD
No		U.S. Export Assistance Center	Baltimore	MD
Yes		U.S. Express	Hanover	MD
No		U.S. Fish & Wildlife Service	BWI Airport	MD
No		U.S. Food & Drug Administration	Baltimore	MD
No		USAirways	BWI Airport	MD
Yes		Unicorn Transportation	Hanover	MD
No		United Airlines	BWI Airport	MD
No		United Parcel Service	BWI Airport	MD
No		United States Postal Service- Airport Mail Center	BWI Airport	MD

BWI Cargo Directory (continued)

Contacted	Interviewed	Organization Name	City	State
No		UPS- Air Cargo	Louisville	KY
No		URS Greiner Woodward Clyde	Hunt Valley	MD
No		USA Cartage, Inc.	Williamsport	MD
No		USAirports Aviation Services, Inc.	BWI Airport	MD
No		US Airways	BWI Airport	MD
No		USDA-APHIS-PPQ	Annapolis	MD
No		USDA-APHIS-PPQ	Baltimore	MD
No		USF Worldwide	Baltimore	MD
No		Velocity Express	Glen Burnie	MD
No		Victory Packing	Hanover	MD
No		Von Paris Moving & Storage	Savage	MD
Martin Associates		W.A. Smith International, Inc.	Hanover	MD
No		Western Pest Services	Timonium	MD
No		Whiteford, Taylor & Preston, L.L.P.	Baltimore	MD
No		Willis of Maryland	Hunt Valley	MD
Martin Associates		Wilson UTC, Inc.	Hanover	MD
No		World Airways, Inc.	Purcellville	VA
No		World Points Services	Baltimore	MD
No		World Trade Center Institute	Baltimore	MD
No		Worldwide Flight Services	BWI Airport	MD
No		Worldwide Flight Services	Baltimore	MD
No		Zantop International Airlines, Inc.	Ypsilanti	MI
No		Zust Bachmeier of Switzerland, Inc.	Baltimore	MD

Appendix B

Interview Pool from Reebie Associates'
Freight Locator *Database*

Appendix B – Interview Pool from Reebie Associates' *Freight Locator* Database

Reebie Associates provided the study team with list of firms from their *Freight Locator* database comprised of shippers in the BWI market as an adjunct to the TRANSEARCH commodity database. As explained in the main body of this section, the study team made some initial calls to shippers in the database before focusing efforts on interviewing freight forwarders. The full *Freight Locator* database for Maryland is not included in this appendix. Instead, the original interview pool of shippers is contained in the following table and represents the first cut of shippers based on the following criteria. Efforts were made to identify likely air cargo shipping firms with 1) commodity codes matching typical commodities of air cargo as explained in this report; 2) high shipment tonnage; and 3) large numbers of employees.

First Cut of Likely Maryland Air Cargo Shippers from Reebie Associates' *Freight Locator* Database

Company Name	City	State	Primary SIC Description	Employees	Primary SIC Tons*
Bethesda Engravers	Baltimore	MD	Stationery & Engraved	50	3,040
Lallie Store	Annapolis	MD	Stationery & Engraved	25	1,920
Bata Shoe Co Inc	Belcamp	MD	Rubber & Plastic Footwear	180	610
Lotus Development Corp	Germantown	MD	Printing Publishing & Allied	10,000	141,303
Heartsense	Potomac	MD	Printing Publishing & Allied	1,500	23,876
Washington Post Newspaper	College Park	MD	Printing Publishing & Allied	400	9,408
Phillips Harborplace Restaurant	Baltimore	MD	Printing Publishing & Allied	500	6,396
Frank Parsons Paper Co Inc	Landover	MD	Printing Publishing & Allied	300	6,195
Thomson Financials	Rockville	MD	Printing Publishing & Allied	660	5,842
Lippincott Williams & Wilkins	Baltimore	MD	Printing Publishing & Allied	300	4,953
Levindale Hebrew Geriatric Ctr	Baltimore	MD	Printing Publishing & Allied	500	4,576
Phillips Publishing Intl	Potomac	MD	Printing Publishing & Allied	600	4,572
Cadmus Journal Svc	Linthicum Hts	MD	Printing Publishing & Allied	300	4,437
C B Weekly Release	Rockville	MD	Printing Publishing & Allied	310	4,389
Craftsman Press	Hyattsville	MD	Printing Publishing & Allied	276	3,509
Barton Cotton Inc	Halethorpe	MD	Printing Publishing & Allied	300	3,192
Homestead Publishing	Bel Air	MD	Printing Publishing & Allied	157	3,136
Smith Lithograph Corp	Rockville	MD	Printing Publishing & Allied	230	2,929
Bureau of National Affairs Inc	Rockville	MD	Printing Publishing & Allied	200	2,850

* **Note**: Reebie Associates defines outbound tons as an "estimate produced and/or shipped from the location. Reebie Associates derives this estimate from the Primary SIC (commodity) and total employees at the location, using national statistics on output per employee for each SIC category" (from Freight Locator Database User's Manual).

First Cut of Likely Maryland Air Cargo Shippers from Reebie Associates' *Freight Locator* Database (continued)

Company Name	City	State	Primary SIC Description	Employees	Primary SIC Tons*
University Publications-Amer	Bethesda	MD	Printing Publishing & Allied	200	2,850
Comprint Inc	Gaithersburg	MD	Printing Publishing & Allied	200	2,552
PBI Media	Rockville	MD	Printing Publishing & Allied	150	2,413
Congressional Information Svc	Bethesda	MD	Printing Publishing & Allied	250	2,280
John H Harland Co	Edgewood	MD	Printing Publishing & Allied	150	2,233
Victor Graphics Inc	Baltimore	MD	Printing Publishing & Allied	200	2,166
Patuxent Publishing Co	Columbia	MD	Printing Publishing & Allied	130	2,156
Patuxent Publishing Co	Baltimore	MD	Printing Publishing & Allied	100	2,156
S & S Graphics Inc	Laurel	MD	Printing Publishing & Allied	200	2,117
Custom Direct Inc	Joppa	MD	Printing Publishing & Allied	200	2,117
Broadneck Publications	Annapolis	MD	Printing Publishing & Allied	150	2,109
FDC Reports Inc	Chevy Chase	MD	Printing Publishing & Allied	120	2,058
University Press of America	Lanham Seabrook	MD	Printing Publishing & Allied	100	1,938
Old Line Plastics Inc	Forest Hill	MD	Plastics NEC	375	7,380
Poly-Seal Corp	Baltimore	MD	Plastics NEC	450	5,148
Owens Brockway	Baltimore	MD	Plastics NEC	300	5,076
Constar Inc	Havre de Grace	MD	Plastics NEC	200	3,960
Independent Can Co	Belcamp	MD	Plastics NEC	200	2,952
Continental Plastic	Baltimore	MD	Plastics NEC	120	2,376
United States Can Co	Baltimore	MD	Plastics NEC	137	2,304
Signode Corp	Baltimore	MD	Plastics NEC	110	1,872
Tenax	Baltimore	MD	Plastics NEC	61	1,260
Apogee Designs Ltd	Baltimore	MD	Plastics NEC	60	936
William T Burnett & Co	Baltimore	MD	Other Textile	50	680
Superior Coat Pad Co	Baltimore	MD	Other Textile	20	306
FMC Corp	Baltimore	MD	Organic Chem	340	162,987
Life-Like Products Inc	Baltimore	MD	Organic Chem	60	22,420
Tilley Chemical Co	Middle River	MD	Organic Chem	40	16,815
Maryland Chemical Co	Baltimore	MD	Organic Chem	27	13,452
Amato Industries Inc	Silver Spring	MD	Organic Chem	25	10,089
D Myers & Sons Inc	Baltimore	MD	Leather Prod	33	112
North Bay Distributors	Elkridge	MD	Laminated Plastics	53	1,352
American Laser Inc	Hyattsville	MD	Instruments, Optical, Medical, Watches	1,037	10,841
Neighbor Care Pharmacies	Annapolis Jct	MD	Instruments, Optical, Medical, Watches	300	1,270
Space Telescope Science Inst	Baltimore	MD	Instruments, Optical, Medical, Watches	600	1,185
Victor O Schinnerer & Co	Chevy Chase	MD	Instruments, Optical, Medical, Watches	300	950
Neighbor Care Pharmacies	Baltimore	MD	Instruments, Optical, Medical, Watches	215	910

* **Note**: Reebie Associates defines outbound tons as an "estimate produced and/or shipped from the location. Reebie Associates derives this estimate from the Primary SIC (commodity) and total employees at the location, using national statistics on output per employee for each SIC category" (from Freight Locator Database User's Manual).

First Cut of Likely Maryland Air Cargo Shippers from Reebie Associates' *Freight Locator* Database (continued)

Company Name	City	State	Primary SIC Description	Employees	Primary SIC Tons*
NLS Animal Health	Owings Mills	MD	Instruments, Optical, Medical, Watches	180	760
Fusion UV Systems	Gaithersburg	MD	Instruments, Optical, Medical, Watches	175	740
Northrop Grumman Oceanic Div	Annapolis	MD	Instruments, Optical, Medical, Watches	800	696
Emmes Corp	Rockville	MD	Instruments, Optical, Medical, Watches	150	630
Genetic Therapy Inc	Gaithersburg	MD	Instruments, Optical, Medical, Watches	150	630
Allegiance Healthcare	Columbia	MD	Instruments, Optical, Medical, Watches	150	630
American Occupational Therapy	Bethesda	MD	Instruments, Optical, Medical, Watches	110	470
Hekimian Laboratories Inc	Rockville	MD	Instruments, Optical, Medical, Watches	250	456
Owens & Minor Inc	Savage	MD	Instruments, Optical, Medical, Watches	100	450
Neighborcare Pharmacies Inc	Baltimore	MD	Instruments, Optical, Medical, Watches	140	450
Cochran Stephenson Donkervoet	Baltimore	MD	Instruments, Optical, Medical, Watches	100	450
Greatbatch-Hittman Inc	Columbia	MD	Instruments, Optical, Medical, Watches	110	437
SRI/Surgical Express Inc	Elkridge	MD	Instruments, Optical, Medical, Watches	85	380
Environmental Technology Group	Baltimore	MD	Instruments, Optical, Medical, Watches	160	360
Calico Industries Inc	Annapolis Jct	MD	Instruments, Optical, Medical, Watches	80	360
Shimadzu Scientific Instrument	Columbia	MD	Instruments, Optical, Medical, Watches	261	350
Digene Corp	Gaithersburg	MD	Instruments, Optical, Medical, Watches	100	340
Quintiles Inc	Rockville	MD	Instruments, Optical, Medical, Watches	73	330
Nucletron Corp	Columbia	MD	Instruments, Optical, Medical, Watches	85	330
Daou-Sentient Inc	Kensington	MD	Instruments, Optical, Medical, Watches	80	300
Boland Trane Svc	Rockville	MD	Industrial Machinery & Computers	250	3,930
Fidelity Engineering	Sparks Glencoe	MD	Industrial Machinery & Computers	260	3,000
Kop-Flex Inc	Harmans	MD	Industrial Machinery & Computers	400	2,184
AM Tote Intl	Sparks Glencoe	MD	Industrial Machinery & Computers	590	2,100
F & E Check Protector Co	Rockville	MD	Industrial Machinery & Computers	70	1,976
Acterna Corp	Germantown	MD	Industrial Machinery & Computers	1,300	1,957
Ward Machinery Co	Cockysvl Hnt Vly	MD	Industrial Machinery & Computers	500	1,904
Vulcan Hart Corp	Baltimore	MD	Industrial Machinery & Computers	450	1,834
A-1 Paper Co	Rockville	MD	Industrial Machinery & Computers	60	1,664
Alban Engine Power Systems	Elkridge	MD	Industrial Machinery & Computers	100	1,590
Adrian L Merton Inc	Capitol Heights	MD	Industrial Machinery & Computers	83	1,380
Ardmore Enterprises Inc	Mitchellville	MD	Industrial Machinery & Computers	250	1,349
Perkin Elmer Fluid Sciences	Beltsville	MD	Gaskets Packing & Sealing Plastics	412	5,106
Kaydon Ring & Seal Inc	Baltimore	MD	Gaskets Packing & Sealing Plastics	250	3,367
Tipco Technologies Inc	Owings Mills	MD	Gaskets Packing & Sealing Plastics	24	462
Phelps Industrial Products	Elkridge	MD	Gaskets Packing & Sealing Plastics	28	407
Universal Plastics Engineering	Rockville	MD	Gaskets Packing & Sealing Plastics	22	296

* **Note**: Reebie Associates defines outbound tons as an "estimate produced and/or shipped from the location. Reebie Associates derives this estimate from the Primary SIC (commodity) and total employees at the location, using national statistics on output per employee for each SIC category" (from Freight Locator Database User's Manual).

First Cut of Likely Maryland Air Cargo Shippers from Reebie Associates' *Freight Locator* Database (continued)

Company Name	City	State	Primary SIC Description	Employees	Primary SIC Tons*
E Goodwin & Sons Inc	Jessup	MD	Fish or seafood (fresh or frozen)	72	44,550
J J McDonnell & Co	Jessup	MD	Fish or seafood (fresh or frozen)	30	17,820
Reliant Fish Co	Jessup	MD	Fish or seafood (fresh or frozen)	24	14,850
Chang Jiang Seafood Supplier	Baltimore	MD	Fish or seafood (fresh or frozen)	20	12,870
Woodfield Ice House	Galesville	MD	Fish or seafood (fresh or frozen)	20	9,900
Panasonic Co	Glen Burnie	MD	Electronic & Electrical Equipment	99	5,238
Hughes Network Systems	Germantown	MD	Electronic & Electrical Equipment	3,500	4,400
SAIC Ideas Inc	Columbia	MD	Electronic & Electrical Equipment	500	2,924
Signal Perfection Ltd	Columbia	MD	Electronic & Electrical Equipment	100	2,912
Axcelis Technologies Inc	Rockville	MD	Electronic & Electrical Equipment	400	2,394
Powercon Corp	Severn	MD	Electronic & Electrical Equipment	380	2,170
Ingram Entertainment	Savage	MD	Electronic & Electrical Equipment	60	1,470
Maryland Sound & Image Inc	Baltimore	MD	Electronic & Electrical Equipment	54	1,352
Baltimore Sound Engineering	Baltimore	MD	Electronic & Electrical Equipment	44	1,300
Cinemax Media	Rockville	MD	Electronic & Electrical Equipment	51	1,218
Best Battery Co	Baltimore	MD	Electronic & Electrical Equipment	28	1,164
Acrodyne Communications Inc	Cockysvl Hnt Vly	MD	Electronic & Electrical Equipment	54	1,092
Washington Professional Systs	Wheaton	MD	Electronic & Electrical Equipment	48	1,040
Signal Perfection Ltd	Columbia	MD	Electronic & Electrical Equipment	35	1,040
Wabtec Railway Electronics	Germantown	MD	Electronic & Electrical Equipment	450	1,038
Teledyne Energy Systems Inc	Cockysvl Hnt Vly	MD	Electronic & Electrical Equipment	110	969
Locke Insulators Inc	Baltimore	MD	Electronic & Electrical Equipment	150	884
H P Electronics	Halethorpe	MD	Electronic & Electrical Equipment	28	832
Litton Systems Inc	College Park	MD	Electronic & Electrical Equipment	575	700
Lucent Technologies	Landover	MD	Electronic & Electrical Equipment	120	697
Power Protection Unlimited	Baltimore	MD	Electronic & Electrical Equipment	30	612
Curiosity Kits Inc	Cockysvl Hnt Vly	MD	Dolls, Toys, Games	100	2,622
Free State Products Inc	Essex	MD	Dolls, Toys, Games	30	782
Antonelli's Pro Fundraisers	Laurel	MD	Dolls, Toys, Games	20	506
Petting Zoo	Glen Burnie	MD	Dolls, Toys, Games	20	506
Joe Corbi's Wholesale Pizza	Baltimore	MD	Dolls, Toys, Games	20	506
Charles Products Inc	Rockville	MD	Costume Jewelry	28	15
W R Grace & Co	Columbia	MD	Chemicals & Allied	350	80,417
Best Ribbons	Baltimore	MD	Carbon Paper & Inked Ribbons	100	1,357
Johnson Controls Inc	Belcamp	MD	Apparel Manuf.	350	2,380
C R Daniels Inc	Ellicott City	MD	Apparel Manuf.	300	1,152
ITSI	Laurel	MD	Apparel Manuf.	100	1,064

* **Note**: Reebie Associates defines outbound tons as an "estimate produced and/or shipped from the location. Reebie Associates derives this estimate from the Primary SIC (commodity) and total employees at the location, using national statistics on output per employee for each SIC category" (from Freight Locator Database User's Manual).

First Cut of Likely Maryland Air Cargo Shippers from Reebie Associates' *Freight Locator* Database (continued)

Company Name	City	State	Primary SIC Description	Employees	Primary SIC Tons*
Textilease Corp	Beltsville	MD	Apparel Manuf.	50	589
Row Clothing Enterprises	Baltimore	MD	Apparel Manuf.	82	570
Shirt Xplosion	Upper Marlboro	MD	Apparel Manuf.	75	546
Summit Marketing	Silver Spring	MD	Apparel Manuf.	50	462
Maryland Screen Printers	Baltimore	MD	Apparel Manuf.	60	448
F W Haxel & Co	Baltimore	MD	Apparel Manuf.	35	441
Dan-Mar Mfg Co	Owings Mills	MD	Apparel Manuf.	100	390

*** Note**: Reebie Associates defines outbound tons as an "estimate produced and/or shipped from the location. Reebie Associates derives this estimate from the Primary SIC (commodity) and total employees at the location, using national statistics on output per employee for each SIC category" (from Freight Locator Database User's Manual).

Appendix C

Interview Guide/Questionnaire

Appendix C – Interview Guide/Questionnaire

BWI Air Cargo Study Freight Forwarders Interview Guide

[Introduction]

The Maryland Department of Transportation and the Maryland Aviation Administration are looking at air cargo facilities and operations at BWI and considering how the airport can best meet the needs of shippers and freight forwarders in Maryland.

Request 15-minute interview.

[Section A – Air Cargo Information]

1. We would first like to confirm that your company forwards air cargo for its shipping clients. *[If yes…]*

   What percentage your shipments are by air and which airports do you use?

   What percentage of your air cargo shipments are international versus domestic?

   What percentage of your shipments are by truck? By other modes (rail, water, etc.)?

   What are some of the primary origins and destinations of your customer's freight?

   Does your company broker freight shipments or does it engage in shipping directly with its own trucks or airplanes?

2. How critical is air transportation to your operations and has it impacted your decision to locate/expand at this location?

3. What is the total value of your inbound air shipments? And of your outbound air shipments? *[If they do not have a breakdown of inbound versus outbound, then total.]*

4. Are you using all-freight carriers (cargo planes) or commercial airlines (belly cargo)?

5. If you use BWI, what are the reasons for using that airport? *[Categorize response as follows:] [If shipper does not use BWI, skip Questions 5 and 6; go to Section B, Question 7.]*

   __ Cities/Countries served from that airport.
   __ Frequency of service.
   __ Cost of service.
   __ Quality and reliability of service.
   __ Proximity of airport.
   __ Availability of specialized handling facilities at/near airport.
   __ Other *[specify]*.

6. Can you envision any changes in circumstance that would cause you to forward a greater proportion of your cargo through BWI? *[If yes…]* What changes would be necessary? *[Categorize response as follows:]*

   __ Cities/Countries served from that airport.
   __ Frequency of service.
   __ Cost of service.
   __ Quality and reliability of service.
   __ Proximity of airport.
   __ Availability of specialized handling facilities at/near airport.
   __ Other *[specify]*.

[Section B – Non-Users of BWI Only]

7. Can you describe the reasons why you do not use BWI? *[Categorize response as follows:]*

   __ Time-sensitive goods.
   __ Too expensive.
   __ Air service not frequent enough.
   __ Lack of specialized air cargo facilities to handle goods.
   __ Airport too far away/drayage costs too high.
   __ Too complicated (too many transfers).
   __ Other *[specify]*.

8. Can you envision any changes in circumstance that would cause you to use air cargo through BWI instead of your current choice? *[If yes…]* What changes would be necessary? *[Categorize response as follows:]*

   __ Cities/Countries served from that airport.
   __ Frequency of service.
   __ Cost of service.
   __ Quality and reliability of service.
   __ Proximity of airport.
   __ Availability of specialized handling facilities at/near airport.
   __ Other *[specify]*.

[Section C – General Information]

9. Is this the principal location and are there others around the State?
10. How many are employed at this location?
11. What is the average hourly wage or annual salary of these employees?
12. How many of them are directly involved in logistics, shipping, and receiving?
13. What is the annual volume of shipments?

Thank you.

Appendix D

Interview Results from Martin Associates

Appendix D – Interview Results from Martin Associates

Shipper Interviews

Company	Number of Employees	Percent Air Cargo Dependent	Goods/Materials Shipped From this Location	Frequency and Size of the Shipments	Airport(s) Commonly Used	Why is BWI Used/Not Used?	Who Makes Shipping Decisions?	If In House, What are Key Factors in Airport Selection?	Who are the Carriers Used (Belly or Freighter)?	Changes to Make BWI More Feasible Option
AAI (United Industrial) (defense contracts)	900	65%	defense/military equipment	air: 40 packages/day avg 50lbs (FEDEX) air: 1 pallet/day up to 1000lbs	FEDEX- BWI pallets typically through JFK/IAD occasionally through BWI	FEDEX service palletized cargo typically handled by emery more direct flights from IAD and JFK	palletized cargo- emery	time sensitivity, and high value componentry	FEDEX freighter	More direct service especially to Europe (Spain, Italy and Germany) as well as Korea and Japan
Citrix (computer software)	no production in Maryland									
Digene (manufactured medical kits)	250	70%	medical kits (e.g. pap test kits)	daily shipments size varies; envelopes to packages	mostly through IAD, some through JFK	frequency of direct flights	uses IFF- typically kamino transport goes thru Dulles or JFK	n/a		
Entremed (biotech R&D/testing)	50		biotech testing (samples etc…)	daily shipments small shipments; handled by FEDEX	assumes BWI	FEDEX service	in-house	use FEDEX exclusively; destinations served, reliability of service	FEDEX freighter	n/a
EG&G Classics (automotive parts distributor)	200	75%	automotive parts	varies (from small trim pieces to larger parts); daily shipments	unknown; UPS & DHL pick up shipments at EG&G facility		in-house	frequency of service (typically overnight), reliability of service	DHL, UPS freighter	n/a
Fiberplex (fiber optic cables & access.)	30	68.50%	fiber optic cables & accessories	daily shipments/small packages under 50lbs	unknown; UPS dictates		in-house	overnight/2-day/ground service; reliability of service	UPS freighter	n/a
Honeywell Tech Solutions (tech componentry)	150	50%	tech components	daily shipments/small packages	would not disclose		IFF (would not provide contact)	would not disclose		

Source: John Martin and Associates.

Shipper Interviews (continued)

Company	Number of Employees	Percent Air Cargo Dependent	Goods/Materials Shipped From this Location	Frequency and Size of the Shipments	Airport(s) Commonly Used	Why is BWI Used/Not Used?	Who Makes Shipping Decisions?	If In House, What are Key Factors in Airport Selection?	Who are the Carriers Used (Belly or Freighter)?	Changes to Make BWI More Feasible Option
Gilford Pharmaceuticals (treatment supplies)	200	50%	treatment boxes (brain cancer medicine) ($10,000 per box)	quarterly shipments: 1 pallet to UK (air), 1 pallet to TENN. (trucked)	JFK; (also uses FEDEX for other small samples and packages)	Gilford uses IFF	IFF world courier or all state world cargo	extremely time sensitive; packed in dry ice needs to stay at -20 degrees	unknown	
Peak Technologies (computer part distribution)	200	90%	Computer parts	dozens of shipments/day 10-15 lbs (overnight) for larger shipments (e.g. pallets) FEDEX 3-day	BWI	FEDEX service	in-house	time sensitivity is critical, needs next day air they have had an excellent relationship w/ FEDEX	FEDEX freighter	
Paratek Microwave (R&D facility)	no production at this facility at this time, may start a new line of production in the near term, however the mfg site has not been specified.									
Shimadzu Scientific (distribution)	120	80%		avg 100 shipments/day: a few ozs to full pallets approx 80% go UPS or FEDEX (overnight/2-day) 20% go through IFF	FEDEX-BWI, UPS-unknown, pallets-unknown	IFF makes decisions FEDEX & UPS service	IFF: priority worldwide, lyndon air freight	time-sensitivity, reliability of service	FEDEX/UPS freighter	
4GL School Solutions (software support)	no production at this facility; tech support and implementation of software packages for special needs students									
Baltimore Aircoil (cooling systems)	425	50%	mfg cooling systems	dom: 2-3 packages/day less that 40lbs intl: 2-3 packages/week avg 300-500 lbs		UPS service	domestic- UPS next day intl: 75% made by customer, 25% by IFF lyndon airfreight or schenker	frequency of service/ time sensitive Intl shipments a lot to ASIA and LATIN AMER.	UPS freighter	
BD Diagnostics (mfg diagnostic equip)	1800	90%	would not disclose any information except for the fact that they use UPS and FEDEX.					UPS & FEDEX		

Source: John Martin and Associates.

Shipper Interviews (continued)

Company	Number of Employees	Percent Air Cargo Dependent	Goods/Materials Shipped From this Location	Frequency and Size of the Shipments	Airport(s) Commonly Used	Why is BWI Used/Not Used?	Who Makes Shipping Decisions?	If In House, What are Key Factors in Airport Selection?	Who are the Carriers Used (Belly or Freighter)?	Changes to Make BWI More Feasible Option
Marktek Biosciences (medical field mfg/dist)	200	90%	mfg fluorescent dyes for medical field	50-100 shipments/day on average; size arrives from envelopes to skids destined for Europe, Asia, Africa, Canada & Mexico	FEDEX & UPS thru BWI	FEDEX & UPS service	in-house	reliability of service (next day air) cities/destinations served price	FEDEX & UPS freighter	
Neighborcare (medical supplies)	500	no air shipments								
Corvis Corporation (telecommunications)			telecommunications products	would not disclose number of shipments size ranges from single pack to full skid	would not disclose	would not disclose	use FEDEX &UPS for small overnight/2-day use IFF for larger skids; would not provide IFF name or contact	cities served (time sensitivity0and price are two key factors	unknown	more direct service
Novovax R&D/ corp HQ	65	0% no shipments from MD; this is R&D and corp HQ								
Micros Systems (mfg electronic devices)	285	70%	Electronic cash registers	air:50/day; 10lbs to 300lbs; worldwide destinations UPS ground domestic 10-20 per day	60% FEDEX next day-BWI 40% IFF (danzas) gets consolidated at JFK	IFF: lack of lift capacity; danzas operates a line haul to JFK, which is a danzas consolidation point	in-house - FEDEX IFF- danzas		FEDEX freighter intl IFF unknown	need of more non-stop, direct flights to more destinations
Raytheon Corp (R&D)	260	moved mfg. operations to FL	10-20 FEDEX & UPS envelopes/day Only ships next day envelopes etc…	BWI overnight or 2-day 2 times a year 1 skid goes out FEDEX heavyweight	FEDEX service	in-house	cities served; availability of next day	freighter or 2-day air service	n/a	
Genco Distribution (cosmetics)	200	0% no air shipments, all trucked domestic								
Gene Logic (Metrgenics) (bioscience)	65	70%	bioscience materials	air: 2 shipments/day all UPS envelopes, padded envelopes, small packages	assumes BWI	UPS service	in-house	overnight services to domestic and int'l destinations, high value cargo		not enough volume to think about; UPS handles their volume sufficiently

Source: John Martin and Associates.

Shipper Interviews (continued)

Company	Number of Employees	Percent Air Cargo Dependent	Goods/Materials Shipped From this Location	Frequency and Size of the Shipments	Airport(s) Commonly Used	Why is BWI Used/Not Used?	Who Makes Shipping Decisions?	If In House, What are Key Factors in Airport Selection?	Who are the Carriers Used (Belly or Freighter)?	Changes to Make BWI More Feasible Option
Nestle Ice Cream (food MFG)		no air shipments; all domestic								
Ohmeda Medical (medical device mfg)	250	25%	Infant care devices (e.g. warmers, incubators, etc...)	50-60 domestic air shipments/day 15-20 int'l air shipments/day small components to 80" tall machinery	JFK & IAD 95%+ only 2-3% actually goes through BWI	lack of direct flights specifically EUROPE	IFF: BDP, Eagle or danzas	key factors: frequency of direct flights to destinations, cost, and reliability of service (high value - high- end equip valued at $35k-40k per piece)		more direct flights to EUROPE

Source: John Martin and Associates.

Forwarder Interviews

Company	Number of Employees	Percent BWI	Percent Dulles	Percent JFK	Top Commodities Shipped	Key Factors in Airport Selection	Why is BWI Used/Not Used?	Why IAD or JFK used?	Additional Comments
Mid-Atlantic Trade Services	4	5%	45%	50%	perishables and bioscience materials	availability of service is the key factor in decision, price is second;	lack of direct flights limits destinations		
Danzas Aei	20	10%	35%	55%	majority machinery, parts & telecommunications lesser extent are perishables	availability of direct flights and price are complementary factors in decision making	not enough direct flights (esp. EUROPE), other factors such as Iceland air's 250 kilo limit also limits choices	IAD offers more service into EUROPE (e.g. PARIS), UNITED's 767 can accommodate a 64" pallet. JFK is consolidation point/gateway for danzas ops they run line hauls from Balt/DC area which costs an additional 15cents per kilo. Also JFK has adequate handling facilities for dangerous goods	
Dartans	14.5	5-10%	90%		computer parts, lithium batteries, hazmat materials & rubber products	1- Price; 2- quality/reliability of service (quality of carrier can override price in some cases)	BWI facilities are adequate for their needs; service to certain destinations is adequate(e.g. British Airways to EUROPE)	IAD offers more direct flights with carriers that offer quality services (e.g. KLM/Delta, Japanair, Singapore Air)	TSA unknown shipper rule limits ability to attract new clients through Leeds
CJ International	3	25% (also use ATL and PHL 25%)	25%	25%		1- direct services drives IFF market 2- price/rates 3- frequency/timing	lack of direct service; if a good rate is found to a specific destination (e.g. continental out of NY), they'll take it; shipments that are very time-sensitive in nature may get shipped thru other airports due to the frequency of service (Lufthansa out of IAD, for example)	lack of direct service; if a good rate is found to a specific destination (e.g. continental out of NY), they'll take it; shipments that are very time-sensitive in nature may get shipped thru other airports due to the frequency of service (Lufthansa out of IAD, for example)	TSA unknown shipper states unknown cargo must be on freighters, not bellies of passenger aircraft
LTSI	10	10%			computers, parts & telecommunications (no perishables)	price and availability of service are complementary factors in decision making some shippers may require specific carriers	with most of the cargo generating from the greater BALT area, it is cheaper to use BWI from a line haul cost standpoint	IAD & JFK offer more direct flights to selected cities due to the wide range of carriers available	

Source: John Martin and Associates.

Forwarder Interviews (continued)

Company	Number of Employees	Percent BWI	Percent Dulles	Percent JFK	Top Commodities Shipped	Key Factors in Airport Selection	Why is BWI Used/Not Used?	Why IAD or JFK used?	Additional Comments
LAING International	1	15% of total business			majority of cargo is ocean freight; 15% of total cargo handled comes in by air through BWI decisions are made by foreign shipper				
BWI Corporation	22	12.50%	42.50%	42.50%	would not disclose information except for the fact that IAD & JFK are used due to the fact that BWI "has no lift capacity"		lack of lift capacity		
Wilson Logistics	4	25%	5%	70%	printed matter; software & hardware tech components	1-service/direct flights, especially to EUROPE 2- price/rates	use BWI whenever possible to support local economy	minimal cost to line haul freight to JFK; would not provide figure, however it is based on weight	
Samuel Shapiro	2	25% also 25% PHL	25%	25%	mostly perishables (fish, vegetables), pharmaceuticals	1/2- availability of direct service/reliability 3 - price	mostly imports on Iceland air & British Airways flights	majority of cargo moves thru IAD & JFK due to selection of carriers; PHL is used typically by US AIRWAYS hub (cargo is line hauled to BALT area)	perishables that move on British Airways need to be trucked away immediately due to the fact that they have no reefer whse space; Iceland air reefer facility is adequate for their fish imports
Olimpex	6	85%			would not disclose any further information				
Kuehne & Nagel					BALT office handles all ocean cargo; IAD office handles air freight and the vast majority moves thru IAD				
WA Smith	7	30%			would not disclose any further information				
Air Net Systems	1				no BWI office; still confirming				
IGL Int'l					waiting for response				

Source: John Martin and Associates.

Appendix E

Glossary of Terms

Appendix E – Glossary of Terms

The following Glossary of Terms has been developed by BWI.

Air Cargo: Any property (freight, mail, express) carried or to be carried in an aircraft. Does not include passenger baggage.

Air Freight: A service provided for the transport of goods in any volume.

Air Waybill: The air cargo shipping document used by a carrier or its authorized cargo agents. It combines several purposes: documentary evidence of the conclusion of the contract of carriage; proof of receipt of the goods for shipment; freight bill; certificate of insurance (if carrier's insurance is requested by the shipper); customs declaration; guide to the carrier's staff in handling, dispatching and delivery of the consignment by air freight. Air waybills are not negotiable.

All Cargo Aircraft: An aircraft for the carriage of cargo only, rather than the combination of passengers and cargo. The all-cargo aircraft will carry traffic in bulk or container in the main deck as well as in the lower deck of the aircraft. It may include scheduled and non-scheduled service.

A.T.A. Carnet (Admission Temporaire-Temporary Admission): A customs document permitting the holder to carry or send merchandise temporarily into certain foreign countries (for display, demonstration, or similar purposes) without payment of Customs duties and posting of Customs bonds.

Belly pits or holds: Compartments located beneath the cabin of an aircraft and used for carriage of cargo, mail and passenger baggage.

Bonded Terminal: An airline terminal approved by the U.S. Customs Service for storage of goods until Customs duties are paid or the goods are otherwise released.

Cargo Agent: An agent appointed by an airline to solicit and process international air freight for shipments.

Certificate of Origin: A document in which the exporter certifies the place of origin (manufacture) of the merchandise being exported. Required by some countries for tariff purposes certifying the country of origin of specified goods.

Chargeable Weight: The weight of the shipment used in determining air freight charges. The chargeable weight may be the actual weight or the dimensional weight, whichever is greater, or on container shipments the gross weight of the shipment less the tare weight of the container.

Charter Service: The temporary hiring of an aircraft, usually on a trip basis, for the movement of cargo or passengers.

CIP (Carriage and Insurance Paid To…): INCO Term used to define the terms of sale between the buyer and seller of goods internationally. The seller has the same obligations as under CPT but with the addition that the seller has to procure cargo insurance against the buyer's risks of loss of or damage to the goods during carriage. The seller contracts for insurance and pays for the insurance premium. The buyer should note that under the CIP term the seller is only required to obtain insurance on minimum coverage. The CIP term requires the seller to clear the goods for export. This term may be used for any mode of transport.

Combi Aircraft: Aircraft specifically designed to carry unitized cargo loads on the upper deck of the aircraft forward of the passenger compartment.

Combination Aircraft: An aircraft capable of transporting both passengers and cargo on the same flight. Some cargo is carried on virtually all scheduled passenger flights in the belly pits below the passenger cabin.

Commercial Invoice: The actual bill of sale for the goods. Not only is it the instrument on which the buyer pays the seller for the goods, it is also used by the customs authorities in the importing country to determine proper classification of the goods being shipped for assessment of duties and taxes, and eligibility for entry into the commerce of that country.

Consignee: A person named as the receiver of a shipment – one to whom a shipment is consigned.

Consignor: One who designates the person to whom goods are to be sent. The consignor is usually the shipper.

Containerization: The practice or technique of using a boxlike device in which a number of packages are stored, protected and handled as a single unit in transit.

Country of Origin: The country of manufacture, production or growth of any article of foreign origin. For goods entering the U.S., further work or material added to an article in another country must effect a substantial transformation in order to render such other country the "country of origin."

CPT (Carriage Paid To…named place of destination): INCO term used to define the terms of sale between the buyer and seller of goods internationally. The seller pays the freight for the carriage of the goods to the named destination. The risk of loss of or damage to the goods, as well as any additional costs due to events occurring after the time the goods have been delivered to the carrier, is transferred from the seller to the buyer when the goods have been delivered into the custody of the carrier. The CPT term requires the seller to clear the goods for export. This term may be used for any mode of transport including multimodal transport.

Customs: A government authority designated to regulate the flow of goods to/from a country and to collect duties levied by a country on imports and exports.

Customs Broker: A person who is licensed by the U.S. Customs Service to transact Customs business on behalf of importers.

Customs Business: Those activities involving transactions with Customs concerning the entry and admissibility of merchandise, its classification, valuation, the payments of duties, taxes or other charges assessed or collected by Customs upon merchandise by reason of its importation, or the refund, rebate or drawback thereof.

Dangerous Goods: Articles or substances which are capable of posting a significant risk to health, safety or property when transported by air and which are classified according to the most current editions of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air and the IATA Dangerous Goods Regulations.

DDP (Delivered Duty Paid…named place of destination): INCO term used to define the terms of sale between the buyer and seller. The seller fulfills his obligation to deliver when the goods have been made available to the named place in the country of importation. The seller has to bear the risks and costs, including duties, taxes and other charges of delivering the goods thereto, cleared for importation. Whilst the EXW term represents the minimum obligation for the seller, DDP represents the maximum obligation. This term should not be used if the seller is unable directly or indirectly to obtain the import license. If the parties wish the buyer to clear the goods for importation and to pay the duty, the term DDU should be used. If the parties wish to exclude from the seller's obligations some of the costs payable upon importation of the goods (such as value added tax VAT), this should be made clear by adding words to this effect: Delivered Duty Paid, VAT UnPaid (…named place of destination). This term may be used irrespective of the mode of transport.

DDU (Delivered Duty Unpaid…named place of destination): INCO term used to define the terms of sale between the buyer and the seller of goods internationally. The seller fulfills his obligation to deliver when the goods have been made available to the named place in the country of importation. The seller has to bear the costs and risks involved in bringing the goods therefore (excluding duties, taxes and other official charges payable upon importation) as well as the costs and risks of carrying out customs formalities. The buyer has to pay any additional costs and to bear any risks caused by his failure to clear the goods for import in time. If the parties wish the seller to carry out customs formalities and bear the costs and risks resulting therefrom, this has to be made clear by adding words to this effect. If the parties wish to include in the seller's obligations some of the costs payable upon importation of the goods (such as value added tax VAT), this should be made clear by adding words to this effect: Delivered Duty Unpaid, VAT Paid (…named port of destination). This term can be used irrespective of the mode of transport.

Dimensional Weight: Dimensional weight refers to density, i.e., weight per cubic foot.

Drawback: A refund or remission, in whole or in part, of a customs duty, internal revenue tax, or fee lawfully assessed or collected which is provided at the time of re-exportation.

Duty: A tax imposed on imports by the Customs authority of a country. Duties are generally based on the value of the goods (ad valorem duties). Some other factor such as weight or quantity (specific duties) or a combination of value and other factors (compound duties).

Express consignment operator or carrier: An entity operating in any mode or intermodally moving cargo by special express commercial service under closely integrated administrative control. Its services are offered to the public under advertised, reliable timely delivery on a door-to-door basis.

EXW (EX WORKS…named place): INCO term used to define the terms of sale between the buyer and seller of goods internationally. The seller fulfills his obligation to deliver when he has made the goods available at his premises (i.e., works, factory, warehouse, etc.) to the buyer. In particular, he is not responsible for loading the goods on the vehicle provided by the buyer or for clearing the goods for export, unless otherwise agreed. The buyer bears all costs and risks involved in taking the goods from the seller's premises to the desired destination. This term thus represents the minimum obligation for the seller. This term should not be used when the buyer cannot carry out directly or indirectly the export formalities. In such circumstances, the FCA term should be used.

FCA (Free Carrier…named place): INCO term used to define the terms of sale between the buyer and seller of goods internationally. The seller fulfills his obligation to deliver when he has handed over the goods, cleared for export, into the charge of the carrier named by the buyer at the named place or point. If no precise point is indicated by the buyer, the seller may choose within the place or range stipulated where the carrier shall take the goods into his charge. When, according to commercial practice, the seller's assistance is required in making the contract with the carrier, the seller may act at the buyer's risk and expense. This term may be used for any mode of transport, including multimodal transport.

Foreign Trade Zones (FTZ): Facilities for conducting international trade activities whereby the usual customs duties and taxes are not required on foreign merchandise unless and until it enters the Customs territory for domestic consumption, in which case the importer ordinarily has a choice of paying duties either on the original foreign material or the finished product.

Freight Forwarder: A person engaged in the business of dispatching shipments on behalf of other persons for a consideration in foreign commerce between the U.S., its territories or possessions, and foreign countries, and of handling the formalities incident to such shipments.

Gross Weight: Entire weight of a shipment including containers and packaging material.

Harmonized Tariff Schedule of the United States: A multipurpose international goods classification system designed for use by manufacturers, transporters, exporters, Customs statisticians and others in classifying goods moving in international trade.

Importer: The person primarily liable for the payment of any duties on the merchandise, or an authorized agent acting on his behalf. The importer may be the consignee, the importer of record or the actual owner of the merchandise.

JIT (Just in Time): The principle of production and inventory control that prescribes precise controls for the movement of raw materials, component parts, and work-in progress. Goods arrive when needed (just in time) for production use rather than becoming expensive inventory that occupies costly warehouse space.

Letter of Credit (L/C): A document issued by a bank per instructions by a buyer of goods authorizing the seller to draw a specified sum of money under specified terms, usually the receipt by the bank of certain shipping documents, within a given time.

Proforma Invoice: An abbreviated invoice, usually sent in advance of a shipment, for the purposes of quotation, opening a letter of credit, obtaining an import license, or shipping samples. Whenever using the proforma invoice, it is usually subject to correction upon receipt of the actual invoice.

Shippers Export Declaration (SED): Used for compiling the official U.S. export statistics and administering the requirements of the U.S. Export Administration Act and is required for virtually all shipments, including hand-carried merchandise.

Subzone: A special-purpose zone established as part of a zone project for a limited purpose, that cannot be accommodated within an existing foreign trade zone.

Tare Weight: The weight of the container before loading of goods being shipped; the actual weight of the container when empty.

U.L.D. (Unit Load Device): Term commonly used when referring to containers and pallets.

Valuation Charges: Transportation charges assessed shippers who declare a value of goods higher than the value of the carriers' limits of liability.

Weight Break: Levels at which the air freight rate per 100 pounds decreases because of substantial increases in the weight of the shipments.