WASHINGTON-BALTIMORE REGIONAL

AIRPORT SYSTEM PLAN

VOLUME III - AIR CARGO

1997

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

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The preparation of this report was financially aided through a grant from the Federal Aviation Administration of the Department of Transportation, under the Planning Grant Program authorized by provisions of Section 13 of the Airport and Airway Improvement Act of 1981.

EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

The rapid expansion of worldwide air cargo traffic reflects the growing importance of expedited transportation to both manufacturing systems and consumer markets, which are increasingly dispersed globally. Total worldwide air cargo traffic more than tripled between 1980 and 1995, growing by 6.8 percent annually. This expansion has been relatively steady, with growth between 1980 and 1985 averaging 8.1 percent per year, 9.6 percent per year from 1985 to 1990, and 7.5 percent per year from 1990 to 1995.

Total U.S. air freight activity is estimated to grow from 38.2 billion pounds in 1996 to 89.6 billion pounds by 2010, an average annual growth of 5.9 percent. Domestic air freight traffic is estimated to grow from 27.4 billion pounds in 1996 to 59.2 billion pounds by 2010 (5.3 percent annual growth), while overseas air freight traffic is projected to grow 7.1 percent per year and U.S.-Canada air freight traffic by 8.6 percent per year to a combined international total of 30.4 billion pounds.

In 1996, Washington Dulles International Airport reported a total of 680.2 million pounds of air freight and mail, a 5.7 percent increase in total air cargo traffic from the previous year. Between 1991 and 1996, Dulles averaged a 13.9 percent annual growth rate. Total cargo traffic is relatively balanced with enplanements equal to 50.8 percent of total weight, although air mail traffic is primarily an outbound market (62.8 percent of the total) and domestic air freight is primarily an inbound market (53.6 percent of the total).

In 1996, Baltimore/Washington International Airport reported a total of 371 million pounds of air freight and mail, a 14 percent increase over cargo traffic from the previous year. Between 1991 and 1996, air cargo traffic at BWI grew by an average of 2.6 percent per year, comprising an overall decline in international air freight traffic and a moderate growth in domestic air freight and total air mail. Overall cargo traffic is relatively balanced with enplaned volumes accounting for 51 percent of total traffic. Enplaned traffic accounts for 62 percent of total air mail volume, with domestic air freight slightly balanced toward inbound traffic (53 percent of total).

Combined, Dulles and BWI accounted for over 1 billion pounds of air cargo in 1996, including 830 million pounds of air freight and 217 million pounds of air mail. Overall, air cargo for the two airports averaged 9.0 percent annual growth from 1991 to 1996 with slightly lower growth in the last year (8.5 percent). Domestic air freight accounted for 75 percent of total air freight, but international volumes grew faster, at a rate of 15.0 percent per year from 1991 to 1996. Air mail traffic increased at a lower rate over the same period, 6.1 percent per year.

In 1988, COG published Volume I of the RASP, the Commercial Airports Element. This document was an update of an earlier proposed plan for an air transportation system plan for the region, and acts as a guide for development at the three major commercial airports in the region. Volume II of the Regional Airport System Plan, the Ground Access Element published in 1994, was developed to address ground access for airport passengers at Washington National and

Washington Dulles International Airports, and incorporates airport system planning into the overall regional transportation planning process. This effort approached the ground access issue from a regional level, examining the total transportation system in the metropolitan area, and considered all major modes of access to the two airports.

In adopting the 1988 RASP, the National Capital Region Transportation Planning Board (TPB) recommended that future system planning efforts include an assessment of airport cargo needs in the region. During the review of the ground access component, numerous comments were received that the RASP does not yet adequately address goods movement with respect to air cargo.

In light of the overall growth in the amount of total air freight activity, both nationwide and within the region, and the various calls for study in this area, Volume III, the Air Cargo Element of the *Washington-Baltimore Regional Airport System Plan* has been developed.

STUDY APPROACH

The intent of the study was to examine the existing and future demand for air cargo at Baltimore/Washington International and Washington Dulles International Airports, and analyze how the movement of this cargo affects the regional ground transportation network. Focusing on the goods movement portion of airport access, the study was to examine the estimated potential demand for air cargo facilities, and compare this demand with current and planned facilities, to determine what air cargo facilities are needed in this region to meet future demand.

This work was coordinated with facility master planning efforts and air cargo facility inventories conducted at Dulles Airport and BWI Airport, as well as intermodal management system planning and congestion management system planning efforts underway in the region.

REGIONAL AIR CARGO DEMAND

Regional air cargo demand consists of air freight and air mail shipments which originate or terminate in a region, regardless of the location of the airport utilized. Regional air cargo demand flows include shipments to and from regional businesses, households and transportation/distribution companies. The key attributes of regional air cargo demand include:

- origin/destination (including intra-regional)
- type of commodity
- shipment size and pattern
- service requirements
- traffic volume (weight, value or cubic volume).

Air cargo markets combine a wide variety of commodity types, shipper/consignee locations and distribution practices, resulting in a highly diverse and dynamic market. Routing decisions often involve trade-offs between cost, transit time and service levels, with flow patterns varying significantly between domestic and international markets.

The types of commodities that comprise air freight are usually time-sensitive (medical materials, newspapers) or perishable (fresh flowers, fish and fruit) or have a high value-to-weight ratio (electronic components, apparel).

The nature of these commodities, as well as the concept of "just-in-time" delivery, generally precludes shipment by other means (such as rail or long-haul truck). The Air Cargo Element was therefore, limited to an examination of Dulles and BWI Airports. While the Virginia Inland Port plays an important role in overall goods movement in the region, it serves as an intermodal terminal facility providing a link between truck and rail for transfer of ocean-going containers, and does not handle the types of commodities shipped by air. The Virginia Inland Port, therefore, was not considered as part of this study.

For this analysis, regional air cargo demand consists of air freight and air mail which originates or terminates in the market region of Dulles and BWI Airports. The overall market region is defined as an eight-state region consisting of North Carolina, Virginia, West Virginia, the District of Columbia, Maryland, Delaware, Pennsylvania and New Jersey. This region is within 250 miles of one of these airports, or within 500 miles of the airports and not closer to a major cargo airport (such as New York-Kennedy, Atlanta International or Chicago-O'Hare). This definition is based on analysis of cargo flow patterns, trucking services, and the marketing systems for the air carriers at those airports.

Regional flow patterns of air cargo are closely related to the location, concentration and shipment characteristics of regional businesses and households. The Washington-Baltimore metropolitan region is a major population, employment and consumer center for both the East Coast and entire United States. The Washington/Baltimore Consolidated Metropolitan Statistical Area (CMSA) was the fourth largest metropolitan area in 1994 population and third in 1993 per capita buying income. The area, and its airports, is centrally located on the Atlantic seaboard with access to a large share of U.S. population and employment activity.

One of the important tasks in this study, for which a consultant was responsible, was an air cargo demand analysis. This included an analysis of the current demand for air cargo in the Washington-Baltimore market region, plus estimates of the potential air cargo demand in the future. To be consistent throughout this project, estimates for the years 1997, 2010 and 2020 were developed. The consultant completed the demand analysis using a four step methodology. The baseline (1996) state-level international and domestic air freight traffic for the eight-state region was estimated from their proprietary State Air Freight Data Base. Air freight traffic for the year 2010 was then forecast, based on historical patterns of trade growth by world region and commodity group, along with estimates of domestic growth developed by the Boeing Company. State-level freight traffic was then allocated to county-based origin/destination groups, based on demographic and economic factors. And, lastly, forecast air freight volumes for 1997 and 2020 were developed, based on 1996 to 2010 growth rates.

Total air freight traffic for the eight-state region in 1996 was estimated at 4.4 billion pounds. By the year 2010, total air freight traffic is forecast to grow to 10.5 billion pounds. This is an annual average growth rate of 6.4 percent.

Future air mail traffic patterns will depend on growth in the use of expedited USPS products, the future patterns of available belly capacity, and the extent to which "air"

mail is transferred to a surface distribution system. The Boeing Company projects that worldwide air mail traffic will average 3.4 percent annual growth from 1995 through 2010. Combined air mail traffic via Dulles and BWI averaged 6.1 percent annual growth from 1991 to 1996, but only 4.6 percent in the last year due to the shifting of certain BWI Priority mail markets to truck delivery. It is assumed that the Boeing growth rates represent a reasonable future growth pattern for air mail in the Washington-Baltimore region. The resulting projected market air mail traffic is 224.1 million pounds in 1997, 346.2 million pounds in 2010, and 483.6 million pounds in 2020.

Total air cargo demand is projected to grow from 4.6 billion pounds in 1996 to more than 20.1 billion pounds in 2020. Total air freight demand is expected to grow from 4.4 billion pounds to 19.7 billion pounds. During this period, air mail should grow from a total of 217 million pounds to more than 483 million pounds.

REGIONAL AIR CARGO FACILITIES

In the past, air cargo facilities were designed and located according to the predominant type of operation: belly freight on passenger aircraft. Cargo areas were placed near passenger terminals, often surrounded by passenger support and other users, without any significant expansion potential. Airport planners did not anticipate the high growth in air cargo traffic or the increasing importance of all-cargo carriers. Additionally, airport planners worked on planning assumptions which involved minimum dwell times for all-cargo aircraft on the ground. As a result, plans for dedicated air cargo aircraft parking aprons were based on aircraft constantly cycling through the ramp area.

Much has changed. As air cargo traffic has continued to grow faster than passenger and other uses, cargo areas have filled up. New cargo areas have been added incrementally, based on available land, often without adequate access, space, or coordination with other cargo areas. This situation has resulted in scattered arrangements of cargo buildings for many airports, a situation which constrains efficiency and results in conflicts with other users. At the same time, due mainly to the rise and dominance of the integrated air carriers, who collectively carry an estimated 60 percent of all air cargo traffic in the United States, aircraft spend most of the day sitting on the ground rather than in the air. As a result of these and other changes, many airports are now looking to develop new consolidated cargo areas which are better oriented to the needs of all-cargo operators.

Off-airport facilities complement and supplement on-airport facilities with additional space for warehousing, shipment processing and intermodal transfer. Most airports, particularly the major cargo airports, have a limited amount of on-airport cargo space, mostly occupied by air carriers, for processing shipments to and from aircraft. In many cases, the majority of forwarders and brokers are located off-airport.

The vast majority of air cargo requires some ground transfer, making access between air cargo facilities and shippers/consignees a key aspect of system efficiency. Ground access for cargo airports typically include on-airport roads, airport entrances and gates, local access roads and highway systems.

The second task for which the consultant was responsible was a review of all current air cargo facilities at Dulles and BWI Airports. The analysis also included an examination of current and planned facilities, as well as an estimate of the capacity of the facilities, plus an examination of the air mail centers at both airports.

This report contains an exhaustive examination of existing on-airport facilities, on-airport air cargo facility development plans, off-airport cargo facilities, and air mail facilities. In addition, the current operating efficiency of freight facilities is discussed, and a facility capacity estimate is made. A description and analysis of the road system in and around each airport is also provided.

REGIONAL AIR CARGO NEEDS

Air cargo traffic includes air freight and air mail shipments that utilize air transportation for some portion of the domestic or international trip. Air mail traffic consists of U.S. Postal Service shipments of envelopes and small packages, plus express traffic, such as envelopes, documents and small packages shipped for time-definite delivery, domestically, by the integrated air carriers. Freight traffic includes larger packages and shipment sizes, as well as smaller shipments moving in international markets.

Air cargo traffic uses a number of types of transportation and distribution services to satisfy regional air cargo demand. These services include:

- air carrier flights between airports;
- cargo handling to and from aircraft and ground carriers at airports;
- cargo storage at airports, off-airport warehouses or origin/destination locations;
- cargo documentation, packaging and inspection; and,
- ground transportation by truck, van or passenger vehicle to the final destination.

Most air cargo shipments combine elements of all these services, either through a single provider, an integrated carrier, or through a multi-party process. The combined cost and time efficiency of air cargo services help determine routing and flow patterns.

The pattern of regional air cargo flows represents the relationship between cargo demand and available services by airports, carriers and other cargo companies. The structure of the domestic air freight market is defined by the wide availability of freight capacity on passenger and integrated carriers which serve small-to-large markets with direct air services. International shipments are more likely than domestic freight traffic to travel long distances to connect to direct flights at major gateway airports. The pattern of international routings reflects relative level of services, the location of competitive airports, and the efficiency of ground access.
Airport truck traffic includes trucks, vans and personal vehicles picking up and delivering air cargo at airport cargo terminals and passenger terminal counters. The volume of truck traffic depends on cargo type, origin/destination, vehicle operating patterns, vehicle type and shipment consolidation.

Commercial truck and other vehicle traffic was projected for both airports based on forecast growth in airport

cargo throughput and estimated patterns of ground transportation flows. The forecasts were developed separately for air mail traffic and freight traffic.

Total air cargo vehicle traffic for BWI is estimated at 336 round-trips for an average weekday in 1996 and 1,249 round-trips in 2020. Annual vehicle traffic growth is 5.6 percent per year from 1996 to 2020. Total air cargo vehicle traffic for Dulles is projected at 578 round-trips in 1996 and 2,495 round-trips in 2020. Annual growth of 6.3 percent per year is projected. Straight trucks and vans are projected to account for approximately three-quarters of the forecast traffic for both airports.

Air cargo capacity at BWI is projected to be able to handle air cargo traffic growth through the year 2017 with an additional 194 million pounds of capacity required by 2020. Facility utilization will drop from 92.3 percent in the base year to 61.9 percent in 2000 as new capacity becomes available. Utilization will be maintained below 75 percent through 2010, then climb to reach full utilization in 2017.

Planned expansion to Dulles' air cargo capacity is not currently scheduled as precisely as that at BWI, with new facilities projected to become available as demand warrants. Capacity is estimated to grow from a current level of 808.8 million pounds to over 1.5 billion pounds. The current utilization is projected at 80 percent with capacity constraints possible by the year 2005 when utilization exceeds 90 percent. Air cargo traffic is projected to reach maximum capacity for the current cargo area in 2011.

Combining the capacity and cargo traffic estimates for both airports, existing planned facility development should be adequate until after 2005 based on current development plans and after 2010 with accelerated development. Based on total cargo traffic estimates, an additional 1.2 billion pounds of capacity would be required by 2020. The horizons for the expected shortfalls at both BWI (the year 2017) and Dulles (the year 2011) provide sufficient time for the planning, design and construction of additional facilities to meet anticipated growth.

REGIONAL NETWORK ANALYSIS

As part of the needs assessment task, the consultant determined that air cargo-related traffic accounts for a relatively minor share of total traffic to and from the airports, and an even smaller share of total highway use. The projected growth in truck traffic to and from the facilities at BWI and Dulles Airports, therefore, should not greatly affect overall use of the regional highway system.

It was consequently decided that the original thinking on the network analysis task should be reversed. Instead of determining the impact of air cargo traffic on the regional transportation system, it was decided that the network analysis should concentrate on examining the effect that current and future vehicle traffic and congestion will have on truck traffic to and from the air cargo facilities.

Building upon the network analysis done for the Ground Access Element of the Regional Airport System Plan, the air cargo network analysis examined the year 1997 as the base case, and modeled scenarios for the years 2010 and 2020. The Aviation Technical Subcommittee decided that the baseline network scenarios for 1997,

2010 and 2020 would reflect the approved Constrained Long Range Plan (CLRP) for the region. In addition, one scenario for the year 2020 would be modeled, which would include highway improvements, over and above the CLRP, in the Western Transportation Corridor in Northern Virginia. It should be noted that, for this additional scenario, the modeling assumptions used were from Alternative 3.3 Upgrade/Link Existing and/or Planned Roadways, in the Virginia Department of Transportation's Major Investment Study for the Western Transportation Corridor. This alternative seeks to meet the north-south travel needs of the study area by adding roadway linkages to roadway improvements already on the CLRP. All of the linkages in this alternative have been included in the counties' transportation plans. The scenario did *not* analyze a complete parkway-type facility in this corridor.

Regional average weekday traffic on select links of the highway networks in the vicinity of each airport were analyzed. For Dulles Airport, the most important observation to be made is that the average weekday traffic on each of these links will increase significantly between 1997 and 2010, and between 2010 and 2020. The overall increases from 1997 to 2020 range from approximately 40 percent on the sections of the Capital Beltway at the Dulles Airport Access Highway, to 70 percent on the Access Highway around VA Route 28, to more than 100 percent on VA Route 7 at Route 28 (a 150 percent increase on the eastern link and a 250 percent increase on the western link). These increases in average weekday traffic will undoubtedly have an adverse impact on air cargo traffic going to and from Dulles Airport.

Based on the network analysis, in the year 2010, almost all of the links in the Dulles area will be operating at level-of-service E or F, representing the worst operating conditions on the highway network. By the year 2020, the volume to capacity ratio for each of these links will increase significantly, and the remaining links will join the list. The severe congestion represented by the levels-of-service on nearly all of the roadway links analyzed in the Dulles Airport vicinity will have a detrimental impact on future air cargo traffic.

While the overall congestion forecast on the regional transportation network in the years 2010 and 2020 could have a significant impact on air cargo traffic, the results obtained from modeling the final network scenario, using the limited highway improvements contained in the VDOT MIS Alternative 3.3 modeling assumptions, are far less conclusive. The average weekday traffic on the links for the year 2020 with these highway improvements in the Western Transportation Corridor do indicate some movement. Most of the changes in AWDT represent less than one percent of the baseline 2020 figures, and can be considered "noise" in the modeling process.

For BWI Airport, which is physically located outside of the area for which COG currently does modeling, the links selected for analysis were those that carry much of the regional traffic to the airport. The important observation from the network analysis is that average weekday traffic on each of these links will increase significantly between 1997 and 2010, and, with two exceptions, again between 2010 and 2020.

While the overall increases from 1997 to 2020 are not as dramatic as those seen on the highway links in the

Dulles Airport vicinity, the range on the regional highway links that will carry traffic to BWI Airport is from 14 percent on the Capital Beltway east of I-95 to 64 percent on US 29 south of the Montgomery County/Howard County line.

The majority of these links will experience an increase in average weekday traffic of more than 25 percent. These increases in average weekday traffic will most likely affect regional air cargo traffic going to and from BWI Airport.

An examination of level-of-service, based on the network analysis, indicates that the majority of the links will operate at LOS E or LOS F in the year 2010. By the year 2020, the volume to capacity ratio for each of the above links will increase, and another link will be added to the list. The severe congestion represented by the levels-of-service on the roadway links that carry regional traffic to BWI Airport will have a negative effect on future air cargo traffic.

RECOMMENDATIONS

The purpose of Volume III of the Washington-Baltimore Regional Airport System Plan is to provide a comprehensive study of the demand for air cargo in the region, along with an examination of the current and planned facilities at Baltimore/Washington International and Washington Dulles International Airports. Air cargo traffic is growing, and will continue to grow in the future. Most forecasts predict a tripling of demand worldwide by the year 2015. This growth is placing increased pressure on cargo facilities and access systems at airports throughout the world.

The current level of air cargo-related vehicle traffic is insignificant when compared with total airport vehicle traffic and traffic levels on major local and regional routes. The projected increase in vehicle traffic levels should not have a significant impact on either regional congestion or expansion requirements. On the other hand, the projected increase in congestion on major access corridors in the metropolitan region could have a detrimental impact on the competitiveness of cargo services at both airports due to increased access costs and diminished service levels relative to other airports.

Throughout the interviews, analyses, and forecasting exercises that were conducted while this study was underway, issues that have arisen seem to be aggregated into two separate categories: those that are related to air cargo terminals, parking areas, access roads and other facilities that are physically located on the airports or in their immediate vicinity; and, issues related to facilities that tend to be more regional in nature. The recommendations included in this report have been categorized in a similar manner.

The current planning for expanding capacity at both BWI and Dulles Airports includes new buildings at the existing air cargo areas and the potential development of new air cargo areas designed for particular types of users (e.g. all-cargo operators). A comparison of projected air cargo traffic levels with currently planned development indicates that regional capacity (both airports combined) should be adequate at least through the year 2005.

Full build out of currently planned buildings at Dulles Airport, which excludes a new cargo area, should provide adequate terminal capacity through 2011. An additional

1.2 billion pounds of capacity will be required by 2020.

The currently scheduled development of BWI capacity, which includes a new midfield area, is projected to keep utilization rates below 90 percent through 2015. An additional 193.1 million pounds of capacity will be required by 2020.

The horizons for the expected shortfalls in air cargo terminal capacity at BWI (the year 2017) and Dulles (the year 2011) provide sufficient time for the planning, design and construction of additional facilities to meet anticipated growth. It is, therefore, recommended that project planning for the implementation of the air cargo terminal facilities required to meet the projected shortfalls at both airports be undertaken in a timely manner.

The analysis of capacity requirements conducted for this study assumed that current activity levels and operating patterns will remain relatively constant. There are available efficiency options which could increase capacity without new facility development, or at the very least, could forestall the need for new facility development.

It is recommended that an examination of potential efficiency measures, such as a reduction in air cargo terminal use through more direct transfers and off-airport handling, rehabilitation of older terminal areas, or more efficient use of truck services, be undertaken at both airports. A determination should then be made as to whether new facility development could be postponed.

The expansion of off-airport facilities used by freight forwarders, customs brokers and even carriers is part of the search for lower costs and more space. This trend, however, has increased the volume of vehicle traffic to and from the airports, further exacerbating the situation in the air cargo complexes at both BWI and Dulles. This situation is not expected to decline in the future.

Internal road access and on-site parking are required to reduce the congestion in and around air cargo terminal areas. It is recommended that both airports conduct analyses of their internal access systems to assure they can accommodate this component of vehicle traffic.

While truck traffic accounts for a small percentage of vehicle movements over a regional road and highway system, this traffic type is concentrated in the immediate vicinity of cargo terminals. As a result, turning radii, signal cycles, lane widths and the number of lanes have to be adjusted to reflect the difference in operating characteristics between passenger automobiles and trucks. Attention needs to be focused on this issue.

It is recommended that the geometry and general layout of roads which serve the air cargo terminals, in the immediate vicinity of both airports, be analyzed to assure that they are configured to meet the requirements of large trucks.

As the use of road feeder services increases, especially as they serve broader regions, the focus of road access has to expand beyond the immediate service area of the two airports. Many of the airlines serving Dulles and BWI attract cargo from distant points to the west and

south. As a result, linkages between the broader Interstate system and the more proximate highways and roads is of increasing concern.

The regional road and highway system surrounding both BWI and Dulles is becoming increasingly congested. In recent years, the overall volume of vehicular traffic has increased, creating problems for truck operations. Under current plans for road improvements, congestion is projected to increase significantly, particularly on main access routes to regional markets. Congestion on the Capital Beltway is an issue with which the entire region is familiar.

Regional access is heavily influenced by existing and projected highway congestion in the metropolitan area, more so than conditions directly on or around the airport. While much cargo activity occurs during off-peak periods, a significant portion of cargo pickups and deliveries are time-sensitive and occur during the peak commuting periods. Recent years have shown an uneven pattern in congestion, with much of the off-peak congestion affecting air cargo activity as well.

In industry interviews conducted by the consultant with shippers and consignees that use both airports, several issues related to regional access were repeatedly raised. A significant amount of truck traffic moves between BWI and Dulles, including international cargo connecting with flights from Dulles. Access between the two airports, particularly congestion on the Capital Beltway, was cited as a major problem.

The primary linkage between BWI Airport and regional markets, I-195, providing direct access to I-95 and the B-W Parkway, was cited as a significant advantage of this airport's location. Once on the regional roadway system, however, areawide congestion was noted by a majority of respondents as one of the impediments to air cargo movement. In it's report *Outlook 2020: Freight Mobility Issues and Recommendations for the 1997 Baltimore Regional Transportation Plan*, the Baltimore Metropolitan Council found that congestion on the regional highway system had a major impact on overall freight movement, including air cargo.

At Dulles Airport, an area of concern for off-airport cargo companies is the dependence on the Dulles Toll Road for access to points east. Vehicles going to and from these companies must use Route 28, which does not connect with the Dulles Access Highway. Trucks must therefore be routed via the Dulles Toll Road, which is typically congested during key morning and afternoon delivery periods. This routing is particularly difficult for trucks destined for the District of Columbia. Trucks often take a circuitous route to get into the city. Routing via the Toll Road also becomes expensive for companies running several dozen vehicles per day.

Another issue related to regional access that was stressed at Dulles is highway access to points west. With many of the airlines that serve Dulles attracting cargo from areas as distant as Tennessee and South Carolina, the linkage between the airport and the broader Interstate system to the west is of increasing concern.

There are several significant highway facilities included in the Constrained Long Range Transportation Plan for the National Capital Region that will have direct impact on air cargo access to Baltimore/Washington Interna-

tional and Washington Dulles International Airports. Improvements such as the widening of the Dulles Access Road, Virginia Routes 7 and 28 and US Route 50 in Virginia, and the widening of US 29 and reconstruction of several major interchanges on the BW Parkway and the Capital Beltway will significantly enhance future air cargo access to the airports.

The analysis done for this study, nonetheless, indicates that the travel demand placed on the highway by the years 2010 and 2020 will cause serious deterioration in airport accessibility. The future growth of air cargo demand in the Washington-Baltimore Region will depend in part on our success in reducing congestion on regional highways as well as roadways in and around the airports, and maintaining a high level of accessibility to both BWI and Dulles Airports.

It is recommended that the area jurisdictions work together to identify opportunities that are financially beneficial to the region for improving access to the commercial airports in the Washington-Baltimore Region.

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I. BACKGROUND

The rapid expansion of worldwide air cargo traffic reflects the growing importance of expedited transportation to both manufacturing systems and consumer markets, which are increasingly dispersed globally. Total world-wide air cargo traffic more than tripled between 1980 and 1995, growing from 33 billion revenue-ton-miles (RTMs)[1] to over 109 billion RTMs (6.8 percent annual growth). This expansion has been relatively steady, with growth between 1980 and 1985 averaging 8.1 percent per year, 9.6 percent per year from 1985 to 1990, and 7.5 percent per year from 1990 to 1995. Air freight traffic accounts for the majority of the total air cargo volume (95 percent).

U.S. airlines carry about one-third of the total world air cargo traffic, including 30 percent of air freight RTMs and 62 percent of air mail RTMs (reflecting the greater use of air mail in the U.S. domestic market). Domestic cargo traffic by U.S. carriers totaled 19 billion RTMs in 1995, accounting for 55 percent of total traffic. Domestic cargo traffic carried by the express (or integrated) carriers (e.g., FedEx or UPS) has shown the greatest expansion, rising from 6 percent of total RTMs in 1980 to 59 percent of traffic in 1995. This increase in express cargo traffic has been at the expense of scheduled air freight services which declined from 68 percent of 1980 domestic cargo traffic to 24 percent of traffic in 1995. Air mail and charter freight traffic declined as a share of total air cargo traffic from 15 percent in 1980 to 12 percent in 1995.

Growth in international air cargo traffic for U.S. carriers has exceeded domestic growth, averaging 8.1 percent annual growth from 1980 to 1995. Total 1995 air cargo traffic of 15.8 billion RTMs consists of 11.9 billion RTMs of scheduled air freight (75 percent of total), 3.1 billion RTMs of charter cargo traffic (20 percent of total), and 1.5 billion RTMs of air mail (5 percent of total). While the integrated carriers continue to expand their international express services, the majority of international freight continues to move in the bellies of passenger or "combi"[2] aircraft.

Trade statistics measuring air freight traffic in shipment weight show similar trends. International air trade for the U.S. grew by 7.5 percent per year from 1990 to 1996, totaling 10.8 billion pounds in 1996[3]. Europe was the top world area with over one-third of total air freight traffic. Pacific Rim markets accounted for over 37 percent of total air trade, mostly for Northeast Asia. Southeast Asia is the fastest growing world area averaging 13.7 percent growth from 1990 to 1996, followed by the Middle East (10.0 percent per year) and Northeast Asia (9.1 percent per year).

Total U.S. air freight activity is estimated to grow from 38.2 billion pounds in 1996 to 89.6 billion pounds by

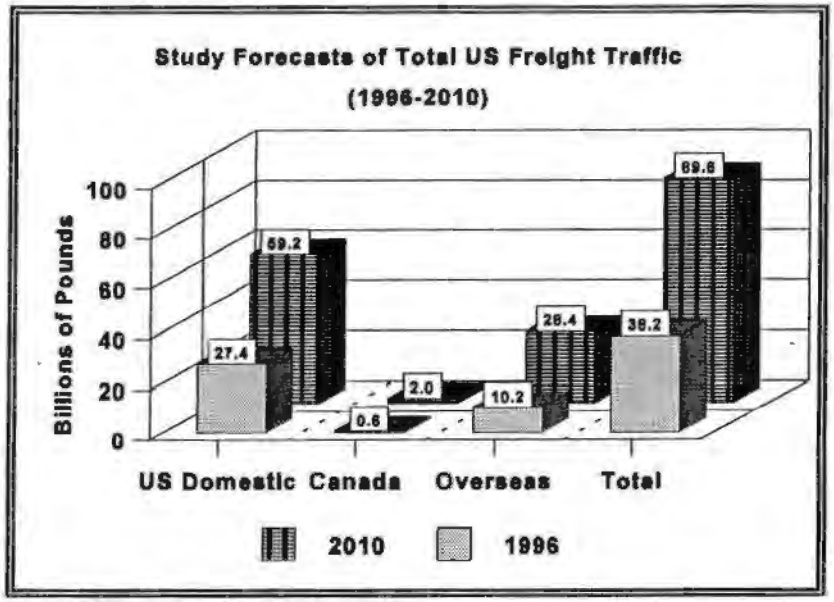
1. The definition of revenue ton-mile (RTM) is based on a short ton (2,000 pounds).

2. "Combi" aircraft combine both passenger and freight capacity on the main deck, as opposed to the typical passenger aircraft with freight capacity only in the plane's belly. Both types of aircraft are operated by "combination" carriers who handle both passenger and freight traffic. "All-cargo" carriers do not transport passengers as a main line of business.

3. Air trade consists of all international air shipments, excluding mail as measured in the U.S. Customs and U.S. Bureau of the Census statistics.

2010, an average annual growth of 5.9 percent[4]. As shown in Figure 1, domestic air freight traffic is estimated to grow from 27.4 billion pounds in 1996 to 59.2 billion pounds by 2010 (5.3 percent annual growth), while overseas air freight traffic is projected to grow 7.1 percent per year and U.S.-Canada air freight traffic by 8.6 percent per year to a combined international total of 30.4 billion pounds. As a comparison, the Boeing Company, in their 1996/1997 World Air Cargo Forecast, projected total world cargo traffic would average 6.6 percent annual growth from 1995 to 2015, while air mail traffic would grow by 3.4 percent per year.

Figure 1



Washington Dulles International Airport

In 1996, Washington Dulles International Airport reported a total of 680.2 million pounds of air freight and mail, a 5.7 percent increase in total air cargo traffic from the previous year. Between 1991 and 1996, Dulles averaged a 13.9 percent annual growth rate. Total cargo traffic is relatively balanced with enplanements equal to 50.8 percent of total weight, although air mail traffic is primarily an outbound market (62.8 percent of the total) and domestic air freight is primarily an inbound market (53.6 percent of the total).

Domestic shipments account for over two-thirds of total air freight traffic, with freight volumes evenly split between combination carriers (i.e. passenger and cargo) and all-cargo carriers. The top airport markets for the combination carriers serving Dulles in 1995 were:

Los Angeles	34.7 million pounds
San Francisco	24.5 million pounds
Chicago-O'Hare	15.8 million pounds
Denver	15.5 million pounds

International air cargo traffic at Dulles was split between U.S. and foreign combination carriers with very little all-cargo charter traffic. Europe dominates international air freight traffic at Dulles, accounting for 82.5 percent of total imports and exports. Northeast Asia is the only other world area with any significant air freight traffic.

Compared to other airports, based on statistics from the Airports Council International, Washington Dulles ranked 25th in total cargo traffic in 1996, and was the 16th largest

4. The freight forecasts are based on trends in air imports and exports by world area and commodity group from 1983 through 1996, combined with industry forecasts for total international and domestic growth.

international gateway. International air freight traffic averaged 14.5 percent annual growth between 1990 and 1996.

Washington Dulles International Airport is a regional domestic hub and international gateway for United Airlines, and is also a primary service airport for the metropolitan Washington area. The airport has air cargo volumes comparable to other regional domestic and international passenger hubs (such as Detroit, Houston, and Portland). The total air cargo traffic volume is approximately one-fifth or less of the traffic handled by the top five airports.

Air mail is mostly handled on passenger flights. Only 13 percent of this cargo is on international flights. Dulles was the 22nd largest U.S. airport in enplaned air mail traffic in 1994, handling 1.6 percent of the national total.

Baltimore/Washington International Airport

In 1996, Baltimore/Washington International Airport reported a total of 371 million pounds of air freight and mail, a 14 percent increase over cargo traffic from the previous year. Between 1991 and 1996, air cargo traffic at BWI grew by an average of 2.6 percent per year, comprising an overall decline in international air freight traffic and a moderate growth in domestic air freight and total air mail. Overall cargo traffic is relatively balanced with enplaned volumes accounting for 51 percent of total traffic. As with Dulles, enplaned traffic accounts for 62 percent of total air mail volume, with domestic air freight slightly balanced toward inbound traffic (53 percent).

Unlike Dulles, the domestic market at BWI is dominated by all-cargo carriers (84 percent of the total) with direct service by all of the integrated carriers. There is also significant air freight traffic by non-integrated all-cargo and charter carriers.

Foreign combination carriers account for over half of total international air freight traffic with U.S. passenger carriers responsible for just 6.5 percent of commercial volumes. The remaining 36 percent of international air freight is handled by all-cargo carriers, though some of this may be trucked to other gateways. Europe is the primary world area for air trade through BWI, with 80 percent of total import and export weight. Southeast Asia accounts for a minor share (6.2 percent) of air freight traffic.

BWI Airport ranked 33rd among U.S. cargo airports and was 26th in international air trade. International air freight traffic accounts for about 10 percent of total air freight traffic, having fallen 21 percent from 1991 to 1996 as international passenger service declined.

BWI has significantly expanded its passenger services in recent years, although a major source of that growth, Southwest Airlines, is not structured to handle large volumes of cargo. In 1996, BWI had limited international passenger service to Europe, Canada and the Caribbean, been successful in attracting integrated all-cargo and charter services which provide the majority of its air cargo traffic. A new international terminal is under construction.

BWI's cargo volumes are comparable to smaller regional airport hubs (such as Hartford, Kansas City and St. Louis) which have limited or no international capacity and

are generally within road feeder range of a larger hub.

Air mail is almost exclusively domestic and moved on passenger carriers. BWI Airport was 26th in enplaned air mail traffic for 1994, with 1.3 percent of the national total.

Other Metropolitan Area Airports and Facilities

In addition to the primary cargo airports, the Washington-Baltimore metropolitan area has significant activity at Washington National Airport and minor passenger operations at other small airports. Washington National reported 112 million pounds of cargo traffic in 1996 with mail accounting for three-quarters of that total[5]. National was ranked 20th among U.S. airports in total enplaned air mail for 1994, ahead of both Dulles and BWI, however, National accounted for less than 10 percent of the combined total air cargo traffic for all three major airports.

Cargo activity at National is exclusively handled in passenger aircraft serving U.S. domestic and Canadian points. This activity has declined in recent years due to capacity constraints, and a shift to narrow-bodied aircraft in domestic service. From 1991 to 1996, total air cargo declined an average of 3.0 percent per year with air mail falling at a slightly higher rate (3.1 percent). It is anticipated that air cargo traffic at National will remain stable or decline in the future.

In addition to the primary airports in the area, there are several smaller airports with minor passenger operations and, presumably, some air cargo traffic. These airports include Frederick, Hagerstown, and Martin State. These airports do not currently play a significant role in regional air cargo, but might have future development potential.

The Washington-Baltimore region is served by two major port facilities (the Port of Baltimore and the Port of Hampton Roads) as well as a significant network of railroads. The nature of the commodities that comprise the majority of air freight, however, generally precludes movement by other means, such as rail, long-haul truck, or ship. The Virginia Inland Port, located in Front Royal, Virginia, serves as an intermodal terminal facility that provides a link between truck and rail for transfer of ocean-going containers to and from the ports. Since the commodities that are shipped through these port facilities are mutually exclusive of the commodities that are shipped by air, the Air Cargo Element was limited to an examination of Dulles and BWI Airports.

Total Regional Airport Cargo Traffic

Combined, Dulles and BWI accounted for over 1 billion pounds of air cargo in 1996, including 830 million pounds of air freight and 217 million pounds of air mail. Table 1 provides a breakdown of domestic and international air freight, plus air mail, shipped through these two airports in 1995 and 1996. Also shown are the average annual growth rates for 1995 to 1996 and 1991 to 1996.

Overall, air cargo for the two airports averaged 9.0 percent annual growth from 1991 to 1996 with slightly lower growth in the last year (8.5 percent). Domestic air freight accounted for 75 percent of total air freight, but

5. Washington National Airport was not considered in this study, due to constraints on cargo expansion, and the policy of airport authorities to divert cargo operations, other than the supplemental cargo traffic connected to passenger flights, to Dulles and BWI Airports.

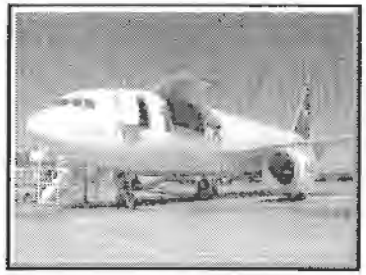
inter-national volumes grew faster, at a rate of 15.0 percent per year from 1991 to 1996. Air mail traffic increased at a lower rate over the same period, 6.1 percent per year.

Table 1

Dulles and BWI Air Cargo (Millions of Pounds)

			Avg Annual Growth	
	1995	**1996**	**1995-96**	**1991-96**
Domestic	571.9	626.6	9.6%	8.5%
Internat'l	185.5	203.1	9.5%	15.0%
Subtotal	757.4	829.7	9.5%	9.9%
Mail	207.3	216.8	4.6%	6.1%
Total	964.7	1046.5	8.5%	9.0%

II. PURPOSE OF THE REGIONAL AIRPORT SYSTEM PLAN



II. PURPOSE OF THE REGIONAL AIRPORT SYSTEM PLAN

The Metropolitan Washington Council of Governments (COG), in cooperation with the Federal Aviation Administration (FAA), the Maryland Aviation Administration (MAA), the Virginia Department of Aviation (VDOA), the District of Columbia Office of Planning (DCOP) and the Metropolitan Washington Airports Authority (MWAA), has conducted a metropolitan airport system planning process since 1978. The goal of this Continuous Airport System Planning (CASP) program is to provide a process which supports the planning, development and operation of airport and airport-serving facilities in a systematic framework for the Washington-Baltimore Region.

At the heart of the CASP program is the *Washington-Baltimore Regional Airport System Plan (RASP)*. In 1988, COG published Volume I of the RASP, the Commercial Airports Element. This document was an update of an earlier proposed plan for an air transportation system plan for the region, and acts as a guide for development at the three major commercial airports in the region. The stated general purposes of the 1988 Plan were:

- To forecast commercial aviation activities for the Washington-Baltimore region to a horizon year of 2000, and to allocate these demand forecasts to Baltimore/Washington International, Washington Dulles International and Washington National Airports; and,
- To consider commercial airport facility requirements on a regional scale, providing a general framework for individual airport planning.

Volume II of the Regional Airport System Plan, the Ground Access Element published in 1994, was developed to address ground access for airport passengers at Washington National and Washington Dulles International Airports[6], and incorporates airport system planning into the overall regional transportation planning process. This effort approached the ground access issue from a regional level, examining the total transportation system in the metropolitan area, and considered all major modes of access to the two airports. Ground accessibility was analyzed from all parts of the region to the airports, current and future deficiencies were explained, and service and facility recommendations were made.

In 1988, Volume I of the *Washington-Baltimore Regional Airport System Plan* noted that air cargo was not considered in the plan, and should be addressed soon in the regional planning process. In adopting the 1988 RASP, the National Capital Region Transportation Planning Board (TPB) recommended that future system planning efforts include an assessment of airport cargo needs in the region.

Volume II of the RASP was adopted by the TPB in September 1994. During the review of the ground access component, numerous comments were received

6. Although Baltimore/Washington International Airport is an integral part of the regional airport system, it was not included in this study at the request of the Maryland Aviation Administration.

that the RASP does not yet adequately address goods movement with respect to air cargo. The emphases on goods movement in the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and the proposed National Economic Crossroads Transportation Efficiency Act (NEXTEA) of 1997, also point to the need for a regional analysis of air cargo, examining the current demand at Dulles and BWI Airports, how this cargo is being moved and how it is getting to the airport.

In developing the *Long-Range Transportation Plan for the National Capital Region*, the National Capital Region Transportation Planning Board was guided by a set of goals and objectives, known as the Policy Element, that provide the general framework for continuing transportation system planning and implementation of transportation facilities in the region. One of these goals deals with the overall transportation system:

*F. **Transportation System***

> ***Develop and fund an intermodal transportation system that meets the region's transportation goals and objectives, as well as supports the region's development, environmental, social and economic goals.***

One of the objectives associated with this goal is:

F. 14: Implement methods to enhance the efficient movement of freight.

The Long-Range Transportation Plan, approved by the TPB in September 1994, specifically states that a regional air cargo study may help pinpoint other measures that could enhance the region's freight transportation efficiency.

The market for air cargo goes beyond traditional regional boundaries, extending from the Carolinas north to the New York metropolitan area. The majority of air cargo shipments are first moved on trucks over the highway system to a particular airport cargo facility. These air cargo facilities are major elements of airport master planning. With the enormous growth in the amount of air cargo nationwide, as well as the amounts being handled by Dulles and BWI airports, an analysis of the demand for air cargo and how it is getting to the airports, conducted at the regional level, would be an invaluable guide for airport master planning.

In light of this overall growth in the amount of total air freight activity, both nationwide and within the region, and the various calls for study in this area, Volume III of the *Washington-Baltimore Regional Airport System Plan* has been developed.

III. STUDY APPROACH

III. STUDY APPROACH

The intent of the study was to examine the existing and future demand for air cargo at Baltimore/Washington International and Washington Dulles International Airports, and analyze how the movement of this cargo affects the regional ground transportation network. Focusing on the goods movement portion of airport access, the study was to examine the estimated potential demand for air cargo facilities, and compare this demand with current and planned facilities, to determine what air cargo facilities are needed in this region to meet future demand.

This work was coordinated with facility master planning efforts and air cargo facility inventories conducted at Dulles Airport and BWI Airport, as well as intermodal management system planning and congestion management system planning efforts underway in the region. Consultant assistance was sought to perform three specific tasks for this study:

A. **Demand Analysis:** Through interviews with appropriate airport officials, freight forwarders, freight shipping associations and others, conduct an analysis of the current demand for air cargo in the extended region. As well, estimate the potential air cargo demand that is not being met at present. This analysis should include air cargo shipped into as well as that shipped out of Dulles and BWI Airports, along with an examination of cargo generated within the Washington-Baltimore Region versus cargo that is brought into the region for distribution through the airports. In addition to this origin/destination information, discuss the general nature of the cargo itself. All demand estimates should be translated into measures of regional and local truck traffic, by type of vehicle.

B. **Facilities Review:** Conduct a review of all current air cargo facilities at Washington Dulles International and Baltimore/Washington International Airports. Also, compile an inventory of current proposals and planning studies aimed at the development of new or the expansion of existing air cargo facilities at these airports.

C. **Regional Needs Assessment:** Based on all current and proposed air cargo facilities, plus the current and estimated potential demand for such facilities, conduct an assessment of the need for additional air cargo facilities in the region.

In November 1996, COG contracted with the firm of Leeper, Cambridge and Campbell, Inc. to perform these three tasks. The project was officially "kicked-off" with a presentation of the study elements and data requirements to the Washington Air Cargo Association at the end of November.

COG staff was responsible for the overall direction of the study. Technical guidance for the project was provided by the Aviation Technical Subcommittee and the TPB Technical Committee. In addition, COG staff was

responsible for two project tasks:

D. **Network Analysis:** Based on the air cargo demand analysis for the extended region produced by the consultant under Task A, conduct an analysis to determine what effect the traffic generated by this demand has on the current transportation network. In addition, perform a network analysis to determine the impact on the system if the estimated demand in the region was met, and what effect different scenarios of future air cargo demand have on the transportation system in place in the future. These analyses would build on the efforts developed for the Ground Access Element of the RASP, which adapted the traditional four-step transportation modeling process to incorporate and specifically focus on airport-related travel.

E. **Documentation:** Produce a final report which will constitute the Air Cargo Element of the *Washington-Baltimore Regional Airport System Plan.* This report will summarize the results of the air cargo demand analysis, the air cargo facilities review, the regional air cargo needs assessment and the network analysis.

In addition to performing all necessary technical analyses required to complete the first three tasks, the consultant also produced a technical memorandum presenting the results of the analyses under each task. These technical memoranda, *summarized* in this report, are as follows:

Washington-Baltimore Regional Airport System Plan, Air Cargo Element. Task A: Demand Analysis Technical Memorandum, July 1997.

Washington-Baltimore Regional Airport System Plan, Air Cargo Element. Task B: Facility and Infrastructure Analysis Technical Memorandum, July 1997.

Washington-Baltimore Regional Airport System Plan, Air Cargo Element. Task C: Regional Needs Assessment Technical Memorandum, July 1997.

Any reader interested in a more in-depth treatment of the components of this study is referred to the Council of Governments to obtain copies of these technical memoranda.

IV. REGIONAL AIR CARGO DEMAND

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Regional air cargo demand consists of air freight and air mail shipments which originate or terminate in a region, regardless of the location of the airport utilized.[7] Regional air cargo demand flows include shipments to and from regional businesses, households and transportation/distribution companies. The key attributes of regional air cargo demand include:

- origin/destination (including intra-regional)
- type of commodity
- shipment size and pattern
- service requirements
- traffic volume (weight, value or cubic volume).

Air cargo markets combine a wide variety of commodity types, shipper/consignee locations and distribution practices, resulting in a highly diverse and dynamic market. Routing decisions often involve trade-offs between cost, transit time and service levels, with flow patterns varying significantly between domestic and international markets.

General

Domestic markets are characterized by a wide availability of local airport service and comprehensive market coverage by integrated carriers. The integrated carriers have direct air service to most U.S. airports, making express and small package service almost universally available at a local airport. In December 1995, the integrated carriers provided scheduled services at 143 U.S. airports, with flight activity ranging from 90 non-stop flights per week at Chicago-O'Hare Airport to five weekly one-stop flights at Marion, Illinois.[8]

Domestic passenger service is also available at a wide range of small, medium and large U.S. airports, resulting in wide spread availability of "standard" domestic air freight and mail service. In 1995, both Dulles and BWI Airports had domestic air freight or air mail traffic to over 150 U.S. airports. The majority of domestic air freight or air mail transferred by truck to a non-local airport results from a lack of lift capacity at the local airport, a requirement for specialized handling (e.g., wide-body aircraft for oversized shipments), or cost savings for large consolidated shipments. While there has been a recent decline in the availability of wide-body aircraft on domestic routes, small-to-medium sized shipments and air mail can typically find domestic service at a local airport.[9]

In contrast to domestic markets, international markets are dominated by a limited number of airport gateways based on both regulatory constraints (i.e.,government-controlled routes) and economies of scale for both passenger and cargo services. The major cargo airports

7. An "air" shipment is defined as one which moves via air on some portion of its domestic or international journey.

8. This analysis was based on published schedules in the December 1995 Air Cargo Guide for Airborne, American International, Burlington, DHL, Emery, FedEx and UPS.

9. Wide-body aircraft permit handling of consolidated unit-load devices (ULDs) and oversized shipments, while freighter aircraft permit handling of hazardous goods not permitted on passenger flights as well as shipments requiring a service level not compatible with passenger routings or flight times.

typically draw cargo from distances up to 500 miles, with some dominant gateways serving the entire U.S. (for example, Miami is the top gateway airport to Latin America for almost all of the U.S.). This results in a high concentration of air freight traffic at a few top airports. Four airports (New York-Kennedy, Los Angeles International, Chicago-O'Hare and Miami International) accounted for over 54 percent of total export weight to all countries in 1996. Market concentration varies for specific countries, ranging from 51 percent for the well-served United Kingdom market to over 70 percent for the highly restricted Japan market. Therefore, international market areas are much more dispersed than domestic markets.

Washington-Baltimore Market Region

For this analysis, regional air cargo demand consists of air freight and air mail which originates or terminates in the market region of Dulles and BWI Airports. The overall market region is defined as an eight-state region consisting of North Carolina, Virginia, West Virginia, the District of Columbia, Maryland, Delaware, Pennsylvania and New Jersey. This region is within 250 miles of one of these airports, or within 500 miles of the airports and not closer to a major cargo airport (such as New York-Kennedy, Atlanta International or Chicago-O'Hare). This definition is based on analysis of cargo flow patterns, trucking services, and the marketing systems for the air carriers at those airports.[10]

The market region was initially subdivided into county-based origin/destination areas. After further analysis and industry interviews, the original O/D areas were grouped and categorized into the following six market areas:

Local Pickup/Delivery (P&D) Area: Washington/ Baltimore metropolitan area[11];

Regional Pickup/Delivery (P&D) Area: Areas within 100 miles served by regional truck carriers;

Primary Road Feeder Area (RFA-1): Areas within 100-400 miles of Dulles or BWI with domestic/ express services at a local airport, but closer to Dulles or BWI than any other top airport;

Secondary Road Feeder Area (RFA-2): Areas within 100-500 miles with domestic/express services at a local airport, and farther from Dulles or BWI than other top airport areas;

All Other Areas within the eight-state Region: Areas closer to a larger more dominant domestic and international cargo airport; and,

Air Transshipment Markets: Areas more than 500 miles away for which air transshipment is the primary option for using Dulles or BWI.

10. The service area definition is intended to include all areas which currently, or potentially could, utilize cargo services at one of the two airports. The total region corresponds to the service area for international freight services, which is the broadest possible definition based on typical trucking patterns. More restricted market regions for mail and domestic freight are defined as subsets of this broader region.

11. The local market area is the same as the COG-defined Washington-Baltimore metropolitan area plus Spotsylvania County, VA (for data consistency). This roughly coincides to Air Cargo Inc.'s "local pickup and delivery" area which receives same-day service from one or both of the airports.

Table 2

Regional Market Areas

Market Area	Portion of Region Included	Highway Distance (Miles)	Truck Access	Primary Airport	Closeet Top 20 International Airport	Commente
Local Pickup & Delivery	Washington-Baltimore Metropolitan Areas, plus Spotsylvania Co., Virginia	<50/60	Local, Same-day	IAD/BWI	IAD	Closest Airport
Regional Pickup & Delivery	MD: Eastern, Southern, Hagerstown	<100	Regional Carrier, Same-day	BWI	IAD	Closest Airport
	VA: Upper Shenandoah, Culpeper			IAD	IAD	
	WV: Northeast Counties			IAD/BWI	IAD	
	PA: South Central (Harrisburg)			BWI	IAD	
Primary Road Feeder Area	MD: Western	100-150	Road Feeder, Next Day	BWI/PIT	IAD	Closer to another Primary Airport with lower service level. IAD/BWI Closest Internat'l Airport
	VA: Central, Eastern Southeast	100-250		CHO/ROA/RIC/ORF	IAD	
	NC: Eastern, North Central	100-400		RDU/GSO/ILM	IAD	
Secondary Road Feeder Area	VA: Southwest	<400	Road Feeder, 1+ Days	ROA	ATL	Closer to another Primary Airport with equal or better service level. Closer to another Internat'l Gateway.
	PA: Phil/Pitt Regions	<250		PHL/PIT	PHL	
	WV: All Other Counties	<300		CRW	IAD	
	NC: Charlotte Area, Southwest	<500		CLT	ATL	
	DE: All	<100		PHL	PHL	
	NJ: Southern	<100		PHL	PHL/EWR	
Other Regional Areas	PA: Northern	<500	Road Feeder, >1 Day	JFK/EWR	JFK/EWR	Closer to another Primary Airport with better service level. Closer to another Internat'l Gateway.
	NJ: Northern/Central	<500		JFK/EWR	JFK/EWR	
Air Transshipment Markets	All Other Continental U.S.	>500	Road Feeder, 2+ Days	NA	NA	Road Feeder service to major Internat'l Gateways only.

Figure 2

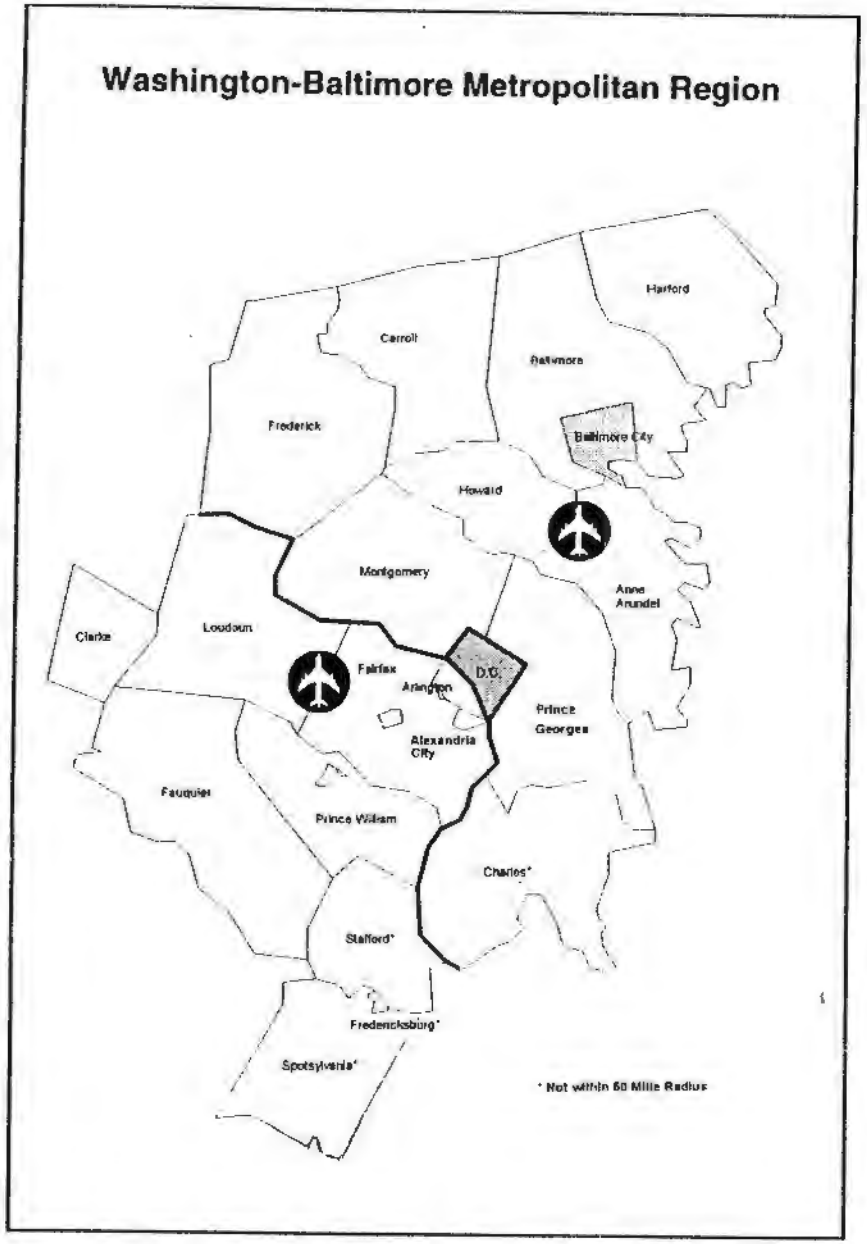


Figure 3

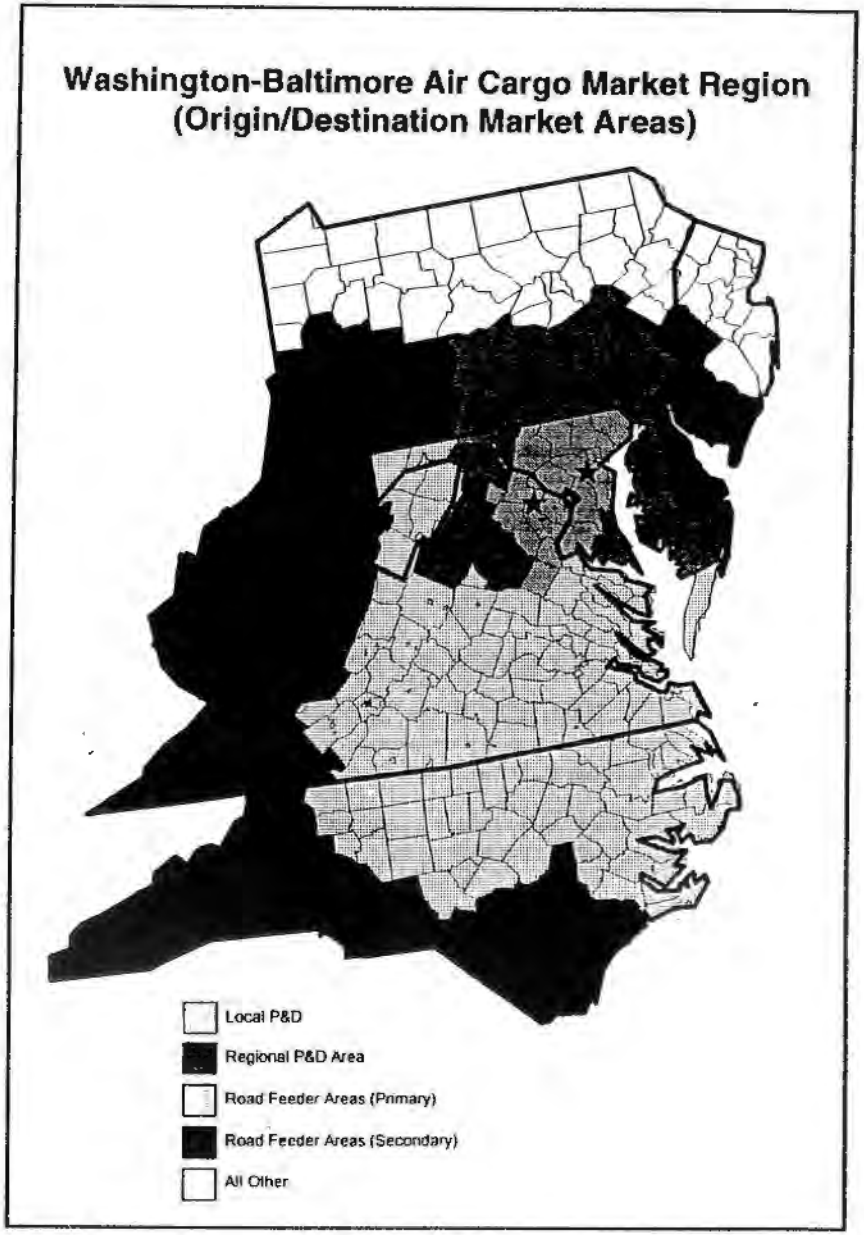


Table 2 provides a description of the five general market areas into which the eight-state Washington-Baltimore market region has been subdivided, plus the air transshipment market. Each market area is described in terms of the portion of the region included, the highway distance, the type of truck access, the primary airport, and the closest top international airport. Figure 2 displays the local pickup and delivery area. This area roughly coincides with the COG definition of the Washington-Baltimore metropolitan area, plus Spotsylvania County in Virginia. Figure 3 illustrates the eight-state air cargo market region, broken down into the five general market areas. A more complete listing of origin/destination market areas by analysis group is provided in Appendix A.

Washington-Baltimore Region Industrial and Demographic Profile

Regional flow patterns of air cargo are closely related to the location, concentration and shipment characteristics of regional businesses and households. The Washington-Baltimore metropolitan region is a major population, employment and consumer center for both the East Coast and entire United States. The Washington/Baltimore Consolidated Metropolitan Statistical Area (CMSA) was the fourth largest metropolitan area in 1994 population and third in 1993 per capita buying income. The area, and its airports, is centrally located on the Atlantic seaboard with access to a large share of U.S. population and employment activity.[12]

12. Both airports publicize their central location relative to U.S. market regions. It is estimated that 50 percent of the U.S. market is within 600 miles of Dulles Airport.

Employment in the study market region totaled 24.1 million in 1996 with the service sector accounting for 30 percent of that total. The next leading sectors were retail and wholesale trade (21 percent of total), government (16 percent) and manufacturing (13 percent). Top employment states in the region are Pennsylvania (6.5 million), New Jersey (4.3 million) and North Carolina (4.4 million). Virginia, Maryland and DC combine to account for about one-third of total employment in the region.

Figure 4

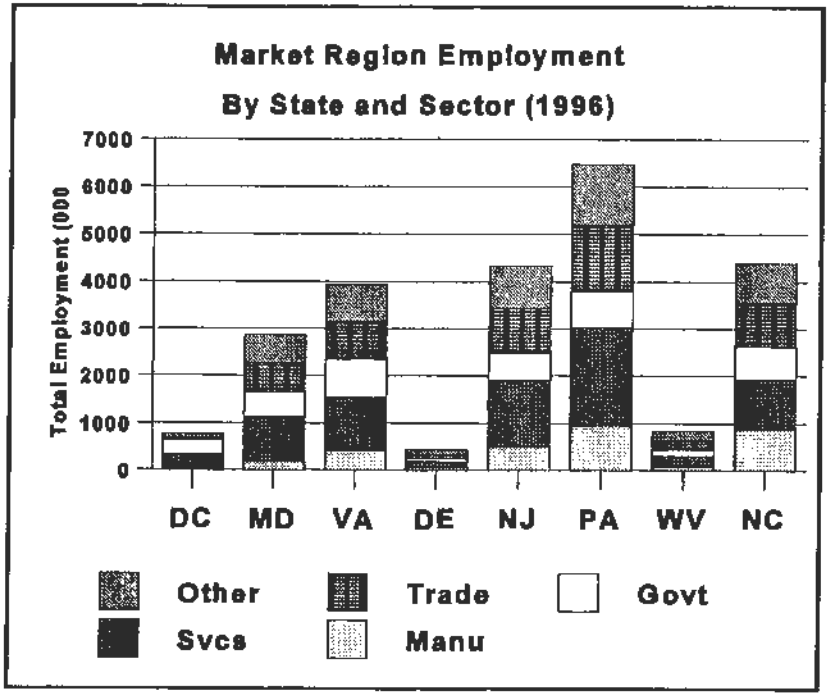


Figure 4 displays the Market Region employment for 1996, distributed by state and by sector within each of the eight states in the region.

Figure 5

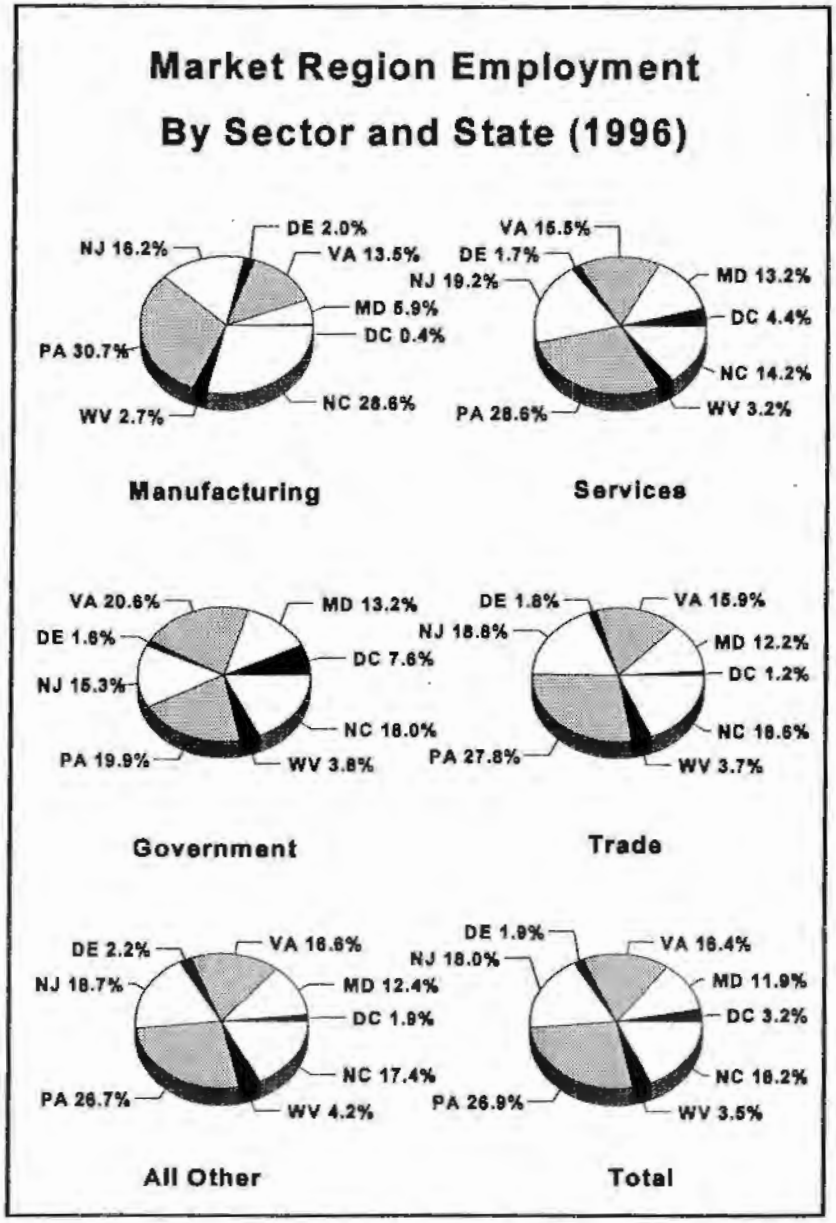
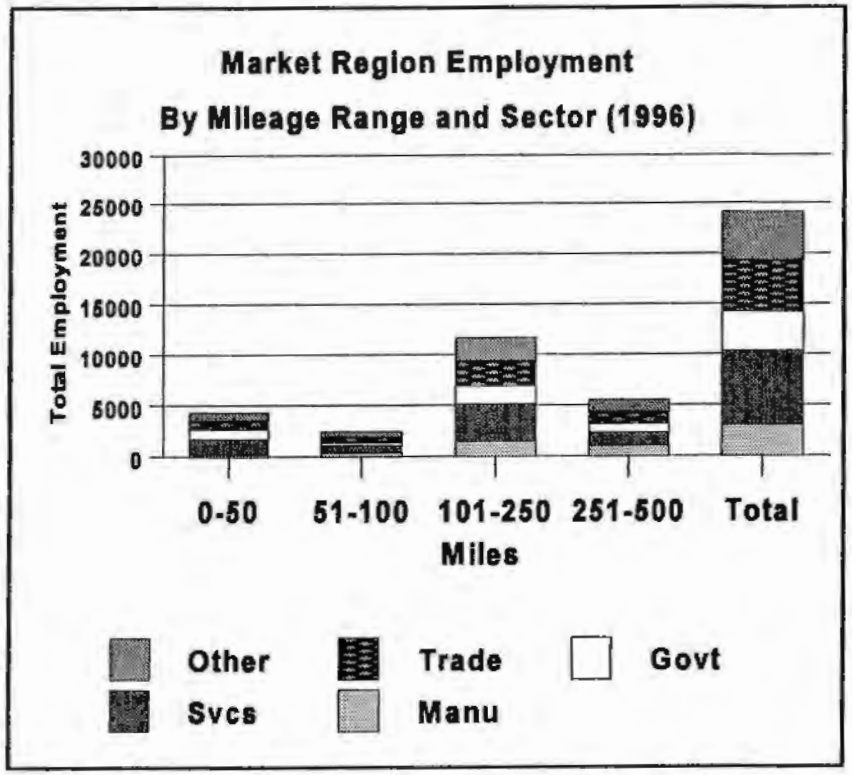


Figure 6



Differences in the industrial makeup of the eight states in the market region are shown in Figure 5. The top employment states (PA, NC and NJ) are also the dominant states in manufacturing (combining for 75.5 percent of all manufacturing employment in the region). The District of Columbia has only 3.2 percent of the total employment in the region, but accounts for 7.6 percent of all government jobs in the region, and 4.4 percent of all service sector jobs. Virginia is also more oriented toward government jobs with 20.6 percent of the regional government total, compared to 16.4 percent of the total

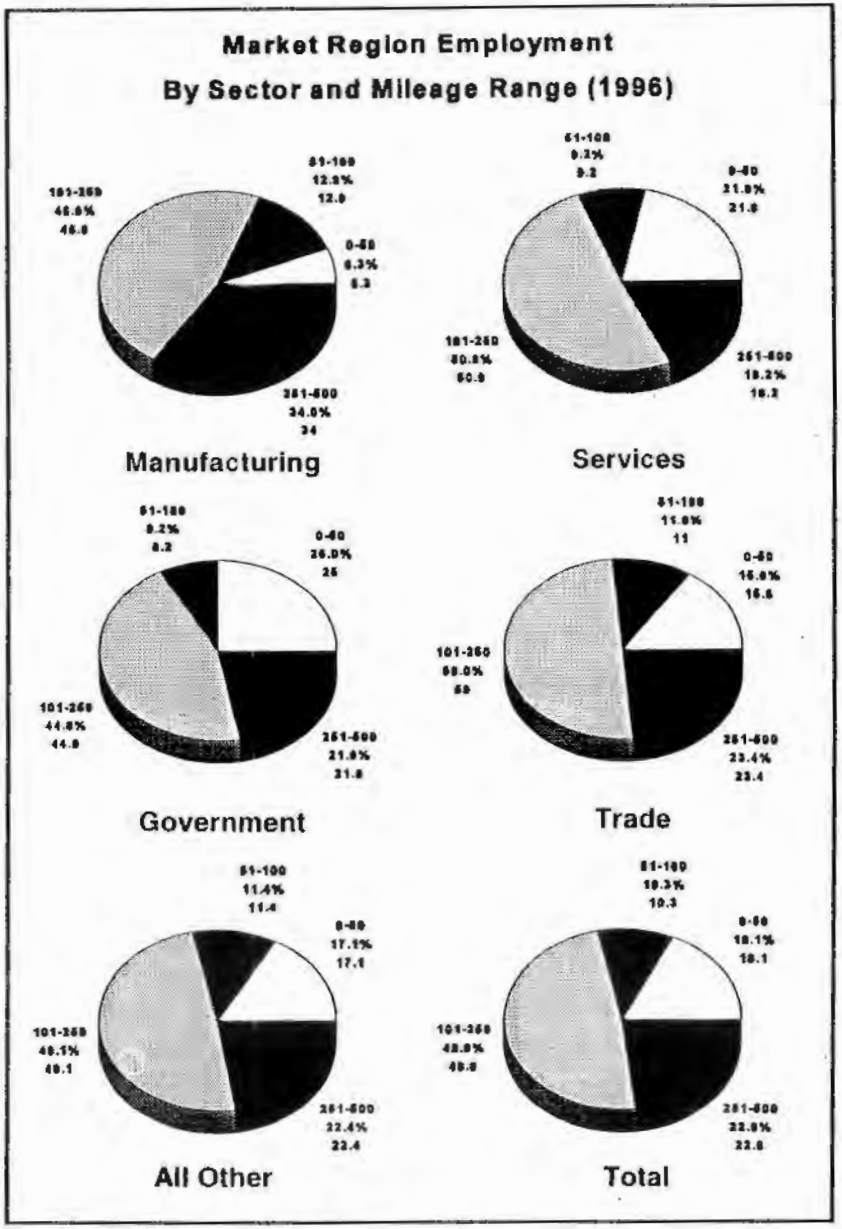
employment for all sectors. Maryland accounts for 11.9 percent of total regional employment, based on a small share of manufacturing employment (5.9 percent) and larger shares (12 to 13 percent) of the other sectors.

Regional employment concentration is shown by mileage range in Figure 6.[13] The local area (0-50 miles) accounts for 18.1 percent of total employment with 28.4 percent within 100 miles. Approximately half of the total regional employment is between 101 and 250 miles away with about another quarter more than 250 miles. The local area is most dominant in the government and service sectors with 25.0 percent and 21.8 percent of total employment respectively. The mid-range area (51-100 miles) has a higher concentration of manufacturing (12.9 percent of jobs), as does the furthest region (251-500 miles). The employment profile for the largest region (101-250 miles) is roughly comparable to the region as a whole. Figure 7 displays the differences in industrial makeup of the mileage-based portions of the region.

Another indicator of market activity which is relevant to air cargo activity is retail sales, particularly for inbound consumer goods. Total regional sales in 1996 were $334.3 billion (in constant 1987 dollars). Figure 8 shows the distribution by state and mileage range. The largest states again dominate the market with PA having 27.9 percent of total sales followed by NJ (20.4 percent) and NC (16.7 percent). Combined, MD, VA and DC accounted for 29.3 percent of total sales, with the local "50-mile" area accounting for 16.3 percent. Again, the

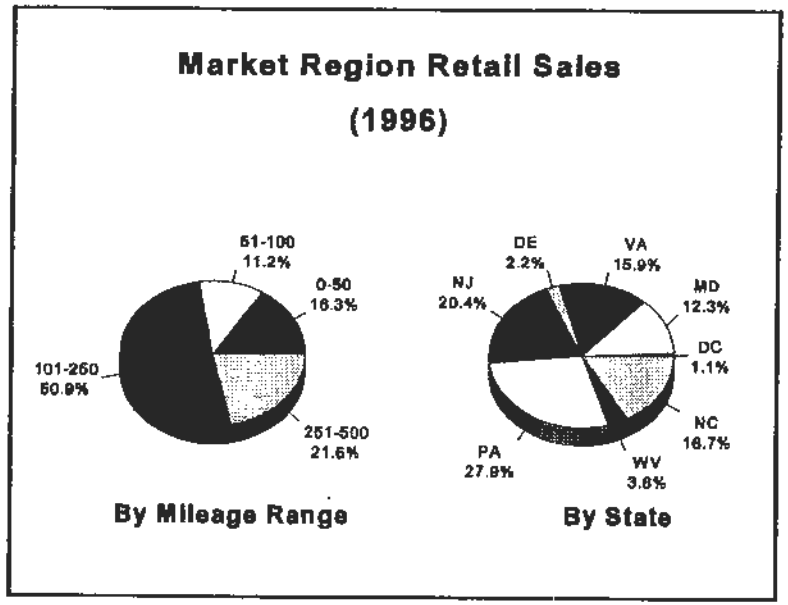
13. The mileage ranges are based on the minimum distance from a central city for each O/D area to one of the two airports, calculated using Automap software.

Figure 7



101-250 mile area is the largest market with 50.9 percent of total sales, followed by the 251-500 mile region with 21.6 percent.

Figure 8



Washington-Baltimore Region Origin/Destination Air Freight Traffic

One of the important tasks in this study, for which the consultant was responsible, was an air cargo demand analysis. This included an analysis of the current demand for air cargo in the Washington-Baltimore market region, plus estimates of the potential air cargo demand in the future. To be consistent throughout this project, estimates for the years 1997, 2010 and 2020 were developed. The consultant completed the demand analysis using a four step methodology. The baseline (1996) state-level international and domestic air freight traffic for the eight-state region was estimated from Leeper, Cambridge and Campbell's State Air Freight Data Base. Air freight traffic for the year 2010 was then forecast, based on historical patterns of trade growth by world region and commodity group, along with estimates of domestic growth developed by the Boeing Company. State-level freight traffic was then allocated to county-based origin/destination groups, based on demographic and economic factors. And, lastly, forecast air freight volumes for 1997 and 2020 were developed, based on 1996 to 2010 growth rates.

Summary by Market Type and Market Area

Total air freight traffic for the eight-state region in 1996 was estimated at 4.4 billion pounds. By the year 2010, total air freight traffic is forecast to grow to 10.5 billion pounds. This is an annual average growth rate of 6.4 percent. Tables 3 and 4 display these baseline (1996) and forecast (2010) air freight traffic estimates distributed by market type and market area within the region.

In 1996, the Local Pickup and Delivery area and the Regional Pickup and Delivery area account for just 7.3 percent and 9.2 percent of the baseline total, respectively. The "All Other" area accounts for the largest share of 1996 air freight traffic (31.1 percent) followed by the Secondary Road Feeder area (29.7 percent) and the Primary Road Feeder area (22.7 percent). The Washington-Baltimore Market Region is estimated to account for 11.5 percent of total U.S. air freight traffic. Within the market areas, the top county-based O/D areas are Central/Northern New Jersey, Eastern North Carolina

Table 3

Baseline (1996) Air Freight Traffic by Market Area

Market Area	Domestic Lbs (000)	Domestic % of Total	Canada Lbs (000)	Canada % of Total	Overseas Lbs (000)	Overseas % of Total	Total Lbs (000)	Total % of Total
Local Pickup & Delivery	213,420	7.0%	5,451	7.6%	102,779	8.0%	321,651	7.3%
Regional Pickup & Delivery	285,425	9.4%	6,034	8.4%	112,959	8.7%	404,418	9.2%
Primary Road Feeder Area	691,620	22.8%	14,848	20.7%	291,277	22.6%	997,745	22.7%
Secondary Road Feeder Area	906,948	29.9%	21,738	30.3%	374,912	29.0%	1,303,597	29.7%
All Other Regional Area	933,186	30.8%	23,601	32.9%	409,716	31.7%	1,366,503	31.1%
Total	3,030,599	100.0%	71,672	100.0%	1,291,644	100.0%	4,393,915	100.0%
Share of All Traffic	69.0%		1.6%		29.4%		100.0%	
U.S. Total	27,439,182		584,562		10,155,979		38,179,723	
Share of U.S. Total	11.0%		12.3%		12.7%		11.5%	

and South Central Pennsylvania.

Total air freight traffic is forecast to grow to 10.5 billion pounds by the year 2010. The distribution among the market areas is expected to be similar to the baseline, with the "All Other" area accounting for the largest share (31.3 percent), followed by the Secondary RFA (29.8 percent), the Primary RFA (22.8 percent, the Region P&D area (8.9 percent) and the Local area (7.1 percent).

Overall average annual growth in air freight traffic is forecast to be 6.4 percent. The patterns of growth for the market areas are similar, with the more local areas growing slightly less (6.2 percent per year) than the more distant ones. For the market region as a whole, the Canadian market is forecast to grow faster (9.5 percent per year) than both Domestic (5.6 percent per year) and Overseas (7.8 percent per year) markets. The fastest growing county-based O/D areas will be Western Maryland (7.1 percent per year), the State of Delaware (7.1 percent per year) and the Hagerstown area of Maryland (6.9 percent per year)

Appendix B includes tables showing baseline (1996) and forecast (2010) air freight traffic broken down by market type and by the county-based origin/destination areas.

Table 4

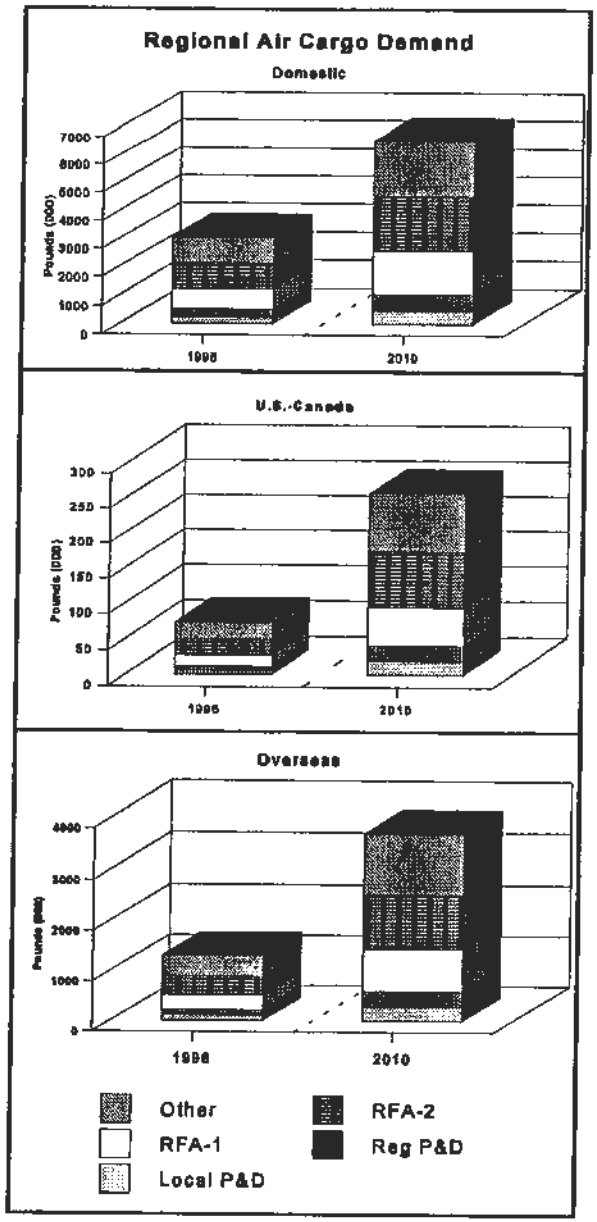
Forecast (2010) Air Freight Traffic by Market Area

Market Area	Domestic Lbs (000)	Domestic % of Total	Canada Lbs (000)	Canada % of Total	Overseas Lbs (000)	Overseas % of Total	Total Lbs (000)	Total % of Total
Local Pickup & Delivery	445,503	6.8%	19,216	7.5%	282,301	7.7%	747,020	7.1%
Regional Pickup & Delivery	599,226	9.2%	21,204	8.6%	315,138	8.6%	935,567	8.9%
Primary Road Feeder Area	1,495,770	22.9%	53,202	20.8%	837,171	22.8%	2,386,144	22.8%
Secondary Road Feeder Area	1,961,279	30.1%	78,229	30.6%	1,076,806	29.3%	3,116,314	29.8%
All Other Regional Area	2,020,502	31.0%	84,151	32.9%	1,166,216	31.7%	3,270,870	31.3%
Total	6,522,281	100.0%	256,002	100.0%	3,667,631	100.0%	10,455,914	100.0%
Share of All Traffic	62.4%		2.4%		35.2%		100.0%	
U.S. Total	59,165,760		2,005,108		28,424,199		89,595,067	
Share of U.S. Total	11.0%		12.8%		12.9%		11.7%	

The breakdown of regional air freight traffic, for the baseline (1996) and the forecast (2010), by market area and by market type is also illustrated in Figure 9. Domestic air cargo traffic accounts for the largest share of baseline air freight traffic, with over two-thirds of the total. Domestic traffic is projected to have a declining share of total air freight traffic by 2010, falling to 62.4 percent of total weight. The forecast amount is based on average growth of 5.6 percent per year in the region. Of the remainder of baseline air freight traffic, the U.S.-Canada transborder traffic is minor (1.6 percent) compared to the overseas international market (29.4 percent). U.S.-Canada air freight traffic is projected to increase to 2.4 percent of the total regional market, while the overseas market is expected to grow to 35.2 percent of the total.

The top county-based O/D areas for domestic air freight traffic are the same as for overall freight traffic, with the international patterns varying slightly. The top areas for overseas air freight traffic in 1996 were Central/Northern New Jersey, Eastern North Carolina, Southern North Carolina, South Central Pennsylvania, and Northern Pennsylvania. The pattern for U.S.-Canada air cargo is very similar.

Figure 9



Within the Local Pickup and Delivery area, the top air freight traffic areas are the BWI area (City of Baltimore plus Howard and Anne Arundel Counties), the Maryland counties directly north of Baltimore, and the Northern Virginia counties of Fairfax and Arlington plus the Cities of Alexandria and Falls Church. This pattern is fairly consistent for each market type. The largest air freight traffic areas are also projected to grow the fastest.

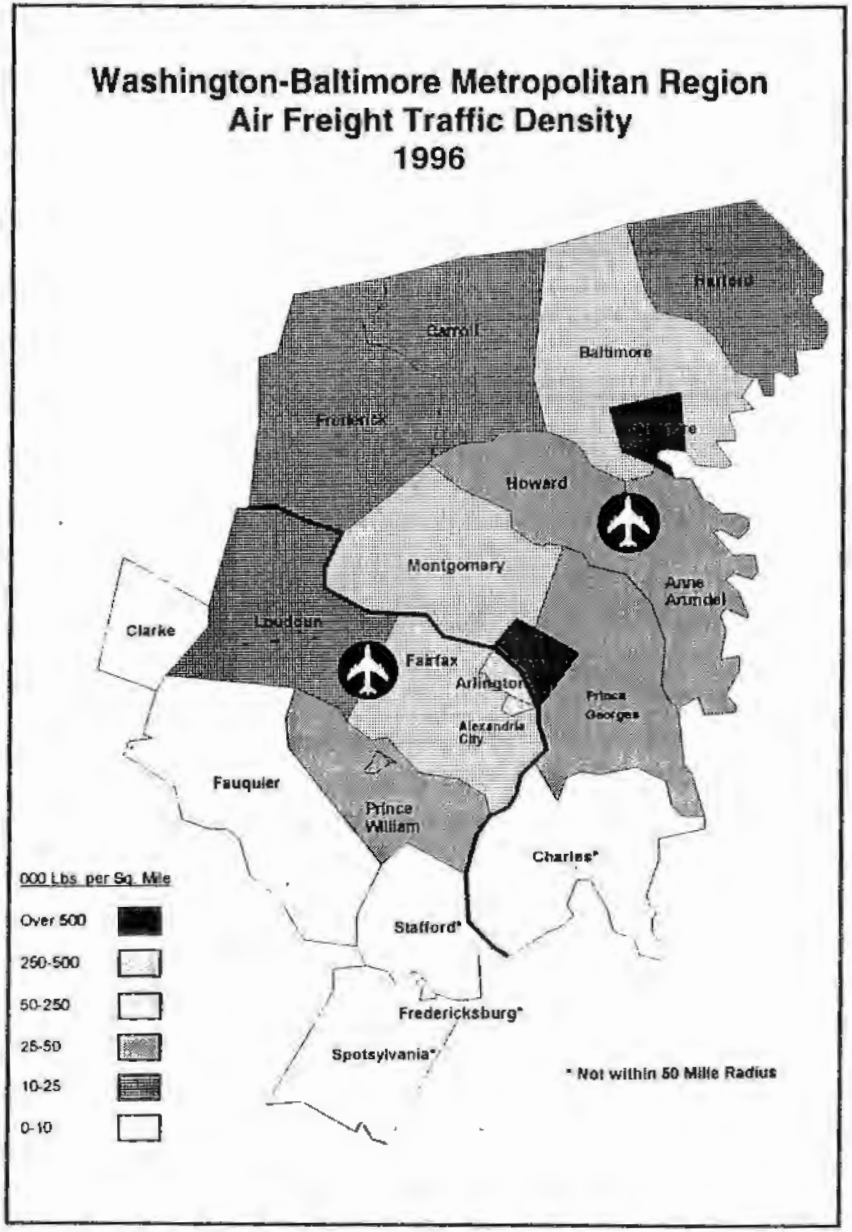
Total baseline air freight traffic per square mile for the Local Pickup and Delivery area is illustrated in Figure 10. It can be seen that the highest air freight densities are found in the cities of Baltimore and Washington. Each of these jurisdictions were responsible for more than 500,000 pounds per square mile. The next densest areas are Arlington County and the City of Alexandria, followed by Fairfax County, Montgomery County and Baltimore County. The areas of lowest density are found in the southern portion of the metropolitan region.

The Regional Pickup and Delivery area is dominated by South Central Pennsylvania, with more than 80 percent of the total air freight traffic for that market area. Eastern Maryland, the Hagerstown area and the Upper Shenandoah Valley in Virginia follow. The county-based origin/destination areas in Western Maryland and Southern Maryland are projected to be the fastest growing areas in the market region. Appendix B contains additional detail regarding these O/D areas.

Summary by World Market

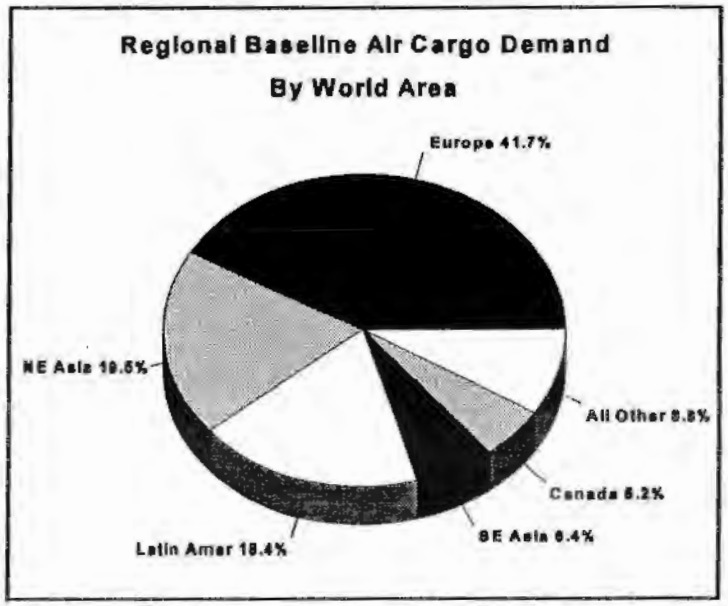
International markets for air freight traffic from this region are led by Europe (41.7 percent of total air cargo), northeast Asia (19.5 percent) and Latin America (18.4

Figure 10



percent). A breakdown of the international markets for baseline regional air freight traffic by world area is shown in Figure 11. By 2010, The region is projected to account for 12.9 percent of total U.S. overseas air freight traffic, 11.0 percent of domestic traffic and 12.8 percent of the U.S.-Canada traffic. The region is responsible for relatively large shares of total U.S. air freight traffic destined for smaller international markets, such as South Asia (18.4 percent), the Middle East (16.1 percent) and Africa (16.1 percent). Appendix B also contains additional detail on the breakdown of baseline and forecast air freight traffic by market area and by world area.

Figure 11



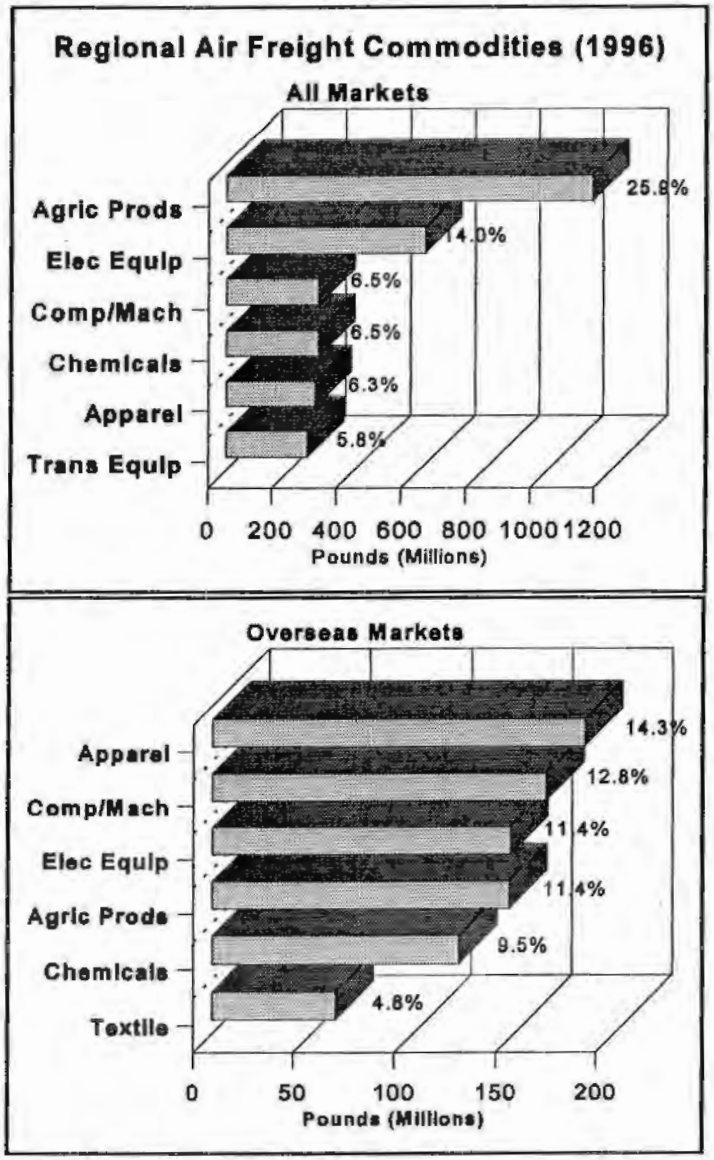
Summary by Commodity Group

Agricultural products accounted for 26 percent of the total baseline air freight traffic, most of which was handled in the domestic market. Other commodities that comprised a significant amount of total air freight traffic include non-computer electrical equipment (14.0 percent of total air freight), computer and related machinery (6.5 percent), chemical and allied products (6.5 percent), apparel and fabric products (6.3 percent) and transportation equipment and parts (5.8 percent). A more complete breakdown of baseline and forecast air freight traffic by commodity group is included in Appendix B.

The international markets, in contrast, have a different commodity mix. The top commodity groups for overseas markets include apparel and fabric products (14.3 percent of total air freight), computer and related machinery (12.8 percent), non-computer electrical products (11.4 percent), agricultural products (11.4 percent), chemical and allied products (9.5 percent) and textile mill products (4.8 percent). The top six commodity groups combined account for almost two-thirds of the total air freight traffic for overseas markets as well as the regional total. Figure 12 illustrates the top commodity groups for total air freight traffic as well as overseas air freight traffic.

With one exception, for each of the market areas within the Washington-Baltimore region, agricultural products was the largest commodity group. The lone exception is the Local Pickup and Delivery area, led by the Public Administration sector. Other industries in each area that accounted for a large share of regional air freight traffic

Figure 12



include:

- Local P&D: Printing and Publishing, Furniture and Fixtures
- Regional P&D: Fabricated Metal Products, Food and Kindred Products
- Primary RFA: Tobacco Products, Textile Mill Products
- Secondary RFA: Petroleum Refining, and Mining Industries
- Other Area: Paper and Allied Products, Chemicals

Washington-Baltimore Region Origin/Destination Air Mail Traffic

Air mail traffic patterns differ from air freight traffic in that air mail volumes are more dominated by domestic traffic and that air mail market areas are more concentrated around airports, due to more direct plane service at local airports and the supplemental use of ground distribution. There is less variation in air mail air and truck service patterns due to single entity control (the U.S. Postal Service), the use of private fleets and contract-based routing conditions. The resulting patterns of origin/destination air mail traffic for the Washington-Baltimore region closely correlate with the overall traffic levels at the two airports.

The earlier discussion of total regional airport cargo traffic in Chapter I indicated that Washington Dulles International and Baltimore/Washington International Airports combined to account for 207 million pounds of air mail in 1995 and 217 million pounds in 1996. For the purposes of this study, it will be assumed that these figures represent total regional air mail demand.[14]

The regional market area for air mail roughly approximates the Local and Regional Pickup and Delivery areas, plus the Primary Road Feeder area, with the exception of that portion extending into North Carolina (see Figure 3 on page 12). The definition of regional market air mail traffic was based on an analysis of USPS truck pickup and delivery schedules for midweek operations in January 1997, information collected during interviews with the managers of the Air Mail Centers.

Based on these truck schedules, estimates were developed for total daily midweek capacity by county-based origin/destination areas. One-way capacity to both airports totaled 565,180 cubic feet, with Dulles accounting for more than half of the total. Table 5 shows the air mail truck capacity and traffic estimates at these two airports. In terms of one-way capacity, the top county-based O/D areas were:

- Northern Virginia 150,075 Cubic feet
- BWI Area 113,400 Cf
- Washington, D.C. 72,500 Cf
- Southern Maryland 40,800 Cf

Note that these services include only direct air mail distribution from the airports and exclude any traffic which might be transferred at another mail facility.

14. With declining amounts of air mail traffic and constraints on air cargo expansion, air mail traffic at Washington National Airport, and any handled at other local airports, will not be considered in this analyis.

Table 5

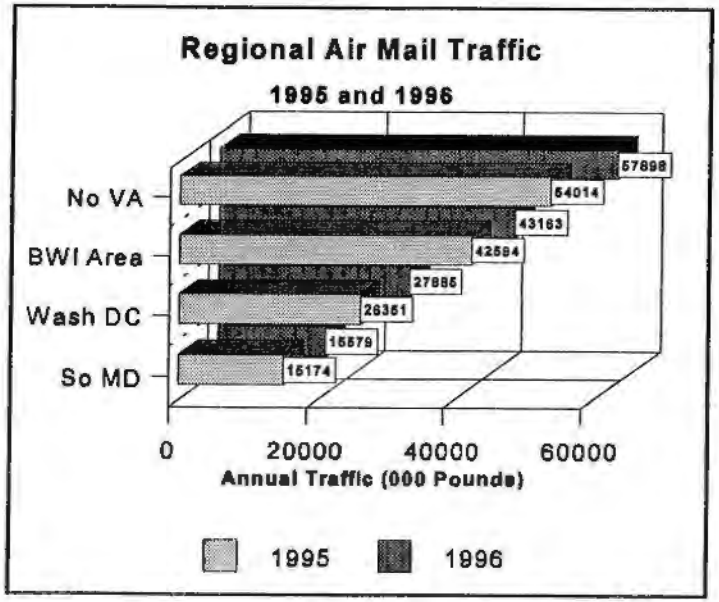
Air Mail Truck Capacity and Traffic Estimates

	Daily Estimates (Cu Ft)	Share of Market	Daily One-Way Truck Trips	1995 Traffic (000 lbs)	1996 Traffic (000 lbs)
Dulles	316,900	56.1%	148	114,057	122,259
BWI	248,280	43.9%	103	93,256	94,501
Total	565,180	100.0%	251	207,313	216,760

Assuming that air mail traffic levels correspond directly with truck capacity, the total air mail traffic for 1995 and 1996 was distributed by county-based O/D/areas. The top air mail traffic areas for both years are shown in Figure 13.

Future air mail traffic patterns will depend on growth in the use of expedited USPS products, the future patterns of available belly capacity, and the extent to which "air" mail is transferred to a surface distribution system. The Boeing Company projects that worldwide air mail traffic will average 3.4 percent annual growth from 1995 through 2010. Combined air mail traffic via Dulles and BWI averaged 6.1 percent annual growth from 1991 to 1996, but only 4.6 percent in the last year due to the shifting of certain BWI Priority mail markets to truck delivery. It is assumed that the Boeing growth rates represent a reasonable future growth pattern for air mail in the Washington-Baltimore region. The resulting projected market air mail traffic is 224.1 million pounds in 1997, 346.2 million pounds in 2010, and 483.6 million pounds in 2020.

Figure 13



A more detailed breakdown of air mail truck capacity and traffic by county-based O/D areas is included in Appendix C.

Regional Air Cargo Forecasts (1997, 2010 and 2020)

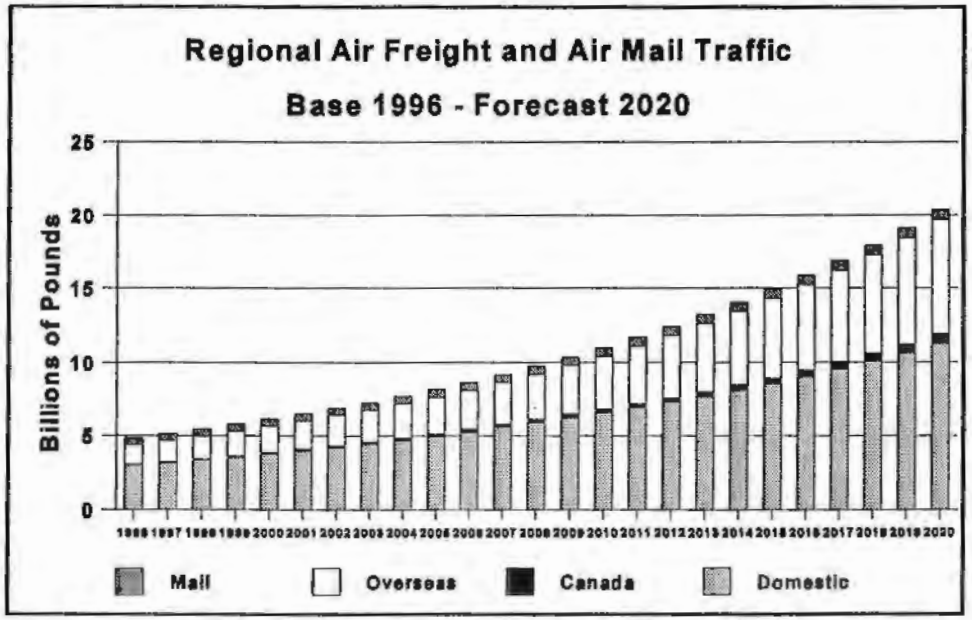
Once the consultant had estimated baseline (1996) and forecast (2010) air cargo demand for the region, total air cargo volumes for the years 1997 and 2020 were developed, using the 1996 to 2010 growth rates. Table 6 summarizes the regional market air cargo demand for the forecast years 1997, 2010 and 2020. Figure 14 displays air cargo traffic throughout the forecast period.

Total air cargo demand is projected to grow from 4.6 billion pounds in 1996 to more than 20.1 billion pounds in 2020. Total air freight demand is expected to grow from 4.4 billion pounds to 19.7 billion pounds. During this period, air mail should grow from a total of 217 million pounds to more than 483 million pounds. Appendix D contains a more detailed picture of these forecast figures, broken down by market area and market type.

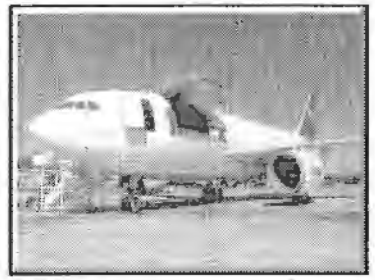
Table 6

Regional Air Cargo Demand				
(000 lbs)	**1996**	**1997**	**2010**	**2020**
Domestic	3,030.6	3,201.1	6,522.3	11,277.2
US-Canada	71.7	78.5	256.0	635.6
Overseas	1,291.6	1,391.9	3,677.6	7,766.1
Air Freight	4,393.9	4,671.5	10,455.9	19,679.0
Air Mail	216.8	224.1	346.2	483.6
Regional Total	4,610.7	4,895.6	10,802.1	20,162.6

Figure 14



V. REGIONAL AIR CARGO FACILITIES



V. REGIONAL AIR CARGO FACILITIES

Air cargo traffic has been expanding rapidly during the previous three decades. Most forecasts predict a continuation of this overall trend, placing pressure on the capacity of air cargo terminals and handling systems to process higher flows and provide an environment in which the users, the airlines, forwarders and brokers, and handling agents can enjoy a high level of service.

Air Cargo Terminal and Area Design

In the past, air cargo facilities were designed and located according to the predominant type of operation: belly freight on passenger aircraft. Cargo areas were placed near passenger terminals, often surrounded by passenger support and other users, without any significant expansion potential. Airport planners did not anticipate the high growth in air cargo traffic or the increasing importance of all-cargo carriers. Additionally, airport planners worked on planning assumptions which involved minimum dwell times for all-cargo aircraft on the ground. As a result, plans for dedicated air cargo aircraft parking aprons were based on aircraft constantly cycling through the ramp area.

Much has changed. As air cargo traffic has continued to grow faster than passenger and other uses, cargo areas have filled up. New cargo areas have been added incrementally, based on available land, often without adequate access, space, or coordination with other cargo areas. This situation has resulted in scattered arrangements of cargo buildings for many airports, a situation which constrains efficiency and results in conflicts with other users. At the same time, due mainly to the rise and dominance of the integrated air carriers, who collectively carry an estimated 60 percent of all air cargo traffic in the United States, aircraft spend most of the day sitting on the ground rather than in the air. As a result of these and other changes, many airports are now looking to develop new consolidated cargo areas which are better oriented to the needs of all-cargo operators.

Various factors relating to the manner in which business is transacted and the changing uses of air cargo have contributed to changes in the flow of air cargo and the design of the facilities in which the flows are processed. It is evident that the breadth of "air-eligible" products is increasing and the size of the average shipment is declining as the frequency of usage increases. As the volume of international shipments increases, different requirements in terms of processing and inspection arise. All of these characteristics affect the design and operation of the air cargo terminal.

The focus of air cargo handling at an airport is the air cargo terminal. These are typically stand-alone structures which may or not be part of the overall passenger terminal complex. There are typically three primary components of an air cargo terminal: the air cargo terminal building; the aircraft parking apron; and, the vehicular access, circulation, and parking areas. The terminal embodies a wide variety of spaces including offices, truck docks, access to the apron, build-up/breakdown areas, general and specialized storage areas, circulation areas for people, and equipment.

Where air cargo terminals were once viewed from the

airside perspective, the focus is now dominated by landside issues. At the same time, the widespread use of automated cargo handling systems has come into question. As a result, the designers of air cargo terminals have had to come to grips with such issues as truck access, vehicle staging and parking areas, and the phased introduction of automated systems and cross-dock transfer.

Air cargo terminals typically fall into one of two categories. The categorization is based on the degree of automated processing. Terminals with a low level of automation are usually smaller with a more open interior. In contrast, a terminal with a high degree of automation is larger and the interior space is highly organized and equipped with various machines to process the higher volumes and racks for multi-level storage.

Off-Airport Cargo Facilities

Off-airport facilities complement and supplement on-airport facilities with additional space for warehousing, shipment processing and intermodal transfer. Most airports, particularly the major cargo airports, have a limited amount of on-airport cargo space, mostly occupied by air carriers, for processing shipments to and from aircraft. In many cases, the majority of forwarders and brokers are located off-airport for one or more of the following reasons:

- facility space costs less and can be expanded more easily;
- space is available for longer-term storage;
- road access does not conflict with passenger activity; and,
- sites are better suited to general distribution activities including non-air related activities and road transfer to non-local airports.

The flow of air cargo often includes some storage or transfer at an off-airport site. Typical activities at off-airport sites include:

- accumulation of outbound shipments at a forwarder warehouse for consolidation and transfer to a local airport or transfer to a non-local airport via over-the-road carrier;
- accumulation of local freight at local cartage carrier's warehouse for consolidated drop-off at the airport;
- transfer between over-the-road and local pickup and delivery truck services; and,
- storage of cargo for processing (e.g., foreign trade zone) or distribution (e.g., parts warehouse).

Most air-related cargo facilities are located in industrial areas near the airport, although some facilities may be located farther away based on non-air activities or proximity to the highway system. (Many forwarders and brokers handle both international air and ocean shipments and must locate to best serve both markets.)

Distribution patterns for air mail provide a good example of the differing roles of on- and off-airport facilities. Most airports with significant air mail traffic have an on-airport air mail center which is used to breakdown inbound shipments dropped off by the airlines. Consolidated inbound shipments from different airlines are sorted at the airport and transferred by truck to various local postal centers, where they are then re-sorted for final delivery.

Outbound air mail traffic is handled by a similar process in reverse. One of the mail centers may be located near the airport for handling local air mail traffic. The two facilities are typically not combined due to constraints on airport space and lease costs, so airport facilities are limited to air transfer activities.

Airport Ground Access Systems

The vast majority of air cargo requires some ground transfer, making access between air cargo facilities and shippers/consignees a key aspect of system efficiency. Ground access for cargo airports typically include on-airport roads, airport entrances and gates, local access roads and highway systems.

On-airport roads provide access between cargo areas and other airport areas and exterior road systems, as well as handling internal vehicle traffic for cargo areas. These roads are typically built, maintained and managed by the controlling airport authority. Most entrances to airport cargo areas are not controlled unless airfield access is required.

Local roads provide access to off-airport cargo locations, local shippers/consignees, and highways connecting to more distant points. These are typically state or local roads, particularly those which connect with off-airport cargo areas. Some airports have direct highway access, but many require some transit on a local road.

Major problems for both on-airport and local roads include:

- congestion and conflicts with passenger and other airport uses;
- difficult connections between cargo facilities (both on- and off-airport); and,
- difficult handling for larger tractor-trailer combinations.

On-airport roads can have the additional problem of conflicts within a cargo area, while local roads are often not designed for truck use, particularly for new business areas which might contain air forwarders and brokers.

Access to regional highway systems is a key factor in determining the market reach and competitiveness of cargo airports, which can capture shipments originating or terminating within 500 miles and beyond. A key factor in the efficiency of highway access is congestion around urban centers due to commuter passenger vehicle traffic. The effect of highway congestion on air cargo operations depends on delivery schedules and the type of flow. A substantial amount of long-distance truck activity occurs at night, while expedited pickup and delivery schedules coincide with local rush hours. The development of new connector highways are often intended to both relieve highway congestion and divert non-local vehicle traffic away from urban centers.

Air Cargo Facilities Review

The second task for which the consultant was responsible was a review of all current air cargo facilities at Dulles and BWI Airports. The analysis also included an examination of current and planned facilities, as well as an estimate of the capacity of the facilities, plus an examination of the air mail centers at both airports.

Baltimore/Washington International Airport

BWI Airport is located nine miles south of the City of Baltimore and 30 miles north of Washington, D.C. It is a designated international airport. Passenger and all-cargo services link BWI Airport to domestic and international destinations. The U.S. Customs Service, U.S. Department of Agriculture, Food & Drug Administration, and U.S. Fish & Wildlife Service have offices and staff permanently assigned to BWI.

Between 1991 and 1996, BWI Airport averaged 2.6 percent annual growth in air cargo tonnage. In 1991, a total of 327 million pounds of air cargo was handled at BWI. The comparable figure for 1996 was 371 million pounds. The 1996 volume reflected a 14.0 percent increase over 1995. According to the Maryland Aviation Administration (MAA), a total of 276.7 million pounds of air freight were handled at BWI in 1996. International air freight accounted for 10.2 percent of this total. The overall 1996 air freight volume was 19 percent above the 1995 level. International air freight expanded by 24.1 percent between the two years. In addition, a total of 94.5 million pounds of air mail were processed at BWI in 1996. Air mail volume increased by 1.3 percent between 1995 and 1996 and 3.0 percent per year from 1991.

BWI has scheduled service by 14 combination air carriers and seven all-cargo air carriers plus various charter services. Five companies provide aircraft ground handling services.

Existing On-Airport Cargo Facilities

On-airport air cargo facilities are operated by the State of Maryland, with Buildings D and E privately-owned and the others state-owned. The air cargo facilities are located in the northeast corner of the airport on 65 acres. It is bordered to the east by runway 15L-33R, to the north and west by access roads, and to the south by the international passenger terminal. Figure 15 is a map of the airport layout.

The cargo complex, which is composed of eight buildings, is divided into two primary areas. The "Main Cargo Complex" is composed of five terminals (Buildings A-E) with a combined area of over 228,000 square feet, including an estimated 172,000 square feet of warehouse space used for cargo. This area contains facilities for the all-cargo carriers, U.S. Customs, the U.S. Postal Service, several combination carriers and various cargo service companies (forwarders, brokers and reefer warehouse). Office space for brokers and other service providers is provided in Building B.

There are three additional cargo buildings immediately adjacent to the international wing of the passenger terminal on Elm Road ("Elm Road Terminals"). These buildings (107, 111 and 112) have a combined area of 73,000 square feet, 6,600 square feet of which is devoted mostly to combination carriers. Appendix E contains a listing of the cargo buildings and occupants as of July 1996.

Table 7 presents a summary of the BWI on-airport cargo space. The air cargo buildings are almost completely full, although there is usually 5-10,000 square feet of unused warehouse space according to airport personnel. (In July 1996, vacant space exceeded 13,000 square feet, 60 percent of which was warehouse space.)

Figure 15

Baltimore/Washington International Airport Layout

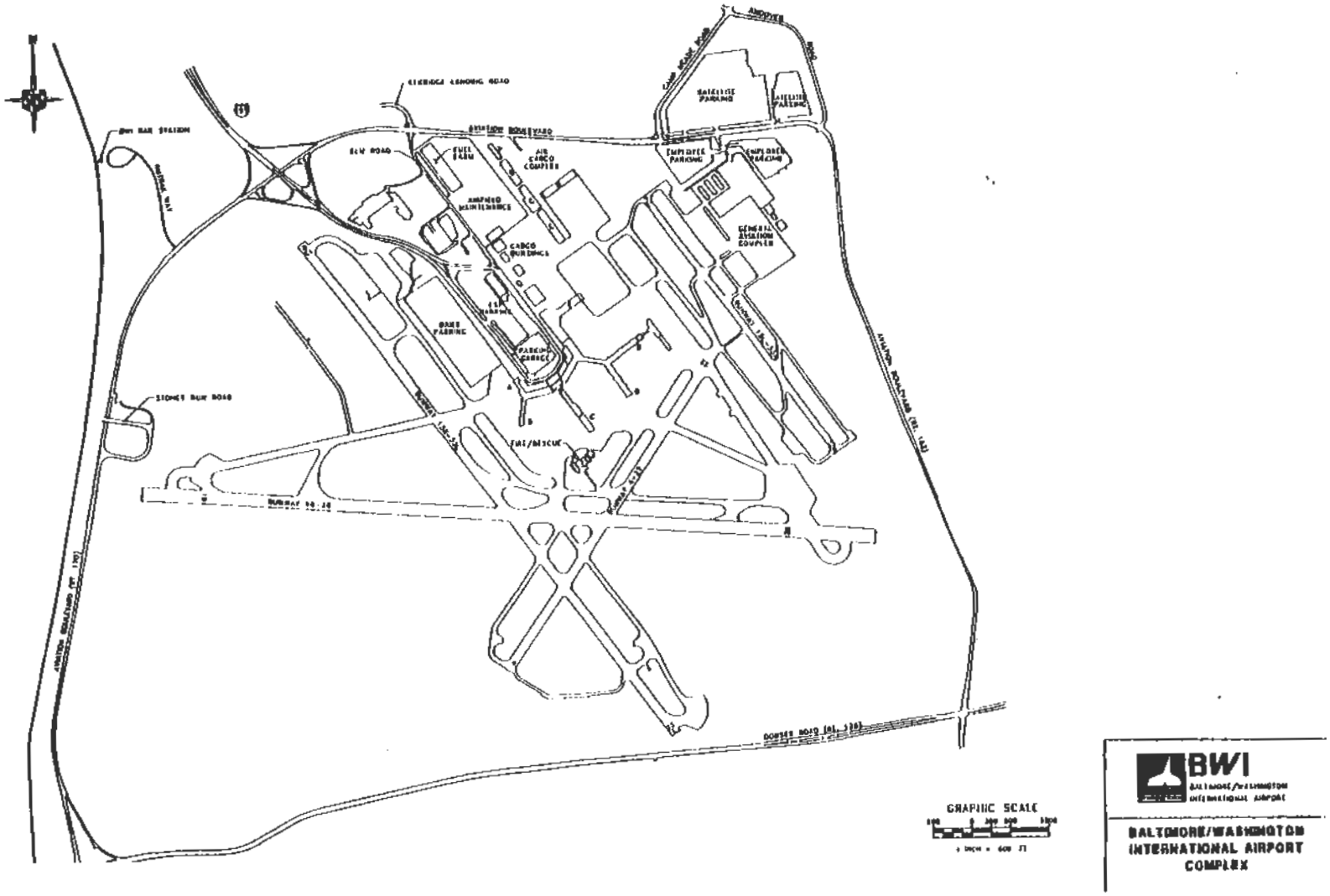


Table 7

BWI On-Airport Cargo Space		
Location	Warehouse (sf)	Total (sf)
Commercial (A-E)	127,744	177,293
Elm Rd. Buildings	6,572	6,572
Cargo Subtotal	134,316	183,865
USPS (Bldgs C & E)	40,596	45,796
Fire Rescue (Bldg B)	4,102	5,174
Elm Rd Non-Cargo	0	66,623
Total	179,013	301,458

The complex is served by a 740,500-square-foot (17-acre) dedicated air cargo aircraft apron. There is 24,000 square feet of cold storage space on the airport. There is a general purpose foreign trade zone which encompasses 70,000 square feet of airport warehouse and almost 100,000 square feet of off-airport space.

On-Airport Air Cargo Facility Development Plans

Most of the currently planned facility and other cargo improvements are based on a master plan completed in 1996. The construction of Building F (across from Building D) was due to be completed in 1997. This will add approximately 62,500 square feet of processing space to the cargo complex. The building will be aligned perpendicular to the runway and have truck-high dock doors on each side to permit cross-dock handling. The distance to the runway will be about 200 yards. The new space is projected to be fully occupied when available.

Because of the lack of space within the cargo area, a "midfield" cargo complex has been proposed. The midfield facility will initially comprise two buildings (G and H) with approximately 120,000 square feet of space. These buildings, which will be tailored to all-cargo airlines, are expected to be in place by 1999, according to MAA. Buildings I and J would each add another 60,000 square feet of cargo space and are expected to be required by 2003 and 2007. There is an area being saved for a new ramp for the midfield site, and the airport is also working on a new parking ramp to handle excess cargo and charter flights.

The availability of new improved cargo facilities will allow the conversion of some older buildings. Conversion of Building A as an MAA warehouse is under consideration when the midfield complex is opened. This would reduce the air cargo terminal space by 14,025 square feet. Current plans predict that the cargo buildings on Elm Road will be torn down at the same time to accommodate the expansion of the international passenger terminal. This conversion would reduce cargo facility capacity by 73,000 square feet, although much of this space is not currently used for cargo handling. It is expected that this will not occur until 1999.

Off-Airport Cargo Facilities

The BWI Air Cargo Directory lists 105 freight forwarders, many of which handle air freight at downtown or Port of

Baltimore facilities. Table 8 shows the locations of 53 firms on or near the airport, the largest number of which (18) were located just south of the airport in BWI Commerce Park. Another nine firms are located just to the west of the airport, on Dorsey Road. In addition to the ten on-airport facilities, forwarders are also concentrated to the northeast in Linthicum (seven, plus the local post office) and east/southeast in Glen Burnie (eight). One additional forwarder is located in Jessup to the southeast, an area responsible for a large share of the region's fresh food wholesaling.

Table 8

Freight Forwarders Near BWI Airport		
Location	**# of Firms**	**Top Industrial Parks**
On-Airport	10	
South (Hanover)	18	BWI Commerce Park
Southwest (Harmans)	6	Balt Commons Business Park, Commons Corp Cntr
West (Parkway)	3	Parkway Center
Northeast (Linthicum)	7	Nursery Rd Business Park, Oregon Business Park
East/Southeast (Glen Burnie)	8	Cromwell Business Park
Other (Jessup)	1	MD Wholesale Food Cntr B-W Industrial Park
Total	53	

The location of customs brokers is very similar to that of forwarders, except for a higher on-airport concentration due to the existence of the customs broker office building. Of 18 brokers with a BWI area location, five are located on-airport and five are in the south industrial area. No other area has more than two firms.

Transfer facilities for the air cargo trucking companies are also located in these same areas which provide quick access to airport facilities for sweep operations.[15] Many trucking companies which do not specialize in air cargo are concentrated at the Route 100/Route 1 interchange near I-95. This area includes several large retail distribution centers and truck intermodal facilities which serve northeast and local markets by way of interstate highway routes. As with the forwarders and brokers, many cargo service firms not specializing in air cargo are located in downtown Baltimore or near the port.

BWI Air Mail Center

The US Postal Service occupies nearly 46,000 square feet of space in the cargo complex with the main sort facility located in Building C. The BWI postal facilities handle air mail for Maryland, the District of Columbia and southern Pennsylvania. International mail is trucked from BWI Airport to Dulles Airport for air carriage. Express mail is handled by a daily "Eagle" dedicated USPS freighter, which also serves Dulles. First Class/ Priority mail is moved primarily on passenger aircraft under negotiated contract rates. Passenger carrier service is supplemented by ad hoc use of excess all-cargo

15. Trucking firm locations were based on the interviews and Air Cargo, Inc. data, rather than the directory listing.

capacity and an increasing use of direct truck service.

The BWI Air Mail Center (AMC) is designed to quickly transfer air mail between the air carriers and trucks connecting to regional mail centers. Inbound mail is brought bagged in carts by the carriers to an open area behind the facility, some of which is covered by a canopy. The mail is then sorted by destination and transferred directly to the trucks. There is no automated "induction" system for sorting the inbound mail. Outbound mail arriving by truck is first sorted by carrier and flight, consolidated into trays and sacks, and then placed in the open area for pickup by the carrier. The open air operations in bad weather are difficult for carriers not under the canopy, and there is often congestion among the carriers handling their mail shipments.

The BWI facility processed 94.5 million pounds of mail in 1996 and is considered to be near full capacity. USPS is currently implementing a program to convert some First Class mail from air to truck carriage in low- to medium-distance markets. For the BWI AMC, Phase I was completed in 1996 and included mail between the local market and Richmond, Atlanta, and North and South Carolina. In 1997, mail to and from Dallas, Florida, and the Midwest (Chicago, Detroit, Indianapolis, Milwaukee and Minneapolis) will also be converted to ground transport. The only remaining markets using direct air service will be western markets beyond 500 miles. The objective of the program is to reduce both transport and facility costs. USPS is currently looking for a non-airport truck facility in the vicinity of I-495. The impact on the air mail center is shown by the low growth in total mail handled from 1995 to 1996 - 1.3 percent compared to 7.7 percent and 10.3 percent in the two previous years.

During the Christmas season, air mail volumes and truck movements triple. During this period, parking becomes a critical issue, particularly as there is difficultly in finding free areas to spot trailers. During normal nighttime sort periods for both USPS and the integrated carriers, the flow of vehicle traffic within the cargo area is often congested with inbound and outbound trucks, shifting trailers and shift employee vehicles all moving about. USPS is trying to shift some of the nighttime activity to the daytime by running mid-day pickups from the regional mail centers, rather than waiting until the final cutoff time in the evening.

The major problems with the facility include congestion in the carrier sort area and some problems with the available dock doors which are old and sometimes do not function properly or match with the trucks used. The AMC manager indicated that the shift to more surface truck traffic should relieve any space-based congestion, although there are sometimes special mailings for which additional space would be useful. In fact, the secondary area leased by the USPS at BWI is used mostly for peak Christmas activity and special mailings, and otherwise is not utilized. Another problem that was mentioned is the lack of parking space for cargo area employees, particularly during the peak season.

Current Operating Efficiency of Freight Facilities

The 1996 draft Environmental Assessment of cargo facility expansion includes the following comments on conditions in the cargo area:

> "The current cargo apron facilities (which provide airfield access) are becoming constrained for

existing users, as well as potential new tenants... Considering that six of the nine positions on the cargo apron at Building E do not have direct apron frontage, and that available aircraft parking positions in portions of the existing Cargo Complex are sometimes used for passenger aircraft overflow from the terminal area, there is a potential for short-term apron deficiencies." (Page 3)

"The landside facilities... are also becoming constrained. A key factor is the location of both the Main and Elm Road Cargo Complexes, which offer little room to expand... Also due to site constraints, there is insufficient maneuvering area for efficient operation of truck and private vehicle traffic in the Main Cargo Complex." (Page 3)

Development plans for BWI's cargo areas are intended to provide additional capacity as it is required. In general, the users interviewed indicated satisfaction with the current facilities with the understanding that additional facilities are being developed to allow for expansion. Some of the problems cited included:

- lack of ramp access at some of the cargo buildings for all-cargo operators;
- non-standard truck docks and lack of cross-dock transfer capabilities;
- lack of employee parking due to high utilization of cargo areas and use by passenger employees;
- congestion during peak nighttime operations for integrated carriers; and,
- difficulty in pickup/delivery of counter shipments.

The potential development of a mid-field complex which would be better suited and adaptable for the all-cargo carriers resulted in both positive and negative responses. The ability to expand and consolidate activities, improve access to the ramp area, expand aircraft parking capacity, and add desired facilities (e.g., fuel tanks) were features which met with positive approval. One manager indicated a reluctance to move from his current facility with good access to both cargo and passenger carriers, unless there is a significant improvement in efficiency. Overall, the cargo operators were satisfied with the current facility situation, but anticipated that cargo growth will require some expansion to avoid congestion.

Facility Capacity Estimate

As of the end of 1996, the eight buildings at BWI, Buildings A-E, plus the three buildings on Elm Road, had a combined maximum available area of 301,458 square feet. MAA estimated a total capacity of 402 million pounds for freight and mail combined, based on the current utilization and productivity of these cargo areas. Table 9 illustrates these estimates. Assuming that capacity can be allocated between freight and mail based on the distribution of cargo weight (i.e., the same utilization rates for both cargo types), the MAA capacity estimates were used to derive average capacity per utilized cargo space of 1,629.7 pounds per square foot for freight and 2,235.0 pounds per square foot for mail. (As indicated, capacity utilization was 92.3 percent for both types of facilities in 1996 based on actual cargo traffic.)

The estimated capacity factor for freight of 1,629.7 pounds per square foot is at the low end of the "automation" range of 1,000-3,600 pounds per square foot. This coincides with the observed facility conditions.

The mail capacity factor of 2,235.0 pounds per square foot reflects a higher use of automated systems, as well as the use of open space for mail processing. These factors were considered to represent the baseline level of capacity for BWI. The MAA estimates of current capacity of 402 million pounds could conceivably be expanded to 516.5 million if all of the cargo area space was used either for freight or for mail handling (an option which may not be feasible).

Table 9

1996 BWI Air Cargo Terminal Capacity			
	Total	**Freight**	**Mail**
Total Cargo Traffic (000 lbs)	371,151	276,650	94,501
Total Cargo Area Space (sf)	301,458	255,662	45,796
Cargo Space in Use (sf)	229,661	183,865	45,796
Total Capacity (000 lbs)	402,000	299,644	102,356
Capacity Utilization	92.3%	92.3%	92.3%
Capacity per Cargo Use Area (lbs/sf)	1,333.3	1,629.7	2,235.0

MAA has conducted a number of recent studies focusing on the need to increase the air freight processing capacity at the airport. A new building is currently under construction with a planned opening by the middle of 1997. Preliminary plans have been prepared for additional cargo terminal space in the new "midfield" area. Concurrently, there are plans to convert Building A to a warehouse and to tear down Buildings 107, 111 and 112 to make way for the long-term expansion of the international passenger terminal. As a result of these plans, the air freight capacity at BWI is expected to increase in order to accommodate the expected increase in air freight volume. It is assumed that the new buildings will be designed with a "medium" level of automation, and will have a capacity of 2,000 pounds per square foot.

The plans at BWI for air cargo terminals envision the expansion from the current level of 183,865 square feet to over 459,000 square feet as of 2008. Table 10 indicates the expected air cargo capacity at BWI as these plans are realized. Based on the estimated capacity factors (1,629.7 pounds per square foot for existing facilities and 2,000 pounds per square foot for new buildings), the annual air freight processing capacity at BWI should increase from the current level of 299.6 million pounds to 858.1 million pounds, a 186 percent increase. The capacity of both existing and planned facilities could presumably be expanded from 80 to 121 percent with full automation.

The future capacity of BWI mail facilities will primarily depend on future plans of the US Postal Service to convert air mail to surface transportation. Based on savings of between up to 30 cents per pound and the immediate success of the truck hub at Indianapolis, it is quite possible that the air carriage of first class mail might begin to decline across the United States. With a higher focus on truck haulage of mail, any expansion of mail facilities will occur off-airport. The current level of mail processing capacity of 102 million pounds can therefore be varied based on demand, with freight capacity adjusted as well.

The current air cargo ramps at BWI cover 740,500 square feet. There are two ramp areas. One parking

Table 10

BWI Air Frieght Processing Capacity Annual Estimates							
	Terminal Space (Square Feet)						
	1996	1997	1998	1999	2000	2004	2008
Buildings A-E	177,293	177,293	163,258	163,258	163,258	163,258	163,258
Building F	0	28,000	56,000	56,000	56,000	56,000	56,000
Building G/H	0	0	0	60,000	120,000	120,000	120,000
Building I	0	0	0	0	0	60,000	60,000
Building J	0	0	0	0	0	0	60,000
Elm Road	6,572	6,572	6,572	6,286	0	0	0
	183,865	211,865	225,830	285,544	339,258	399,258	459,258
Estimated Capacity (Million Pounds)	299.6	355.6	388.8	503.4	618.1	738.1	858.1

apron is adjacent to Building D, while the second is between Building E and Elm Road. Each ramp is served by one taxiway throat. The ramp adjacent to Building D is large enough to handle aircraft up to the size of a Boeing B-747, while the other parking apron is more ideally suited to handle small and medium sized freighters.

Based on a study of thirty eight U.S. airports, the average annual cargo capacity of dedicated air cargo ramps is 936 pounds per square foot of ramp, with the range within one standard deviation of 530 and 1,340 pounds per square foot. If all of the air freight were carried on freighter aircraft, the required ramp area, based on the 1996 freight traffic volume of 276.7 million pounds, would range between 206,500 and 522,100 square feet.

Based on this calculation, the existing ramp has an effective utilization level of between 28 percent and 70 percent. However, continued growth in cargo-related flight activity, the increased need by the integrated air carriers to stage aircraft on the ramp for extended periods of time, the proximity of the ramps to the expanding passenger terminal, the limited access to each parking apron via a single taxiway throat, and the lack of direct through-terminal access to the aircraft parking aprons, combine to limit the long term use of the existing ramp.

Washington Dulles International Airport

Washington Dulles International Airport is located 26 miles west of Washington, D.C. in northern Virginia, straddling the border between Fairfax and Loudoun Counties. It is a designated international airport with international and domestic cargo flights to hundreds of markets. All U.S. border agencies, except the U.S. Fish & Wildlife Service, provide on-site offices and personnel to serve international air cargo traffic at the airport.

In 1996, a total of 558 million pounds of air freight was handled at Dulles. This included 179.9 million pounds (32.2 percent) of international freight. An additional 122.3 million pounds of air mail also passed through the airport in 1996. Between 1995 and 1996, total air freight volumes increased by 5.4 percent. International freight traffic experienced an increase of 7.6 percent. In the same period, air mail experienced growth of 7.2 percent.

Dulles has over 200 weekly international flights and 300 daily domestic flights. In 1996, direct cargo service was provided by 21 combination airlines (12 foreign-flag), four integrated air carriers, and seven commuter carriers. In all, over 140 companies provide air cargo services for the airport.

Existing On-Airport Cargo Facilities

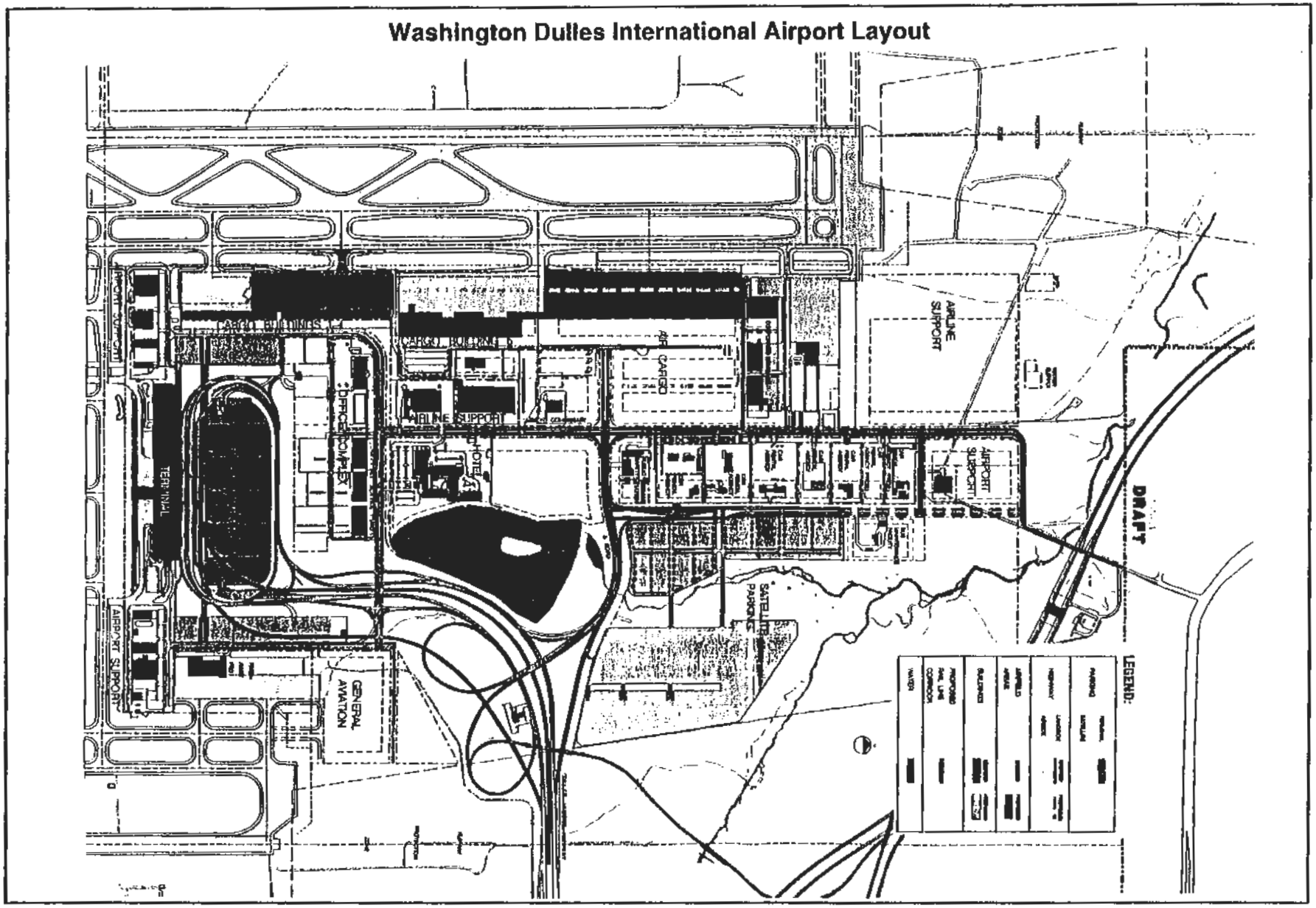
On-airport air cargo facilities are owned by both the Metropolitan Washington Airports Authority (MWAA) and by a private developer. Total cargo building space is almost 400,000 square feet in two main cargo areas, with 295,000 square feet active in cargo operations in 1996 (excluding vacant areas). Buildings 1-4 were constructed between 1962 and 1982 and are owned and operated by MWAA. Total building space is 113,360 square feet of which 74,600 square feet is currently used for cargo operations. Top cargo users in this area include carriers, forwarders, and Air Cargo Inc., which operates a warehouse for selected combination carriers. This cargo area is located directly west of the passenger terminal and primary parking area. Figure 16 is a map of the airport layout.

Building 5 opened in 1993 and is owned and leased by the West Group. This building is located north of the original cargo area and contains 283,000 square feet of space. Carriers are the primary leasers in this building. A ground handling agent, a trucking company and U.S. Customs also lease space in Building 5. A listing of the cargo buildings and occupants, as of April 1996, is contained in Appendix E. Table 11 presents a summary of the Dulles on-airport space.

Table 11

Dulles On-Airport Cargo Space		
Location	**Cargo (sf)**	**Total (sf)**
Building 1	13,664	26,124
Building 2	24,782	27,882
Building 3	18,500	32,700
Building 4	17,655	26,655
Building 5	282,709	282,709
Total	375,310	396,070

Figure 16


Washington Dulles International Airport Layout
AIRLINE SUPPORT
AIRPORT SUPPORT
AIRLINE SUPPORT
AIRPORT SUPPORT
GENERAL AVIATION
SATELLITE PARKING
DRAFT
LEGEND:

There is a total of 686,000 square feet (15.75 acres) of dedicated air cargo aircraft aprons. There are two dedicated parking aprons. The original one, which serves Buildings 1 through 4 covers 256,000 square feet. Building 5 is served by its own ramp which covers 430,000 square feet.

On-Airport Air Cargo Facility Development Plans

Future development plans include two additional cargo buildings (Buildings 6 and 7) to be constructed at the north end of the present cargo area, when demand warrants. Building 6 is proposed to be constructed immediately north of Building 5, and the necessary infrastructure is already in place. The program design suggests that this building should have 150,000 square feet of space. Building 7 is currently planned to be located adjacent to Building 6 and have the same basic design.

Long-term airport plans include additional cargo buildings located south of the future crosswind runway. Access would be via Route 50 with no planned direct connection to the current cargo area. This option would provide a cargo area which does not conflict with other airport users, can be purpose-built to existing demand, and which has greater expansion potential. The feasibility of this option will depend on both the continued expansion of all-cargo operations and the willingness of these carriers to relocate away from the main airport entrance and the facilities of the combination carriers. The ability to shift cargo operations to a new airport site would free up existing facilities for passenger and other development.

Off-Airport Cargo Facilities

Most freight forwarders and customs brokers maintain offices off the airport. In 1994, 41 forwarders/brokers had locations in the airport area, of which 11 were on-airport. This pattern has not changed significantly since 1994 based on a comparison of cargo directories. The primary concentration of off-airport facilities is north of the airport, west of Route 28. A total of 15 firms are located there in the Concorde Industrial Park, North Pointe, and Loudoun Business Park. Another nine firms are on the other side of Route 28 in the Sterling Park Business Center, the Commonwealth Center and other business complexes. The remaining firms within the local area are at business parks to the south. Trucking and other cargo-related firms are located in these same business areas.

As is the case at BWI, these companies have chosen to locate off-airport because of cost savings and the ability to better design and expand facilities suited to their individual operations. However, these off-site locations contribute to increased truck and automobile traffic as shipments and documents are collected and delivered to the air carriers at the air cargo terminals.

Dulles Air Mail Center

The Dulles Air Mail Center (AMC) is located west of the passenger terminal, to the south of Building 1, and adjacent to the airside gate which must be transited for truck access. The facility serves the D.C. metro area (including parts of Maryland) plus Charlottesville, Lynchburg, Roanoke, Richmond, and Norfolk in Virginia. All domestic air mail for Dulles flights is handled through

this facility except for some direct truck service to carrier terminals from regional markets (e.g., Harrisburg, Pennsylvania).

All international mail is processed off-site at the Dulles Pickup & Delivery Center (P&DC) approximately four miles from the airport in the north cargo area. The Department of State has a special location at that facility for handling their mail. The transfers between this facility and the AMC total 32 inbound and 30 outbound trucks each day. Prior to construction, there was some interest in locating the local P&DC facility on-airport, but the expense and space requirement was too high. The daily truck traffic between this facility and the airport has been greatly affected by the opening of the airport's north gate.

As in the case of BWI, the Dulles AMC is served by the dedicated USPS air network for Express Mail and passenger carriers for other types of air mail. Over 122 million pounds of mail was handled via the airport in 1996, including 16 million pounds of international traffic. An increasing amount of air mail is being handled exclusively on trucks, similar to general trends in the air freight industry. There does not appear to have been a significant shift in Dulles mail traffic to surface handling as was evident for BWI.

The facility has 12 docks, nine of which are truck-high. The access to the AMC is through the airside gate beside Building 1. This delays the movement of vehicles as they must be escorted over a short distance. This is the primary efficiency problem at present. There is a total of 76 daily trucks on a normal weekday, most of which occur during non-rush hours. Most of the trucks are directly loaded at the AMC docks except for those bound for the local P&DC and Northern Virginia postal center in Merrifield. This mail is handled to and from trailers which are dropped and picked up.[16]

The exact size of the AMC was not available, but assuming a processing throughput of 2,100 pounds per square foot (based on experience at BWI), the total space should be about 50,000 square feet. There was no indication from the manager that facility capacity was a problem, although a visual inspection indicated a high utilization of space.

Current Operating Efficiency of Freight Facilities

In a 1994 cargo market study, users of Dulles cargo facilities indicated general satisfaction with airport facilities and the ability to handle cargo activity.[17] In the limited interviews for this study, similar results were found. Primary areas of concern included:

- Cargo Facility Parking - There is a lack of parking spaces for cargo facility employees, trucks, and counter customers. At Building 1-2, parking spaces are used by passenger terminal employees and construction workers. Building 5 is also tight on parking with excess trailers being

16. "Drop and pick" patterns consist of an empty trailer parked near the terminal and shifted to the truck dock for loading. The loaded trailer is then shifted back to a parking area, where it is picked up by a tractor which typically brings another trailer, which is either loaded or empty. This procedure maximizes the utilization of truck tractors and allows cargo handling to be better scheduled without holding up the tractors.

17. Domestic and International Air Cargo Market Study for Washington Dulles Airport, Leeper, Cambridge & Campbell, Inc., June 3, 1994.

placed in the new cargo development area. The congested parking situation sometimes makes it difficult to maneuver larger tractor-trailers around the terminal areas and delays transfer operations as drivers must seek parking;

- Passenger Terminal Parking - A small but vital element of cargo traffic consists of expedited "hot shot" shipments handled by the passenger airlines directly at their counters in the passenger terminal. The local pickup and delivery carriers have difficulty in finding parking which allows them to meet very stringent delivery standards (perhaps within 60-90 minutes of flight arrival). These carriers have to use two employees to handle this market - one to stay with the car and the other to go to the counter. Designated parking would be helpful;

- Loading Docks - Several users indicated problems with matching their truck equipment with the available docks, although one noted that this situation is common for other types of general transfer facilities. One tenant indicated a desire for a truck restraint system and roller ball transfer plates for handling unit-load devices (i.e., containers and pallets);

- Airfield Cargo Handling - The combination carriers must transfer cargo traffic between their cargo facilities and aircraft at the passenger terminals. The mid-field terminal, in particular, lacks adequate space to accumulate and handle shipments prior to loading. This results in a lot of double handling of freight as it is shifted several times prior to loading, and also requires more labor to shuttle cargo between the terminals in a short time frame. Access roads to the airfield have recently been upgraded and users indicated an improvement in transfer operations;

- Access Between Terminals - Air cargo truckers typically must call at both cargo areas during their sweep and P&D routes, and there is no direct road between them.[18] The lack of a direct link between the two cargo areas has created circulation problems for trucks. The intersection at East-West Service Road and North-South Service Road, which is the main route, is not suitable for tractor-trailer units, especially when making a right-hand turn onto the East-West Service Road;

- Building Design - One user indicated that the cargo buildings were not optimally designed for transfer operations. The traditional air cargo terminal did not allow for full automation and cross-dock operations; and,

- Truck Processing Times - Truckers are required to fill out forms regarding identification of shipments and shippers. This process, which is in response to FAA requirements for increased security, add to the processing and wait time of the trucks and hence consume valuable parking and staging

18. Air freight is often picked up or delivered to the airport by local trucks which "sweep" multiple terminals during a single trip. Local pickup and delivery (P&D) of air freight may be directly to or from the airport terminal or via an intermediate stop at a truck terminal or forwarder/broker warehouse.

areas. One user questioned the value of this additional paperwork.

In general, Dulles cargo users are satisfied with the current efficiency of the cargo facilities, but recognize that increased throughput will require capacity expansion to maintain a competitive level of efficiency.

Facility Capacity Estimate

As of the end of 1996, the five cargo buildings at Dulles had a combined maximum available area of 396,070 square feet, of which 357,310 square feet were in cargo use. (This total excludes the air mail facility which is handled separately.) Table 12 summarizes the available space and the associated capacity estimates. The capacity estimates were calculated by applying assumed utilization levels for Buildings 1-4 (90 percent) and Building 5 (75 percent) to 1996 freight traffic levels. The appropriate freight traffic volumes musf be adjusted for traffic which does not pass through the terminals. There is a significant amount of cargo which is directly transferred between domestic and international flights, most of which is part of the "Touch-N-Go" program instituted by United Air Lines. Approximately 12 percent of the total air freight volume handled by United at Dulles passes through this program which means that it is never handled in the cargo terminal. In 1996, United handled about 235 million pounds of air freight, or 42 percent of the airport total. Air ramp transfer volumes are estimated at 27.9 million pounds for Building 5 carriers.

After removing the estimated "Touch-N-Go" program freight traffic, the cargo traffic which passed through the five cargo terminals in 1996 was 525.1 million pounds.

Based on the area currently devoted to air freight processing, fhe theoretical capacity of fhe existing air cargo terminals is 676.3 million pounds of air freight on an annual basis. This level could reach 738.3 million pounds if all of the available facility space was utilized for cargo operations.

Table 12

1996 Dulles Air Freight Terminal Capacity

	Bldgs 1-4	Bldg 5	Total
Freight Traffic (million lbs)	107.3	445.7	553.0
Adjusted Freight Traffic (million lbs)	107.3	417.8	525.1
Estimated Utilization	90.0%	75.0%	77.6%
Facility Capacity (million lbs)	119.2	557.1	676.3
Cargo Space (000 sf)	74.6	282.7	357.3
Capacity Factor (lbs/sf)	1,598.1	1,970.7	1,892.9
Maximum Cargo Space (sf)	113.4	282.7	396.1
Maximum Capacity (million lbs)	181.2	557.1	738.3

Based on these capacity estimates, capacity factors (pounds per square feet) were calculated for both cargo areas. Buildings 1-4 had a capacity factor of 1,598.1 pounds per square foot, while the newer Building 5 had a factor of 1,970.7 pounds per square foot. These throughput levels are below the average of the standard aufomation range of between 1,000 and 3,600 pounds per square foof for air cargo ferminals. This reflects the

overall low level of automation and the limitations of the low ceiling heights (in Buildings 1 through 4).

Space has been identified for the expansion of cargo terminal space. The primary location of the additional cargo terminal area is to the north of Building 5. In the longer-term, additional space has been identified to the south of the future crosswind runway. The current plan envisions the construction of a cargo terminal, to be called Building 6, of about 150,000 square feet. Building 7 is tentatively planned to be the same size.

Table 13

Dulles Air Freight Processing Capacity Annual Estimates				
	Terminal Space (Square Feet)			
	1996	1997	2000	2008
Buildings 1-4	74,600	74,600	74,600	74,600
Building 5	282,700	282,700	282,700	282,700
Building 6	0	0	150,000	150,000
Building 7	0	0	0	150,000
Total	357,300	357,300	506,300	657,300
Estimated Capacity (Million Pounds)	676.3	676.3	971.9	1,267.5

Table 13 summarizes the annual freight processing capacity at Dulles, with the addition of these two cargo terminals assuming the same processing capacity as Building 5. Capacity is estimated to increase to over 1.2 million pounds by 2008. As the potential volume could double in the next ten years, the existing road and parking system for the cargo area could be severely strained.

Capacity for the air mail facilities is estimated at 132.5 million pounds based on the assumption that current utilization is equivalent to the 92.3 percent estimate developed for BWI. It is assumed that capacity can be expanded to keep pace with projected demand.

With the increased use of direct on-ramp aircraft-to-aircraft transfers, the maximum cargo capacity at Dulles can be higher than this estimate. Another avenue to increase the effective cargo capacity at Dulles is the direct transfer of containerized freight between trucks and planes either on the dedicated air cargo parking aprons or through the terminals. In either case, the long-term capacity constraints of the existing and planned air cargo terminals can be avoided. However, the pressures on the road and parking system serving the air cargo complex will only increase, which in turn could lead to congestion related delays and added costs to air cargo shippers and service providers at Dulles.

The two dedicated air cargo aircraft parking aprons at Dulles cover a combined 686,000 square feet (15.75 acres). The smaller ramp, which is adjacent to Buildings 1 and 2, covers 256,000 square feet and is served by one taxiway throat. The larger ramp, which is adjacent to Building 5 covers 430,000 square feet and is also served by one taxiway throat. The former ramp can handle up to DC-8F sized aircraft, while the latter aircraft ramp can handle up to B-747F size aircraft. There is land available to extend the smaller ramp along the airside of Buildings

3 and 4. Any parking apron extension could be linked directly to the airport's runway and taxiway system by one or two taxiway throats.

As previously mentioned, the range of cargo throughput capacity for dedicated air cargo aprons is between 530 and 1,340 pounds per annum per square foot. If all of the air freight handled in 1996 at Dulles were carried on all-cargo aircraft, the estimated ramp to handle this volume would have ranged between 416,420 and 1,052,830 square feet, or an average of 596,154 square feet.

However, unlike many airports in the United States, a significant proportion of air freight volume is carried in passenger aircraft. This reflects the dominance of United at Dulles and the presence of numerous foreign-flag carriers which only operate passenger aircraft. If we assume that the U.S. integrated air carriers handle about 60 percent of the domestic air freight at Dulles, then the required dedicated air cargo ramp area would range between 97,657 square feet and 246,906 square feet. Based on this calculation, the available dedicated cargo apron had an effective utilization level of between 14 percent and 36 percent.

Ground Access Systems

Access to airports by shippers, consignees, and airport workers is essential. Fast and efficient linkages to cargo airports is a key consideration in industrial locations and the ability of local businesses to serve domestic and international markets. Emerging airports must emphasize accessibility and ease of use to compete with the large hub airports which currently dominate the market. As external and on-airport roads become congested, the ability of vehicle traffic to flow in an efficient and safe manner declines. This situation can in turn have a detrimental effect on the ability of the airport and the service providers to maintain high levels of service and to attract additional cargo traffic.

Air cargo flows have experienced steady growth at both BWI and Dulles Airports. This growth, in terms of vehicle trips, has placed stress on the external and internal roadway systems which serve the airports. At the same time, the overall growth in passenger and commercial vehicle traffic in the Washington-Baltimore metropolitan area has congested the linkages to cargo customers. The layout of the road systems, provision of adequate capacity to accommodate mean and above average vehicle traffic volumes in terms of lane miles, and adequate parking for trucks and automobiles are all factors which affect the flow of traffic.

Baltimore/Washington International Airport

BWI Airport is located in a region served by over 23,300 miles of roads and highways. This network includes three interstates, I-95, I-695 and I-195, a number of federal and state highways, including US 50, US 301 and the Baltimore-Washington Parkway (Maryland Route 295).

The primary linkage between BWI and regional markets is I-195, which provides direct access to the airport from I-95 and the B-W Parkway. I-95 is the primary north-south access corridor connecting northbound to the Baltimore metropolitan area and the Northeast corridor, and southbound to the Washington metropolitan area

and southern market regions. Western Maryland and central Pennsylvania are accessed via I-695 (the Baltimore Beltway) and I-70. The BW Parkway runs roughly parallel to I-95, but permits truck traffic north of MD Route 175 only. This routing provides access to Jessup (a major food distribution point) and southern Baltimore. Although I-97 (east of the airport) also connects to I-95 north (via I-895), direct access via I-95 is the preferred routing, due to congestion on Key Bridge. Annapolis and Maryland's Eastern Shore are reached via I-97 and US Route 50, and Southern Maryland is reached via Route 3 or the Capital Beltway (I-495).

Road System Description

Direct local access to BWI is provided by Aviation Boulevard (MD Routes 162 and 170) and Dorsey Road (MD Route 176), which encircle the airport. These roads provide access to off-airport cargo facilities located around the airport. Figure 17 illustrates the road network surrounding BWI. The air cargo complex at BWI is located in the northeast quadrant of the airport and immediately south of MD Route 170. Primary access to the complex is via the signalized intersection of MD 170 and Air Cargo Drive. Additional access to Buildings 107, 111 and 112 is via Elm Road. The roadway system includes access to each building, employee parking lots, visitor parking lots, truck parking and staging areas, and truck loading areas.

Recent improvements on and around the airport include a recently rebuilt intersection between Eldridge Landing Road and Aviation Boulevard, intended to relieve congestion anticipated when light rail operations begin to the airport. There is also expanded employee parking across Aviation Boulevard from the main cargo complex to relieve unauthorized use of the air cargo area. MD 100 has just opened, connecting I-95 and I-97 south of the airport. By the year 2000, it will connect all the way west to US Route 29.

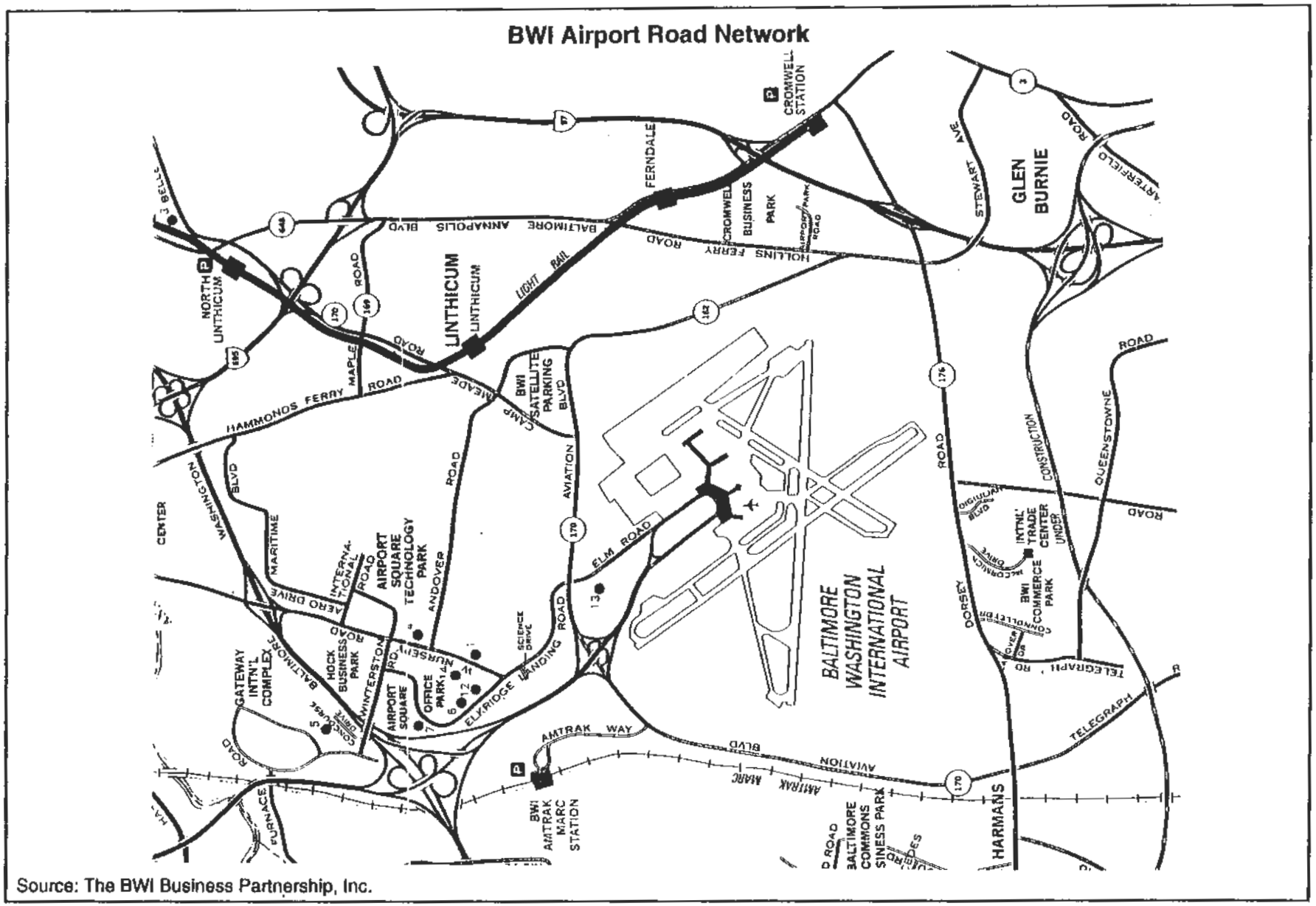
Short term improvements have focused on upgrading local roads, while developing the Intercounty Connector between Montgomery and Prince George's counties, and Barney Circle in the District of Columbia are longer term objectives.[19] The Intercounty Connector would be constructed between Gaithersburg and Laurel to relieve congestion on the Capital Beltway (I-495) and to provide better access for commuters who now live and work within that region. This development would benefit cargo users with improved access to the linked areas (especially the I-270 technology corridor) and congestion relief on the primary access routes. There is also some interest in light rail access to the cargo area, mostly by the airport, to allow for the handling of airport construction materials and de-icing.

Road System Analysis

BWI has close, direct access to major interstate arteries and local business areas. In discussions with cargo users, most indicated satisfaction with road access and cited access as a major advantage of the airport location. Many noted recent improvements to the local roads and attempts to relieve parking congestion.

19. This information was gathered from the airport and an interview with the BWI Business Partnership, a private development organization which sees the existence and growth of BWI as a major factor in its marketing efforts.

Figure 17



Source: The BWI Business Partnership, Inc.

Congestion on and near the Capital Beltway (I-495) was a key concern to some users, particularly for BWI express carriers trying to meet morning delivery schedules in the Maryland suburbs. One carrier indicated that a short delay in departing for their morning deliveries could more than double travel times during rush hours. A significant amount of truck traffic moves between BWI and Dulles including international cargo connecting with Dulles flights. Difficult access to Dulles diminishes that airport's advantage of proximity relative to JFK Airport. Intra-airport freight also includes traffic which uses a flight at one of the airports, but is delivered out of the other's warehouse. The ability to do this efficiently is again restricted by congestion. Many air cargo truckers jointly serve both airports on daily delivery routes, and Beltway congestion inhibits their activities as well.

In general, BWI has good access to its service market areas with some complications during congested commuting periods. The *Washington-Baltimore Regional Airport Ground Access Travel Time Study Update,* published by MWCOG in 1995, examined road access to BWI and compared findings with a similar study conducted in 1988. Six different routes were studied, predominantly oriented toward air passenger access. The study was developed travel times during on- and off-peak periods. The vehicle used to collect data on the routes was a passenger automobile. Table 14 presents a summary of the findings for five of the routes.

With the exception of the route from central Baltimore to BWI, the study identified improved access to the airport, in terms of travel time. A more recent study by the Greater Washington Board of Trade projected that regional roads would be "gridlocked for nearly half of every weekday" by 2020 based on currently planned road projects. Examples cited included travel time between BWI and Dulles rising from 63.5 minutes in 1990 to 103.4 minutes in 2020, a 63 percent increase. Similarly, a trip from BWI to Silver Spring is projected to increase 47 percent from 30.7 minutes in 1990 to 45.1 minutes in 2020.

Table 14

Ground Access to BWI Airport (Average Time in Minutes)

Route	1988	1995	Difference
Baltimore to BWI	14.6	18.7	28.1%
Annapolis to BWI	38.7	29.7	-23.3%
Rockville to BWI (Freeways)	54.9	53.8	-2.0%
Rockville to BWI (Arterials)	55.6	52.6	-5.7%
Washington, DC (NE) to BWI	47.9	46.7	-2.5%

The State of Maryland recently completed an environmental impact analysis on the Intercountry Connector between Laurel and Gaithersburg with similar conclusions. The study found that one proposed route would ease congestion at 28 of the 54 busiest intersections in a two-county area, and that a new highway could reduce projected travel times between Laurel and Gaithersburg from 71 minutes to 38 minutes in the year 2020.

Access near or on the airport was also generally thought efficient with some minor concerns over the entrance

intersection and on-airport flows. Although the intersection of Aviation Boulevard and Air Cargo Drive entering the complex has been upgraded recently, one user noted that the signal often only allows one tractor-trailer to exit when turning left. There is also concern over possible delays due to light rail service which will enter the airport via the Aviation Boulevard/Elm Road intersection.

A more pressing concern involved on-airport activity. Although most general employee parking has been shifted across the road, the opening of Building F and a new service station is expected to increase vehicle traffic in the cargo complex. Currently, access to and between the cargo buildings occurs on open-area roads interspersed with employee and truck parking spaces. During peak periods, particularly the heavy nighttime sort periods, there is congestion between incoming and outgoing trucks, employee travel, and trailers being spotted for loading or discharge. The airport authority continues to study options for improved circulation flows within the complex and is working with cargo tenants to improve efficiency by measures for parking control, signage, lane striping, and intersection re-alignment.

Washington Dulles International Airport

Dulles Airport is located in Northern Virginia, a region covered by a complex road and highway network which provides extensive market access to the airport. The network includes toll facilities (Virginia Route 267, Dulles Greenway), interstate highways (I-66, I-495, I-95), and a number of state highways and arterial roads (US Route 50, Virginia Route 7, Virginia Route 28). There are two main access routes to the airport: the Dulles International Airport Access Highway (east-west orientation) and Virginia Route 28 (north-south orientation). Figure 18 illustrates the highway network in the Northern Virginia region.

The Dulles International Airport Access Highway is a limited access, four-lane highway which runs 16 miles from the airport to its intersection with I-66 inside the Capital Beltway (I-495). This freeway is restricted to commuter buses and airport vehicle traffic between I-495 and the airport. The Dulles Toll Road (VA 267) brackets and parallels the Access highway. While its primary purpose is to serve local vehicle traffic, the toll road also carries traffic between off-airport cargo sites and service areas to the east.

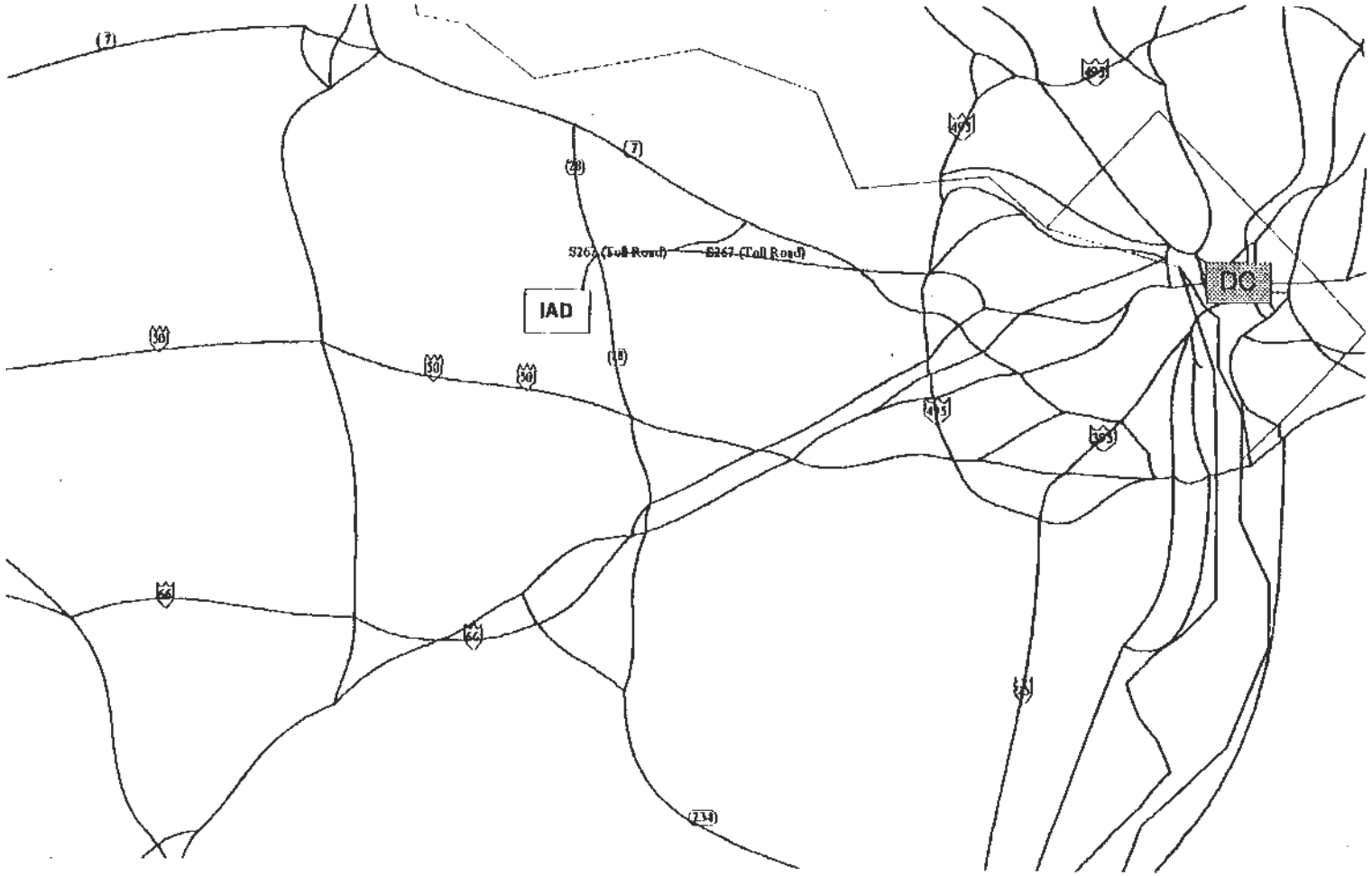
Virginia Route 28 provides a direct connection from the airport to I-66 to the south (and on to the Shenandoah Valley and points west and south) and Virginia Route 7 to the north (which connects to the Leesburg area and Western Maryland). This route provides access to the airport from Fairfax, Loudoun and Prince William Counties. The Dulles Greenway is a private toll road extending beyond the Dulles Access Road, connecting directly into Leesburg.

Road System Description

The majority of vehicles entering the airport must utilize the section of the Access Highway west of Route 28. Access to the newest cargo areas (Building 5 and future buildings) is by means of the "A" Road, which passes the car rental lots and intersects with the North Service Road. This route is only usable for inbound vehicle traffic. Outbound vehicle traffic and traffic for Buildings

Figure 18

Dulles Airport Road Network



1-4 and the air mail facility must connect with the Access Road via the East-West Service Road. (Some inbound vehicle traffic to Building 5 also uses this route.) There are traffic signals at the intersection of East-West Service Road and North-South Service Road. Access between Buildings 1-4 and 5, requires a somewhat circuitous route via the East-West Service Road and North-South Service Road.

In order to divert cargo delivery traffic off the main road and provide easier access to storage facilities on the north side of the airport, MWAA recently opened a new North Gate from Virginia Route 606. This exclusive entryway for cargo will ease the process of handling both inbound and outbound shipments. Users of the North Gate are charged an entrance fee which is electronically deducted via a device, attached to a vehicle's windshield as it passes through the gate.

A major concern in airport access planning at Dulles is the control of "backtracking" passenger vehicles which use the Access Highway for commuting purposes. (A commuter might go between Reston and the Beltway by "backtracking" towards the airport on the Access Highway, reversing direction at the airport, and using the uncongested non-toll Access Highway eastbound.) MWAA has a legislative mandate to control this activity, which limits their flexibility on new airport access.

Road System Analysis

Road access to Dulles is generally regarded as good by cargo users and considered a competitive advantage relative to other airports. Some users suggested that greater emphasis on regional access is necessary to expand the market reach for the airport, particularly for international cargo markets. Other concerns identified include access to regional market areas, access from off-airport sites, and airport signage.

The ease of regional road access affects both the cost of transportation and the level of service available to shippers and consignees. Highway delays result in increased operating costs and lower equipment utilization, and hinder the ability of air cargo truckers to operate profitably. Longer travel times decrease the ability of shippers to meet same-day delivery schedules, diminishing the value-added of air transportation in general and reducing the advantage of nearby airports relative to larger more distant airports. The availability of quick and reliable road access to a cargo airport is a key consideration in attracting new high technology businesses, and the range for which that efficiency is available affects development in more distant areas.

Regional access is heavily influenced by existing and projected highway congestion in the metropolitan area, more so than conditions directly on or around the airport. While much cargo activity occurs during off-peak periods, a significant portion of cargo pickups and deliveries occur during the peak commuting periods. Recent years have shown an uneven pattern in congestion with marginal improvement in access times for certain routes. The 1995 *Washington-Baltimore Regional Airport Ground Access Travel Time Study Update* conducted an examination of three access routes to Washington Dulles International Airport. This study compared the findings from 1995 with the same study done in 1988 to identify changes in levels of accessibility. Table 15 provides a summary of the study's findings.

Table 15

Ground Access to Dulles Airport (Average Time in Minutes)			
Route	**1988**	**1995**	**Difference**
Tyson's Corner to Dulles	18.1	16.7	-7.7%
Rockville to Dulles	39.7	36.2	-8.8%
Washington DC to Dulles	40.0	43.3	8.3%

Two of the three routes studied experienced an improvement, measured in minutes of travel between 1988 and 1995. In the case of the route from Washington, D.C. to the airport, however, the level of service declined.

Despite this trend, studies by regional development organizations are projecting large increases in travel times for the region based on currently planned development projects. As stated by the Washington Airports Task Force:

> "Current MWCOG forecasts indicate that by 2010, 50 percent of the population will be taking between 25 and 50 percent longer to reach the airport from their point of departure. Significant portions of Fairfax, Prince William, Stafford, Frederick and Montgomery Counties in particular will be adversely affected."[20]

20. "Why We Need A Western Transportation Corridor", Washington Airports Task Force, September 16, 1996.

Specific regional access issues related to Dulles Airport include:

- access between Dulles and BWI Airports, and general Beltway congestion;
- highway access to western points; and,
- access from off-airport sites to D.C. and other eastern points.

Congestion on the Capital Beltway (I-495) restricts access between the two airports and to suburban markets. Development in the region surrounding Dulles is also putting pressure on connecting routes such as VA Route 28 and VA Route 7. Road development options currently under consideration include:

- a Western Transportation Corridor linking northern Loudoun County and the airport with I-95 south of the Beltway;
- a Tri-County Connector route between VA Route 606 and Manassas;
- widening of VA Route 28 to 8 lanes; and,
- a corridor connecting VA Route 7 with areas west of the airport.

Otherwise, there are mostly marginal improvements to existing routes which are planned. The viability of new routes will primarily depend on vehicle traffic other than air cargo, but cargo users have indicated that the ability to better connect with western market areas or the I-95 corridor south, could have a significant impact on the airport's market reach.

Another area of concern for off-airport cargo companies is their dependence on the Dulles Toll Road for access to

the east. Vehicles for these companies must use VA Route 28 which does not connect with the Access Road. Consequently, they must route trucks via the Toll Road which is typically congested during key morning and afternoon delivery periods. This routing is particularly difficult into D.C. and delivery vehicles often must take circuitous routes into the city. The Toll Road routing is also expensive in terms of tolls, particularly for companies with several dozen vehicles per day.

Another concern raised during the course of this study was access to the airport cargo areas from external roads. At that time, all access was via the Dulles Access Highway, using the "A" Road/North Service Road or East-West Service Road routes. Vehicles from off-airport sites to the north and the southeast were forced to travel on Route 28 which experiences commuter congestion throughout the day. From points west of the airport, vehicles had to reach Route 28 by a longer routing around the airport. The difficulty of access to western points is a primary reason why off-airport cargo activity is concentrated to the north and southeast.

The September 1997 opening of the North Gate, which is near key off-airport sites, will undoubtedly ease this concern. It is estimated that access via this gate will require a 5-minute one-way trip rather than current routings of 15 to 30 minutes, depending on the time of day. The USPS estimated annual savings of $130,000 for vehicles moving between the airport mail facility and the PU&D center via the North Gate.

Although of less short-term necessity, a western gate has also been suggested. As development land fills to the north and south, new industrial development will be pushed to the west, creating new demand for truck access. Current routings from the west utilize Route 50 and Route 28 to the south, or the Dulles Greenway and Route 606 to the north. The feasibility of western gate access is made more difficult due to the location of the runways. It may be better to develop improved routings via the North gate. The development of a midfield cargo area to the south would also require new gate access.

Two final issues have also been raised. The first is the availability and prominence of signage to direct truckers to the airport cargo areas, both near the airport and at more distant points (e.g., the I-95/Beltway interchanges). Improvements to signage would improve safety and promote Dulles as an accessible airport.

The second issue involves possible future direct access to the airfield with cargo trucks, thereby bypassing the cargo terminal and alleviating demand for facility capacity. Until recently, cargo volumes have not been large enough or concentrated enough to generate full unit-load devices (ULDs) at off-airport sites. With the growing prominence of Dulles Airport as an international gateway, the potential exists to develop new expedited routings which improve transit times with no new facilities required on-airport. Direct airfield truck access would obviously raise safety and regulatory issues which must be addressed.

VI. REGIONAL AIR CARGO NEEDS

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Air cargo traffic includes air freight and air mail shipments that utilize air transportation for some portion of the domestic or international trip. Air mail traffic consists of U.S. Postal Service shipments of envelopes and small packages, plus express traffic, such as envelopes, documents and small packages shipped for time-definite delivery, domestically, by the integrated air carriers. Freight traffic includes larger packages and shipment sizes, as well as smaller shipments moving in international markets.

Air cargo traffic uses a number of types of transportation and distribution services to satisfy regional air cargo demand. These services include:

- air carrier flights between airports;
- cargo handling to and from aircraft and ground carriers at airports;
- cargo storage at airports, off-airport warehouses or origin/destination locations;
- cargo documentation, packaging and inspection; and,
- ground transportation by truck, van or passenger vehicle to the final destination.

Most air cargo shipments combine elements of all these services, either through a single provider, an integrated carrier, or through a multi-party process. The combined cost and time efficiency of air cargo services help determine routing and flow patterns.

Air Carrier Services

The air portion of an air cargo shipment is provided by an air carrier, operating aircraft and airport facilities. Air carrier services are distinguished by the type of carrier and delivery service, by the type of aircraft and capacity, by flight schedules and markets served, and by passenger and cargo distribution systems. Air carrier types are defined by a combination of these service attributes.

Combination carriers in the U.S. market include U.S. and foreign airlines operating domestic and international jet flights, plus regional carriers and smaller commuter carriers. The passenger markets for these carriers typically overshadow cargo operations and are the primary consideration for aircraft selection, flight scheduling, and airport routings. For the most part, combination carriers depend on the freight forwarder and broker industry to provide direct service to shippers and consignees, but may also operate as domestic and international forwarders. Combination carriers typically are oriented (and often constrained) to a particular set of markets based on origin/destination airport pairs and aircraft fleet composition.

Integrated carriers are almost exclusively dedicated to cargo transportation and have developed expedited door-to-door distribution systems which combine air, ground and handling services. The typical integrated system combines pickup and delivery services, air transportation between origin and destination airport via a sort hub, and all intermediate packaging, handling and documentation. Different types of integrated carriers are distinguished by delivery requirements (overnight vs deferred) and shipment size. While direct services were originally limited to

domestic markets, the integrated carriers have expanded into international markets with direct scheduled and charter flights, plus forwarding and brokerage services.

Other all-cargo carriers do not provide integrated services, but concentrate on direct air carriage on a scheduled and charter basis. Most non-integrated all-cargo carriers focus on a specialized market niche (such as mail or bank checks) or a particular market area.

Ground Services

Air cargo ground services link airports with regional shippers and consignees. The availability and efficiency of these services is a major factor in determining market range and penetration for airports. In most cases, air cargo shipments do not originate or terminate at an airport location, but rather require some ground transfer to and from the origin and destination airports. In fact, many cargo shipments travel long distances by truck to connect with direct flight services, particularly for international markets (due to limited direct service) or where economies of scale create large cost advantages. The ability to use air cargo services from non-airport industrial locations has been a key factor in the immense growth in air shipment volumes.

Ground services for the air cargo industry can be characterized by market range, equipment type, operating patterns and customer base. The market range for an airport can be characterized as follows:

- Local airport area - The area within five to ten miles of the airport where most of the off-airport forwarders, brokers and other air cargo service providers are located. This area can be served by direct shuttle services on local roads without encountering major congestion;
- Local Pickup and Delivery area - The local pickup and delivery (P&D) area includes points within approximately 50 miles of the airport where local cartage carriers can deliver (or pickup) cargo shipments on the same day of a flight. The geographical range of this area depends on the location and market size of origin/destination points, the proximity of competing airports, and ease of road access;
- Regional Pickup and Delivery area - This area encompasses origins/destinations within 50 to 100 miles of an airport and not closer to a comparable cargo airport. These regions have "same-day" or near-"same day" service, typically provided by a carrier specializing in that region; and
- Road Feeder Area - The road feeder area, both primary (RFA-1) and secondary (RFA-2), includes origins/destinations and airports within one-day truck service (100-500 miles), and is defined by the location of comparable airports and the efficiency and economy of road access.

Points outside of these same-day or next-day service areas are mostly served by air transshipment (direct transfer between flights without any local ground transport) or by ad-hoc dedicated trucks or national less-than-truckload (LTL) type services.[21] The competitive-

21. Two primary categories of trucking operations are truckload (TL) services, which typically involve a single shipper moving directly between origin and destination, and less-than-truckload (LTL) services, which use hub-and-spoke systems to consolidate smaller shipments into economical linehaul loads.

ness of these long-distance routings compared to a direct flight from a nearby airport depends on the availability of specialized services, cost efficiencies, or market conditions which allow for low-cost ground or air rates.

Most carriers operate different types of truck equipment to cover a variety of service requirements. The type and size of equipment depends on the required capacity as determined by shipment patterns and the structure of the carrier's service. Local pickup and delivery services mostly use straight trucks and delivery vans, but may also use passenger cars and trucks (for small package express services) and tractor-trailer combinations for large shipments. Regional P&D, RFA and long-haul services primarily use tractor-trailers to maximize efficiency, but also use smaller equipment for local shuttle services which "feed" the long-haul equipment.

Table 16

Air Cargo Truck Equipment Capacity/Load Characteristics

Type	Capacity (Pounds)	Avg Load (Pounds)	Comments
Passenger Vehicles	N/A	Up to 200	1-2 shpmnts
Delivery Vans	N/A	2-4,000	Also used for small shpmnts
Straight Trucks	10,000	1-5,000	Low end for sweep opns
Tractor-Trailers	40-50,000	2-25,000	

Table 16 shows the capacity and load characteristics of the differing types of air cargo truck equipment. Service requirements of the various types of air cargo flows has resulted in specialized carriers and private fleets providing the types of services that generally correspond to the geographical areas defined above.

Local Pickup and Delivery Services

Local pickup and delivery, or "cartage" services generally use straight trucks and vans to provide local shippers, consignees, forwarders and brokers with "same-day" connections to flight arrivals and departures. There are specialized local cartage companies which provide common carrier services, as well as private fleets operated by the integrated carriers, the US Postal Service and some forwarders and brokers. Local P&D services typically consist of the following elements:

- "sweep" pickups and deliveries at airport cargo terminals throughout the day, scheduled to coincide with flight arrivals and departures;
- scheduled pickup and delivery routings to local or regional points; and,
- cargo transfer and sorting between airport sweep and delivery routes at a nearby terminal or warehouse.

Sweep routings also transfer freight between airport terminals and nearby forwarders and brokers, although some forwarder/broker freight may be processed at the trucker's terminal. Although sweep operations permit more efficient local P&D services, the direct P&D vehicles often call directly at the airport with large shipments or to make departure cutoff deadlines. Local P&D services are generally less-than-truckload (LTL),

although large dedicated truckload transfers are sometimes required.[22] Local pickup and delivery for many U.S. and foreign combination carriers is handled by Air Cargo Inc., a not-for-profit corporation owned by some of the carriers. Local cartage companies also provide independent services on an ad-hoc or contract basis with carriers, forwarders and brokers. The integrated carriers control most of their own local pickup and delivery service, but may contract all or some of their ground services to independent trucking companies.

Regional Pickup and Delivery Services

Regional pickup and delivery services are a hybrid of local P&D services and road feeder services, typically designed to service an area which is beyond the local area, but within 100 miles of the airport, with no other major passenger or cargo airport, and a significant origin/destination point warranting scheduled truck services. In most cases, a single carrier provides an LTL-type service to the region, also offering truckload services as needed. These carriers also may conduct P&D services within their service region for integrated air cargo and air mail traffic, if local volumes do not fill a truck for a single carrier.

Regional Road Feeder Systems

Regional road feeder systems connect cargo airports with areas outside of the local P&D area. The majority of air cargo is handled by specialized air trucking companies, although some traffic is also distributed using general commodity LTL and TL systems.[23] The typical road feeder service connects the local airport with other regional cargo airports, often via local truck terminals at each airport. Transfer to and from the airport is carried out using in-house or contract cartage or sweep services, often combined with local P&D freight. The over-the-road element of the trip is mostly via tractor-trailer and may include more than one regional airport. Air cargo LTL operations are comparable to general LTL truck operations with consolidation at hub terminals. Truckload operations may utilize the local terminals or move directly between carriers and final origin/destination.

Airport-to-Airport Transfer

Another specialized version of road feeder services are the airport-to-airport transfers which specialize in freight moving between major and secondary cargo airports. These services are mostly designed for international freight traffic and cover a large market region such as the Northeast corridor. A major source of activity for these services is intra-line and interline cargo moving directly between carriers. A good example of these services are the nightly trucks scheduled from Dulles and BWI to New York's JFK Airport to meet the next day's international departures. These trucks will gather freight at Philadelphia and Newark along the way, perhaps also delivering local destination freight or transferring freight for those airports' air services. The reverse trip picks up

22. LTL truck services are defined by multiple shipments and shippers/consignees being handled on a single vehicle, typically requiring sorting at local terminals. Large shipments (over 5-8,000 pounds) can support a direct routing between the airport and final origin/destination.

23. Some air freight is moved on a "non-intermodal" basis within domestic trucking systems, signifying that airport origin/destinations are treated as any other domestic point without any special orientation to air cargo.

inbound freight for distribution along the route.

A similar category of services is dedicated truckload services connecting carriers' feeder stations with their international gateway or primary hub airports.[24] These services use tractor-trailers, mostly operated under contract with an independent trucker. Recently, some international carriers have assigned "flight" numbers to give the appearance of "direct" through service, which is more desirable than connecting intermodal service.

Air-Substitute All-Surface Systems

A final category of air cargo trucking is the substitute truck-for-air services which compete for expedited freight traffic on certain major shipping lanes (mostly domestic) without the use of any air services. These truck services utilize a traditional regional LTL hub-and-spoke distribution system, although often over a larger region than the airport road feeder systems, or as a combination of multiple regions. These services are distinguished from general LTL systems by a strategy to cater to the expedited market with delivery products based on that of air carriers (e.g., next morning delivery).

Other Cargo Services

Additional services that may be required for air cargo shipments include:

Freight Forwarding and Brokering. Freight forwarders act as the shipper's or consignee's agent in purchasing direct air services, and typically also handle or provide ground transfer and other cargo services. Import shipments require a customs broker to handle shipment clearance, documentation and other services required by import regulations in the U.S. and other countries. Some forwarders and carriers provide brokering services, and some customs brokers specialize in servicing local import markets with limited outbound activity.

Cargo Storage. Air cargo typically moves on an expedited basis, minimizing the requirement for storage at airport or other warehouses, other than holding inventory items for fast distribution. Even with short dwell times, some commodities require specialized holding such as refrigeration or security, as well as bonded areas for customs-held import items and foreign trade zones for duty minimization. Cargo storage is available at the airport cargo terminal and the terminals of local and regional forwarders, brokers and truckers.

Cargo Handling/Processing. Terminal transfer of air cargo may be performed by the trucker or the terminal operator. On-airport transfer of cargo between the aircraft and the terminal, and aircraft handling is typically performed by a ground handling company, but may also be done by individual carriers if volumes are large enough.

Packaging/Consolidation. The wide variety of shipment sizes, unit load devices and handling requirements has led carriers, forwarders and other cargo companies to

24. The primary international cargo airports are designated as "gateways" by carriers and forwarders, describing a strategy to consolidate freight traffic at a limited number of airports. Carriers use the gateway concept due to restrictions on service points in international markets, while forwarders utilize the concept to connect with the largest variety and volume of flight capacity in order to improve economies of scale and negotiating power with the carriers.

develop specialized packaging services to assist shippers. The loading of containers and pallets is often the responsibility of the carrier to allow optimal use of aircraft capacity.

Cargo Documentation. A key element of air cargo service value is the ability to monitor and control the movement of valuable shipments while in transit. Carriers and forwarders have developed tracking systems which allow computerized tracing, information transfer and processing of shipments. This is particularly important for international shipments which require customs and other documentation.

Cargo Inspection. The majority of inspection services are concentrated in international markets based on government requirements to track import and export commodities, collect duties, and monitor health, safety and trade restrictions. The Federal inspection service agencies monitor and inspect air cargo shipments, typically using a local management office with visits to terminals as needed.

Cargo Distribution Services. A final category of non-carrier services combines many of the above elements in managing the distribution of air cargo shipments. Forwarders, warehouse operators and other third parties have developed comprehensive service packages which allow shippers to out source much of the management and physical handling of their cargo.

Air Carrier, Forwarder and Other Services at BWI Airport

Cargo activity at BWI is dominated by all-cargo domestic carriers which accounted for three-quarters of total 1996 air freight. All of the integrated carriers provide daily weekday direct flights to their national hubs with some carriers also serving regional hubs. In March 1996, there were a total of 45 scheduled all-cargo flights per week for a total estimated one-way capacity of 2.6 million pounds. The top air freight carriers at BWI were UPS, FedEx, Burlington Air Express and Emery.[25] Many of these carriers also have complementary truck services to their hubs for less time-critical shipments. The market range for these carriers consists of the State of Maryland plus small parts of West Virginia and central Pennsylvania (depending on service access via other airports). Carriers which only serve BWI also cover the District of Columbia, Northern Virginia, and, in some cases, the Shenandoah Valley.

BWI also serves specialized and non-scheduled all-cargo carriers which accounted for almost 10 percent of total domestic all-cargo traffic in 1996. Domestic service by combination carriers accounted for 16.5 percent of total air freight traffic with 13 carriers reporting traffic for the year. The top carriers were United and US Airways with over two-thirds of domestic combination freight traffic. Table 17 summarizes domestic and international freight activity in 1996 at BWI Airport.

In 1996, BWI had few international passenger services, and con-sequently limited international freight capacity. The January 1997 flight guide for the airport lists direct

25. As noted previously, the airport cargo traffic statistics include surface flows handled at the airport, but not transferred to or from a flight. The carriers for which this evidently applies include FedEx, United and some of the international carriers.

Table 17

Domestic and International 1996 Freight Activity at BWI Airport					
	Total Weight (000 Lbs)			Percent of Total	Enplaned Share
	Enplaned	Deplaned	Total		
Domestic					
Combination Carriers	16,642.1	24,353.7	40,995.7	16.5%	40.6%
All-Cargo Carriers	100,510.6	106,995.2	207,505.8	83.5%	48.6%
Total	117,152.6	131,348.9	248,501.5	100.0%	47.1%
International					
Foreign Combination Carriers	8,149.0	6,632.3	14,781.3	52.5%	55.1%
U.S. Combination Carriers	1,049.8	602.4	1652.2	5.9%	63.5%
All-Cargo Carriers	3,167.1	6,009.9	9,177.1	32.6%	34.5%
Subtotal	12,366.0	13,244.6	25,610.6	91.0%	48.3%
Foreign Military	2,053.5	13,723.9	28,143.4	9.0%	81.1%
Total	14,419.5	13,723.9	28,143.4	100.0%	51.2%

service on approximately 120 flights per week to points in the Caribbean, Mexico, Europe and Canada. Direct trans-Atlantic service is to London, England and Reykjavik, Iceland, plus two weekly one-stop flights go to Tel Aviv, Israel.

Total 1996 international freight traffic was over 28 million pounds with British Air accounting for one-third of that total and foreign carriers over one-half. The all-cargo carriers reported 9.2 million pounds, but much of that traffic may be handled by ground services to another gateway airport.

Most air mail is transported via combination carriers, although the USPS does have a daily dedicated flight which carries Express Mail to and from their Indianapolis

sort hub. During peak periods, additional aircraft to the sort hub may be used, and the AMC manager has the option of utilizing excess capacity on all-cargo flights on a negotiated basis.

BWI is well-served by freight forwarders, customs brokers and other cargo handling services. The airport cites over 100 freight forwarders and 43 customs brokers which serve the airport including twelve forwarders and five brokers located on-airport. The airport is served by all of the Federal inspections services including 24-hour per day customs clearance. There are also five companies providing ground handling services.

Air Carrier, Forwarder and Other Services at Dulles Airport

Air carriers provide 300 daily domestic flights and nearly 200 weekly international flights at Dulles Airport. The domestic market is dominated by the hub operations of United Airlines, carrying more than 42 percent of the total domestic air freight. All-cargo operations by integrated carriers are dominated by Federal Express, which carries almost 41 percent of total domestic freight. In March 1996, a total of 20 scheduled all-cargo flights per week provided an estimated 1.2 million pounds of one-way capacity. The integrated all-cargo carriers handled over half of the total domestic air freight. Based on freight traffic statistics, the top service markets for Dulles Airport are Los Angeles, San Francisco, Denver, and Chicago.

The airport continues to grow as an international gateway with direct service to Europe, Asia and Latin America by U.S. and foreign carriers. International freight services are even more dominated by the flight patterns of passenger carriers than is the domestic market. In October 1996, there were a total of 180 weekly departures to international points, either directly or via another U.S. airport. Europe is the dominant area with nearly two-thirds of the services. Table 18 summarzes domestic and international freight activity at Dulles Airport in 1996.

United was the top carrier, with almost 43 percent of total international air freight traffic in 1996. The next largest carriers are European airlines including Lufthansa, British Airways, and Air France, each with over 10 percent of the market. The international carriers market range extends from the Carolinas to New York and west into Ohio, Georgia and Tennessee. The integrated carriers also provide international service via domestic flights to their international hubs.

As with BWI Airport, most of the air mail is transported via combination carriers. Dulles shares the Express Mail flight to and from the US Postal Service Indianapolis sort hub with BWI Airport. A substantial amount of mail is carried on the international flights with mail often accounting for a large share of capacity on some U.S.-flag flights.

In addition to the direct air carriers, Dulles has a large array of cargo service companies. The airport directory lists 53 companies with freight forwarding services, 25 firms with customs broker capability, and 52 companies with short- or long-term warehousing services.[26]

26. The Washington Dulles World Cargo Center Directory and User's Guide lists 133 companies serving the airport, but may exclude companies not affiliated with local cargo associations.

Table 18

Domestic and International 1996 Freight Activity at Dulles Airport					
	Total Weight (000 Lbs)			Percent of Total	Enplaned Share
	Enplaned	Deplaned	Total		
Domestic					
Combination Carriers	84,239.9	94,901.5	179,341.4	47.4%	47.1%
All-Cargo Carriers	91,144.4	107,531.3	198,675.7	52.5%	45.9%
Charter/Commuter	33.5	81.0	114.4	0.0%	29.3%
Total	175,617.9	202,513.7	378,131.6	100.0%	47.1%
International					
Foreign Combination Carriers	51,397.1	39,849.4	91,246.5	52.2%	56.3%
U.S. Combination Carriers	38,889.4	44,772.9	83,662.3	47.8%	46.5%
Total	90,286.6	84,622.3	174,908.8	100.0%	51.6%

Surface Transportation Services

The consultant study performed in conjunction with this project identified 31 companies providing local and regional trucking services for air cargo users. This total includes 11 local or regional pickup and delivery carriers, plus 14 carriers with LTL service and 19 full-truckload providers. Most of the companies provide services in more than one category. These numbers only include companies with specialized air cargo services and exclude carriers which serve air cargo users with generalized domestic trucking services.

The types of surface transportation services provided are the result of the requirements of the various types of air cargo flows. These services generally correspond to the geographical areas defined earlier in this report.

Local Pickup and Delivery Services

Local P&D delivery areas are those that receive "same day" pickup and delivery, meaning that an inbound shipment on a morning flight will be delivered that day, and an outbound shipment picked up in the morning can meet an evening flight on the same day. The Dulles

local area includes the Washington metropolitan area in and around the Capitol Beltway plus areas south and west of the airport. The BWI local area includes all of the Baltimore metropolitan area, the northern ring of the Capitol Beltway, the Maryland Eastern Shore, and Central Delaware.

There are seven carriers which provide local P&D services to the Washington-Baltimore region, 3 of which serve both airports. Some of the carriers serve just a portion of the airport's local area, while others offer comprehensive services. Most of the designated cartage carriers also provide common carrier services and may also contract equipment to specific carriers.

Operational characteristics of local P&D carriers include an off-airport terminal for transferring shipments between airport sweep runs and direct P&D routes to service areas; sweep routes that consist of multiple calls per day between the terminal and the airport, usually calling at several carriers to collect or deposit freight for particular flights; a daily truck to key market areas, delivering and picking up freight on a single run; mostly owner-operated equipment, with some contracted services, using straight trucks and vans, or tractor-trailers for specialized runs; and, handling of expedited "over-the-counter" shipments at the passenger counter, using direct courier services for pickup and delivery. Local truck services can also be operated on a dedicated basis by forwarders and brokers. These companies may have one or two trucks to shuttle their own freight traffic to and from the airport, and use the cartage carriers for local P&D or to handle peak volumes. The cartage carriers may also act as a local agent for a regional trucker.

Regional Pickup and Delivery Services

Regional P&D areas include regions which are outside the local same-day service area, but are relatively high volume areas and do not have a major airport. The Shenandoah Valley and Central Virginia are regional P&D areas for both airports, with BWI also having regional P&D services to Frederick/Hagerstown and South Central Pennsylvania.

The regional P&D services are provided by four carriers, including one which also serves the local area. One carrier operates single trucks to areas outside the normal service region, while the others operate a distribution system to a single primary area (Shenandoah Valley, Western Maryland, and Central Virginia.

Operational characteristics of regional P&R services include operating straight trucks and/or tractor-trailers between one or both of the local airports and a terminal in the service area where shipments are sorted to and from local vehicles. One of the carriers has a local terminal at Dulles and operates a sweep truck to and from airport terminals and local forwarders and brokers. The other services directly load and discharge the linehaul vehicles, also making local pickups and deliveries with the same vehicles. Some of the carriers have interline agreements to connect their regions to other gateway airports (e.g., JFK Airport) and may also operate general trucking services in the region. Each of the carriers reported direct trucking services were available on an ad hoc basis. At least one of the carriers also provided regional services to the USPS and to integrated carriers.

Regional Less-Than-Load Services

LTL trucking systems distribute local air cargo to and from mostly non-local points, concentrating on smaller ad-hoc shipments which do not justify dedicated trucks or the use of designated distribution systems. The distinction between LTL and TL services in air cargo markets is mostly based on the ability of LTL carriers to handle and efficiently distribute smaller shipments, often with regional systems tailored to particular types of flows.

A total of 39 companies advertise LTL trucking at Dulles including many forwarders and brokers, presumably using contract carriers for their service. Similarly, there are 15 carriers with over-the-road services at BWI, although LTL services are not separately identified.

Operational characteristics of the regional LTL services include operating a local terminal near the airport where shipments are interchanged to and from linehaul trucks; use of tractor-trailers for linehaul trips, with local sweep and P&D operations using both trailers and straight trucks; services oriented to a general market (e.g., airport "peddle" runs), but also providing supplemental services in other markets to maximize equipment use and market share; services designed to maximize load factors to particular markets while providing the fastest delivery times and efficient connections to carrier flights; and, an average load per truck ranging between 10,000 and 35,000 pounds depending on shipment and route density. The breakpoint between LTL and truckload rates (i.e., the load at which a dedicated truck is economically efficient) is typically between 6,500 and 7,500 pounds.

Regional Truckload Services

Regional truckload (TL) services are dedicated to a single shipper/shipment, carrier or other cargo user who generates a consolidated load large enough to justify a full truckload (typically 6,000 to10,000 pounds). The types of services which fall into this category include large volume or specialized cargo flows (e.g., refrigerated seafood), carrier road feeder services between an international gateway or domestic hub and its feeder stations, and direct gateway services for cargo consolidators.

The Dulles cargo directory listed 35 companies offering truckload services including airlines, forwarders/brokers, truckers, couriers and Air Cargo, Inc. The BWI cargo directory does not specifically identify which of the 15 trucking companies listed are truckload carriers.

Air Mail Ground Services

Regional air mail, including Express Mail, is transported by air to Dulles and BWI and distributed on daily delivery trucks and vans, either directly or via local sort centers. The average day at Dulles includes 76 inbound and 72 outbound trucks, with the majority of the traffic occurring during non-rush hours. The top service point is the nearby Pickup and Delivery Center (P&DC) located north of the airport in the main off-airport cargo area. Other areas with significant service include Washington, D.C. (13-14 trucks per day) and Northern Virginia (11 trucks). Service to non-local areas includes 8-9 trucks to the Charlottesville/Roanoke/Lynchburg area and three trucks to Norfolk and Richmond.

All of the Dulles trucks are processed directly at an AMC dock except for the P&DC and Northern VA vehicles which use a "drop-and-switch" procedure where trailers are parked and handled separate from the tractor. In addition to mail processed through the AMC, some air mail is trucked directly to the cargo terminal.

The daily schedule at BWI includes 68 outbound and 87 inbound vehicles per weekday, with two-thirds of the vehicles for priority and first class mail. The Express Mail trucks are operated separately from other air mail. More than one-third of all vehicles service the local BWI area (including Baltimore City, Annapolis, Columbia and points in-between) with nine vehicles to and from the nearby Inbound Mail Facility located on Nursery Road. Other top service areas include Southern Maryland (18 one-way vehicles per day), Suburban Maryland (18), Maryland's Eastern Shore (15) and D.C. (Ten). A total of 22 one-way trips serve Western Maryland and the Harrisburg/Lancaster area of Pennsylvania. The majority of vehicle trips occur during non-rush hours.

Most of the scheduled trucks for BWI utilized USPS equipment, although they do contract services to lower volume areas such as the Eastern Shore. In addition to the scheduled local runs, ad hoc vehicles will be operated for peak or special activity. Dedicated trucks are also run between the airport and the primary sort hub in Indianapolis.

Integrated Carrier Ground Services

The ground transportation systems for U.S. Postal Service (USPS) Express Mail and the integrated carriers are similar in both local distribution and contract practices. The systems are designed to link dedicated flights to national hubs with expedited pickup and delivery in the local market. Since these systems are mostly based on internal traffic, there is less emphasis on common carrier services and greater use of dedicated trucks.

The Washington-Baltimore region is well-served by the integrated carriers, some of which serve both Dulles and BWI. Express carriers accounted for almost 60% of U.S. domestic air cargo traffic (as measured in revenue ton-miles) in 1995. Forty percent of the total regional airport freight traffic is handled by express carriers, consisting of 60 percent at BWI and 33 percent at Dulles. Express carrier ground services are designed for early morning distribution of inbound cargo arriving on the nighttime flight from the national hub and afternoon/evening collection of shipments for the outbound flight. The express service region for Dulles and BWI includes the Washington-Baltimore metropolitan region plus more distant points such as Western and Eastern Maryland and south central Pennsylvania, depending on the location of other service airports for each carrier.

Freight pickup and delivery services for the integrated carriers are similar to general P&D operations for combination carriers with the main difference being a heavier reliance on dedicated vehicles. The market range is similar to that of the express services with a broader coverage of regional areas such as the Shenandoah Valley and West Virginia. Most of the services use straight trucks or vans and call directly at shipper and consignee locations rather than sorting shipments through regional distribution terminals.

In addition to P&D trucking services, the integrated carriers also operate over-the-road vehicles to their national hubs and primary gateways. These services are used for international freight traffic to and from an international gateway, regional freight traffic which bypasses a national hub, "non-system" freight handled on a forwarder basis, and deferred and overflow freight to and from the national air and truck hub. The integrated carriers also operate ad hoc truckloads to local and regional markets for large shipments or peak period flows.

Air-Substitute Trucking Services

Air-substitute ground services provide time-definite expedited delivery using specialized LTL trucking networks without any use of air transportation. The services are structured similarly to integrated carrier hub-and-spoke networks, but are mostly focused on a single region or high volume corridors. The services compete directly with air products of both the integrated and general freight carriers, using delivery regions to identify various levels of service (e.g., next-day or 2-day). While most of the activity for these carriers occur off-airport, some shipments may also move as a combination of air and these ground services, particularly for international freight traffic.

Regional Cargo Flow Patterns

The pattern of regional air cargo flows represents the relationship between cargo demand and available services by airports, carriers and other cargo companies. The structure of the domestic air freight market is defined by the wide availability of freight capacity on passenger and integrated carriers which serve small-to-large markets with direct air services. International shipments are more likely than domestic freight traffic to travel long distances to connect to direct flights at major gateway airports. The pattern of international routings reflects relative level of services, the location of competitive airports, and the efficiency of ground access.

Domestic Freight Market

There is very limited statistical data on domestic flow patterns, but the market range is known to be more compact than for international markets, particularly for express integrated carriers which rely heavily on direct air services. Domestic combination services handle a large share of local origin/destination cargo traffic, excluding shipments requiring specialized services (e.g., oversized) or which use non-local airports based on rate differentials. The routing of regional cargo to and from combination carriers mostly occurs for carriers with large-to-medium hubs which provide more capacity than the local market can support, particularly on long-distance widebody flights.

The transshipment of freight directly between flights mostly occurs for international connections and connections between regional and primary domestic routes at domestic hubs. The integrated carriers also capture a large share of the local market, drawing from more distant areas when there is no local service, to utilize large aircraft, or to connect with flights to non-hub points. The market range for express services are more compact than that of heavy freight services due to more direct services and smaller shipment sizes.

A 1994 market study for Dulles estimated market leakage of 12 percent for the local metropolitan area, 45 percent for D.C., Maryland and Virginia combined, and 98 percent for North Carolina, West Virginia and Pennsylvania combined. The distribution of domestic freight by origin/destination area was estimated as follows:

Local	30 %
Regional P&D	25 %
Road Feeder Areas (Primary)	15 %
Road Feeder Areas (Secondary)	10 %
All Other Regional Areas	5 %
Other U.S. Areas	5 %
Air Transshipment	10 %
	100 %

International Freight Market

Dulles accounts for over four-fifths of the combined international freight traffic for both airports, based on United's European gateway and direct flights by other domestic and foreign carriers, mostly to Europe. Therefore, the pattern of regional international flows is mostly determined by the characteristics of Dulles' activity.

The pattern of export freight traffic for Dulles and BWI is measured by U.S. Bureau of the Census foreign trade statistics.[27] Figure 19 summarizes the distribution of the 1996 combined Dulles/BWI export value and weight by state of origin. Virginia accounts for the largest share of freight traffic with 37.2 percent of total value and 25.0 percent of weight. Maryland origins have 14.2 percent of value and 14.4 percent of weight, while D.C. accounts for less than 5 percent of the total. The two airports also draw significant volumes from Pennsylvania and North Carolina, as well as from California which is the top domestic air market and is probably handled via transshipment services.

Figure 19

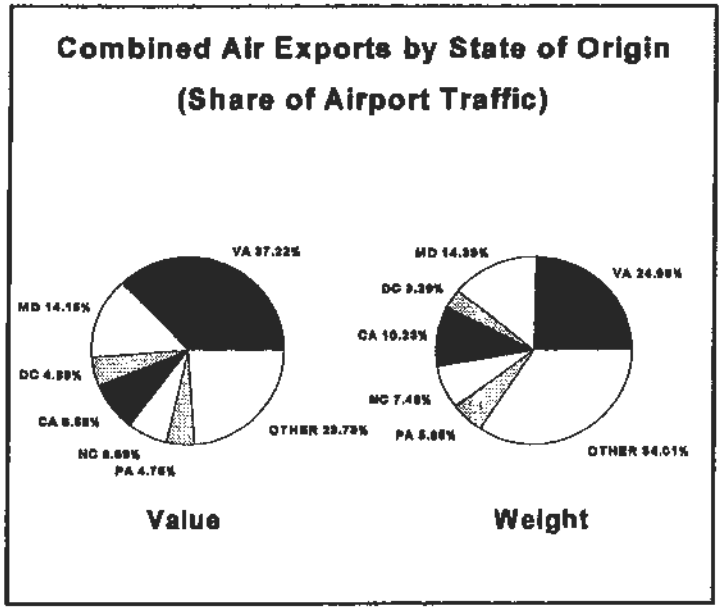
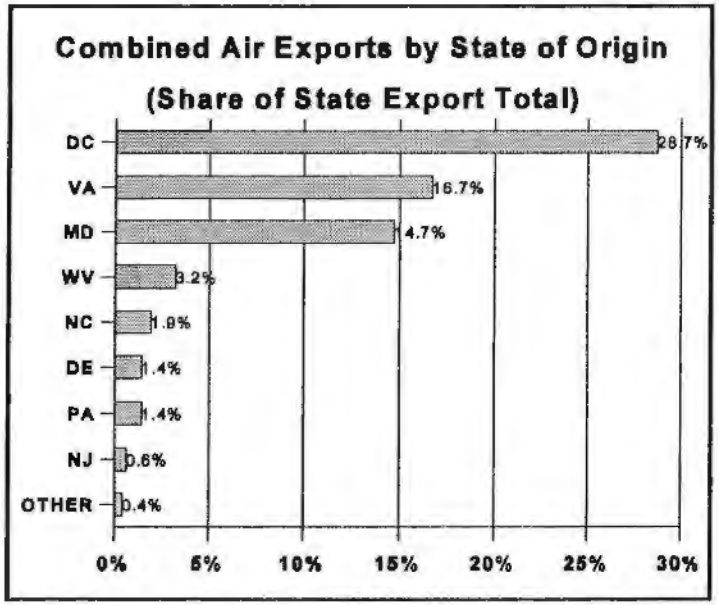


Figure 20 shows the share of total state export weight which is handled via BWI or Dulles. These airports account for the largest share of DC's freight traffic with 28.7 percent of shipment weight, followed by Virginia

27. Air trade consists of all international air shipments excluding mail as measured in the U.S. Customs and U.S. Bureau of the Census statistics. The "state of export" data series provides airport routing patterns for state exports by country and regional market. Appendix B provides detailed reports showing state origin and routing patterns for the analysis in this section.

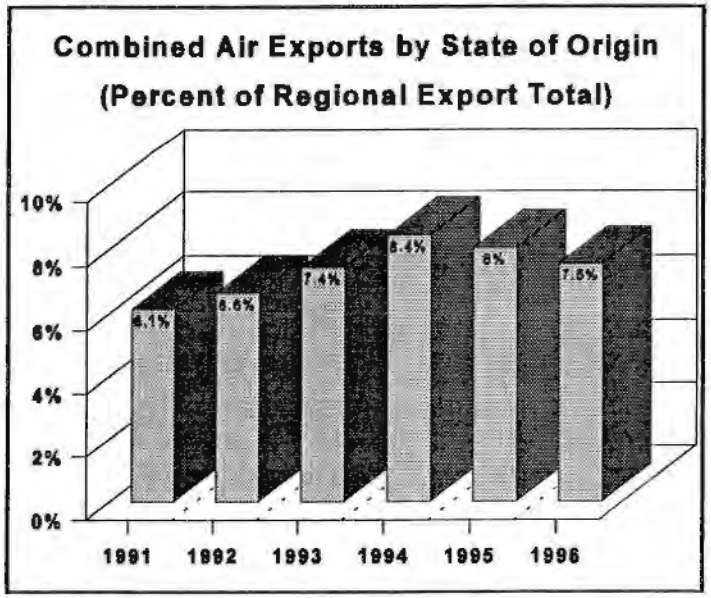
(16.7 percent), Maryland (14.7 percent), and West Virginia (3.2 percent). Despite the large volumes which are derived from North Carolina and Pennsylvania, the two airports handle less than two percent of total export freight traffic from those states.

Figure 20



The share of combined exports for the eight-state market region, illustrated in Figure 21, was 7.5 percent for 1996. This share has grown from the 1991 level of 6.1 percent, but is less than the peak level of 8.4 percent in 1994. This pattern reflects a large expansion in the number of Dulles flights to both European and Asian markets from 1991 to 1994 with capacity in recent years not keeping pace with activity growth.

Figure 21



The routing of regional export freight traffic by airport is shown in Figure 22. The New York area airports of JFK and Newark account for the largest share of export weight from the eight-state market region with nearly half of the freight traffic (46.8 percent), compared with only 7.6 percent for Dulles and BWI combined. This market leakage is based on the high concentration of international passenger and all-cargo flights at these airports, as well as the incentives for forwarders and brokers to consolidate shipments via this primary Eastern U.S. gateway for East-West freight traffic. The only other airport which handles more than 5 percent of regional freight traffic is Miami, the primary U.S. gateway to Latin American markets.

Figure 22

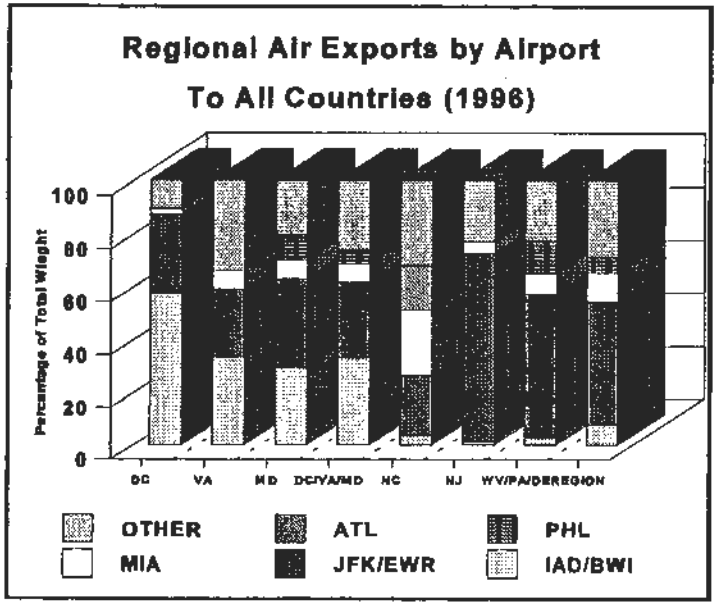
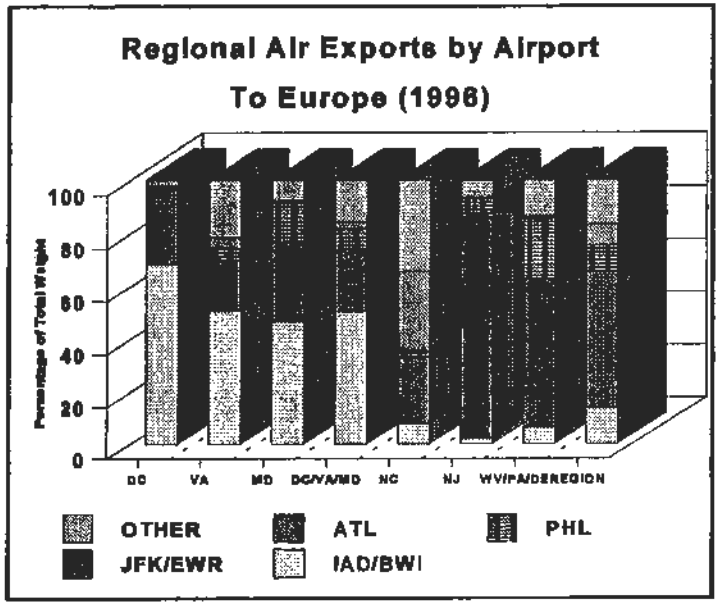


Figure 23



The pattern of diversion of individual states in the region reflects both the strong attraction to the New York area airports' services and the competition with other secondary gateways such as Philadelphia and Atlanta for various regional markets. JFK and Newark Airports account for 25-30 percent of all freight traffic for both local and southern markets, and more than half of states to the north and west. Miami handles less than 10 per-cent of freight traffic for D.C., Virginia and Maryland and points north, but a quarter of freight traffic for North Carolina. Philadelphia captures very little of freight traffic south of D.C., but captures 10 percent of Maryland's freight traffic and a larger share of combined traffic for West Virginia, Pennsylvania and Delaware. Similarly, Atlanta captures over 16 percent of North Carolina's exports, compared to only 3.8 percent for Dulles and BWI combined.

Routing patterns vary by world market as well, reflecting the high attraction of concentrated services at both primary gateways with multiple services to worldwide markets and secondary gateways, which are mostly dependent on a single world area (Europe for East Coast airports, Asia for West Coast airports). In the case of Dulles and BWI, the majority of direct international services are passenger flights to the top European gateways by U.S. and foreign carriers, as well as U.S. services to secondary points which the non-flag foreign carriers serve over their European hub.

Dulles and BWI account for 13.8 percent of European exports from the eight-state region, almost double the share for all world areas combined. Figure 23 shows that the two airports handle over half of the combined

weight for D.C., Virginia and Maryland, but still less than 10 percent for the other regional states. JFK and Newark handle a larger share of the regional freight traffic to Europe with half of total weight, based on only slightly smaller shares of local state markets (D.C., Maryland and Virginia) and larger shares of all other regional states. Philadelphia's concentration of European services is reflected by its larger share of surrounding state markets, while Atlanta's penetration is mostly limited to North Carolina.

The limitations on direct international flights results in larger market coverage, varying by carrier, based on the gateways utilized and relative capacity levels. A large share of the regional road feeder services by combination carriers is dedicated to international freight traffic. Carriers also handle freight at local airports for flights at the primary gateways, utilizing the airport-to-airport "peddle" services or dedicated trucks. Regional freight traffic which is transferred to or from a non-local airport by a forwarder or broker often is not handled at an airport facility. Air transshipment is more prevalent for international freight traffic, although most of the traffic is transshipped between domestic and international flights due to bilateral restrictions. Dulles handles a large share of this market, due to United's use of the airport as its primary gateway to Europe.

The 1994 market study for Dulles estimated international market leakage of 40 percent of the local metropolitan area, 73 percent for D.C., Maryland and Virginia combined, and 94 percent for North Carolina, West Virginia and Pennsylvania combined. The distribution of international freight by origin/destination area was estimated as follows:

Local	30.0%
Regional P&D	10.0%
Road Feeder Areas (Primary)	10.0%
Road Feeder Areas (Secondary)	7.5%
All Other Regional Areas	2.5%
Other U.S. Areas	20.0%
Air Transshipment	20.0%
	100.0%

Air Mail Market

Air mail is almost entirely handled within the U.S. Postal Service system. It is assumed that Dulles and BWI handle all of the estimated volumes which are transferred to or from local or regional points by truck. Air mail traffic, allocated by county-based origin/destination area based on the capacity estimates for truck services, is included in Appendix C. A summary of the distribution of airport air mail by origin/destination area is as follows:

Local	75%
Regional P&D	14%
Road Feeder Areas (Primary)	11%
	100%

Airport Truck Activity

Airport truck traffic includes trucks, vans and personal vehicles picking up and delivering air cargo at airport cargo terminals and passenger terminal counters. The volume of truck traffic depends on cargo type, origin/destination, vehicle operating patterns, vehicle type and shipment consolidation. Air cargo traffic has been measured for both airports in recent studies.

The Air Cargo Complex Traffic Circulation Study (Maryland Aviation Administration, Office of Planning and Engineering, August 1996) analyzed vehicle traffic patterns at the main cargo facility at BWI including cargo, employee and all other traffic. This study included both a vehicle traffic count by equipment type for a single 12-hour period and a week long vehicle count.

Average weekday vehicle traffic on the primary entrance road to the cargo complex (Air Cargo Drive) was 7,547 vehicles in both directions compared with an average of 3,934 vehicles per day on the weekend (52 percent of weekday average). The vehicle classification count for a single 12-hour period (6:00 a.m.-6:00 p.m) identified 4,308 vehicles in both directions - 57 percent of average total weekday volumes.

Commercial vehicles only account for 18.2 percent of total vehicle traffic for this period. The commercial vehicle traffic from the classification count was as follows:

	1-Way Trips	% of Total
Pickup Truck/Vans (50% Cargo)	229	29%
Straight Truck (2-axle/6-tire)	420	54%
Straight Truck (>2-axle)	25	3%
Tractor-Trailer	110	14%
	784	100%
Total - All Vehicles	4,308	

Truck traffic information for Dulles is contained in the Washington Dulles International Airport - Access and Parking Study (1992) and an independent survey of possible use of a new access gate. The access study included a vehicle classification survey on the Dulles Access Road for the afternoon peak period (3:30-7:00 p.m.) of a single day with the following truck traffic. Commercial truck traffic only accounted for 3.4 percent of total vehicle traffic during the survey period, classified as follows:

	1-Way Trips	% of Total
Straight Truck	159	73%
Tractor-Trailer	60	27%
	219	100%
Total - All Vehicles	6,351	

The industry survey of possible users of a new access gate at Dulles yielded the following estimates:

- Possible use by cargo companies located north of the airport (the largest off-airport area for cargo-related activity) was estimated at 185-285 trips per day including automobile traffic.[28]
- Gate usage by day of week averaged 30.6 companies for weekdays and 20.9 companies for weekends. Assuming the average activity for weekend users is three-quarters of that for weekday users, average daily weekend trips would be about half of the weekday average.

28. The survey questionnaire queried daily use of the new gate including "4 or more" trips for the largest users. The trip volume range is based on possible average trips of 5-10 for this category of respondents.

- Tractor-trailers are estimated to account for eleven percent of non-automobile vehicle traffic.

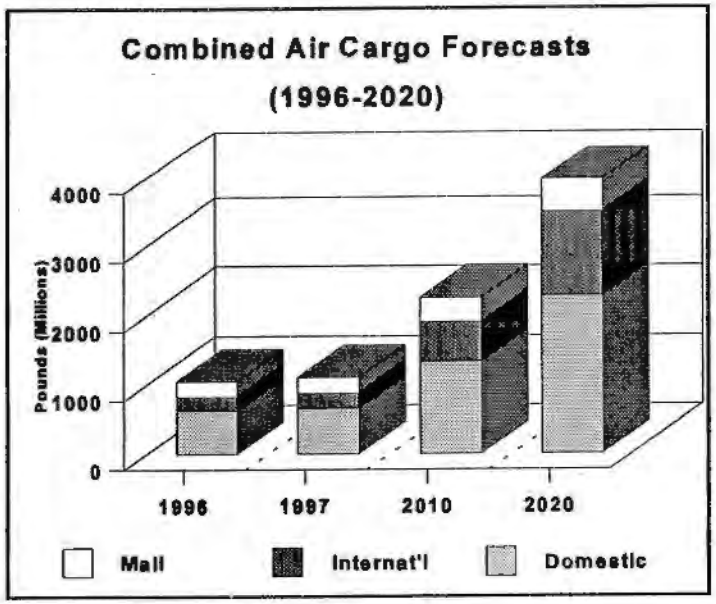
It was difficult to estimate actual truck activity for airport users other than the USPS which operates on fixed daily schedules. Although the industry interviews attempted to derive total volumes, many users were reluctant (or were unable) to identify actual daily trips, particularly as many of the freight trips involve more than one of the interviewees. From the interviewees who were able to provide data, average weekday truck traffic of 154 to 164 trips at BWI and 119 to 152 trips at Dulles was estimated.

Airport Cargo Traffic Forecasts

Forecasts of air cargo traffic handled at Dulles and BWI were based on the four-step methodology discussed in detail in Chapter IV of this report. Baseline demand was estimated by cargo type (mail, domestic and international freight) and origin/destination region. Baseline traffic for each airport was estimated by cargo type (mail, domestic and international freight) from airport statistics. Distributions of baseline cargo traffic by cargo type and O/D market area were estimated for each airport, based on routing pattern data and industry interviews, yielding market capture shares which were compared to other sources. Airport cargo traffic by market area and type was projected into the forecast years based on average growth rates for total traffic.

Total combined cargo traffic for Dulles and BWI is projected to grow from over 1.0 billion pounds in 1996 to 2.25 billion pounds in 2010 and nearly 4.0 billion pounds in 2020. Figure 24 illustrates these forecasts. Growth is

Figure 24



projected based on 3.4 percent annual growth for mail, 7.7 percent for international freight, and 5.5 percent for domestic freight. It is assumed, thus, that these growth rates would be the same for both airports.

Based on the estimated distribution of baseline cargo traffic by O/D market area, market shares were derived for domestic and international freight traffic:

	Domestic	International
Local	88.1%	56.3%
Regional P&D	54.9%	17.1%
Road Feeder Areas (Primary)	13.6%	6.6%
Road Feeder Areas (Secondary)	6.9%	3.8%
All Other Regional Areas	3.4%	1.2%
Other U.S. Areas	0.4%	0.9%

Airport Truck Traffic Forecasts

Commercial truck and other vehicle traffic was projected for both airports based on forecast growth in airport cargo throughput and estimated patterns of ground transportation flows. The forecasts were developed separately for air mail traffic and freight traffic.

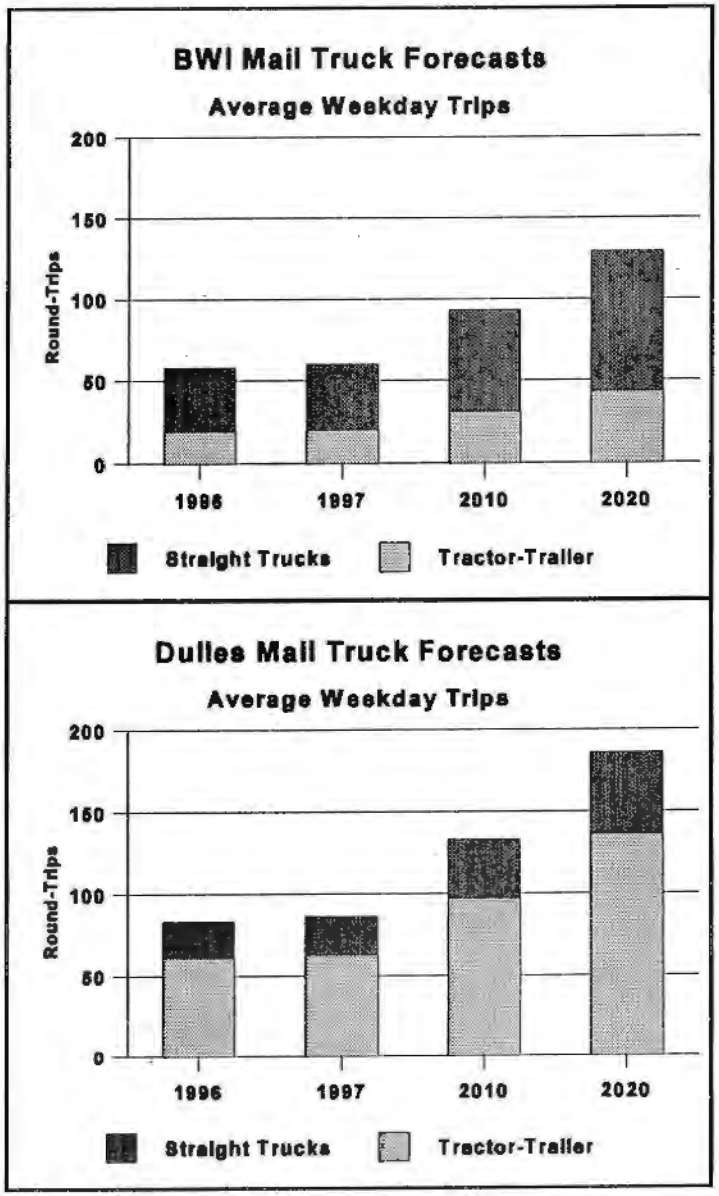
Air Mail Traffic

Patterns of truck flows for air mail were based on scheduled pickup and delivery vehicles. Forecasts of air mail truck activity assumed that truck traffic growth would be constant from 1996 to 2020 and the same for both airports. The average weekly truck traffic is assumed to be equal to 6.2 times the average weekday traffic (Sunday traffic is assumed at 20 percent of the average for the other six days). The ratio of the average daily weekday truck traffic to "typical" weekday traffic will be 1.125 (the average for the peak quarter is assumed at 150 percent of the average for the other three quarters). It is also assumed that there will be no significant changes in operating characteristics in the forecast period.[29]

Total truck traffic at BWI is projected to grow from 58 daily round-trips for an average weekday in 1996 to 129 round-trips in the year 2020. About one-third of those trips will be tractor-trailers. Dulles weekday truck traffic is projected to increase from 83 round-trips in 1996 to 186 round-trips in 2020, with three-quarters of that traffic in tractor-trailers. Figure 25 illustrates these projections.

29. It was beyond the scope of this study to forecast possible changes to the distribution of regional air mail. Truck traffic estimates could vary significantly with increased use of tractor-trailers or larger load factors.

Figure 25



Further details of the air mail truck activity forecasts for both BWI and Dulles Airports are included in Appendix F.

Air Freight

The model used to estimate freight truck traffic for both airports converts baseline and forecast freight traffic by airport and origin/destination region (local, regional and air transshipment) to truck volumes, using several assumptions. Operating characteristics for this analysis were developed from industry interviews and secondary sources. More exact estimates would require a comprehensive industry survey and vehicle classification and traffic counts.

The share of freight traffic which is transferred to or from the airport by way of a sweep vehicle serving a nearby forwarder, broker or trucking warehouse varies by O/D region and cargo type. The estimated shares by airport used in this analysis were:

	Domestic		International	
	BWI	Dulles	BWI	Dulles
Local O/D	20%	15%	75%	75%
Regional O/D	40%	25%	50%	35%

The estimated share of total freight traffic handled by tractor-trailers is assumed to be five percent for off-airport sweeps, 25 percent for local direct sweeps and 90 percent for regional direct sweeps. The average load assumed per one-way trip by vehicle type was 2,000 pounds for a sweep tractor-trailer, 10,000 pounds for a direct tractor-trailer, 1,000 pounds for a sweep straight truck or van, and 3,000 pounds for a direct straight truck or van.

Average daily truck traffic on weekends was assumed to be 50 percent of average weekday traffic. And, baseline domestic and international truck volumes by airport were projected to grow at a rate equal to the growth in overall cargo traffic in those categories, thereby assuming no significant changes in operating patterns.

BWI truck traffic for freight operations is projected to grow from 228 round-trips per day in 1996 to 960 round-trips in 2020. Domestic truck traffic accounts for nearly three-quarters of total baseline traffic with tractor-trailers at just over 10 percent. Weekday truck traffic for Dulles is estimated to increase from 420 round-trips in 1996 to 2,066 in 2020. International truck traffic exceeds domestic volumes with tractor-trailers representing 14 percent of baseline traffic.

Figure 26 illustrates the air freight truck activity forecasts for both airports. Further details of these forecasts for BWI and Dulles are included in Appendix F.

A final category of vehicle activity that should be considered is personal automobile, trucks and other vehicles used to transport "expedited", over-the-counter shipments directly to or from local points. This activity is currently handled directly at the passenger terminal baggage counters. Average weekday traffic for these vehicles was assumed at 50 round-trips per day for BWI and 75 round-trips per day for Dulles. As with freight traffic, weekly vehicle traffic was assumed to be six times the weekday average and future growth was projected at five percent per year.

Figure 26

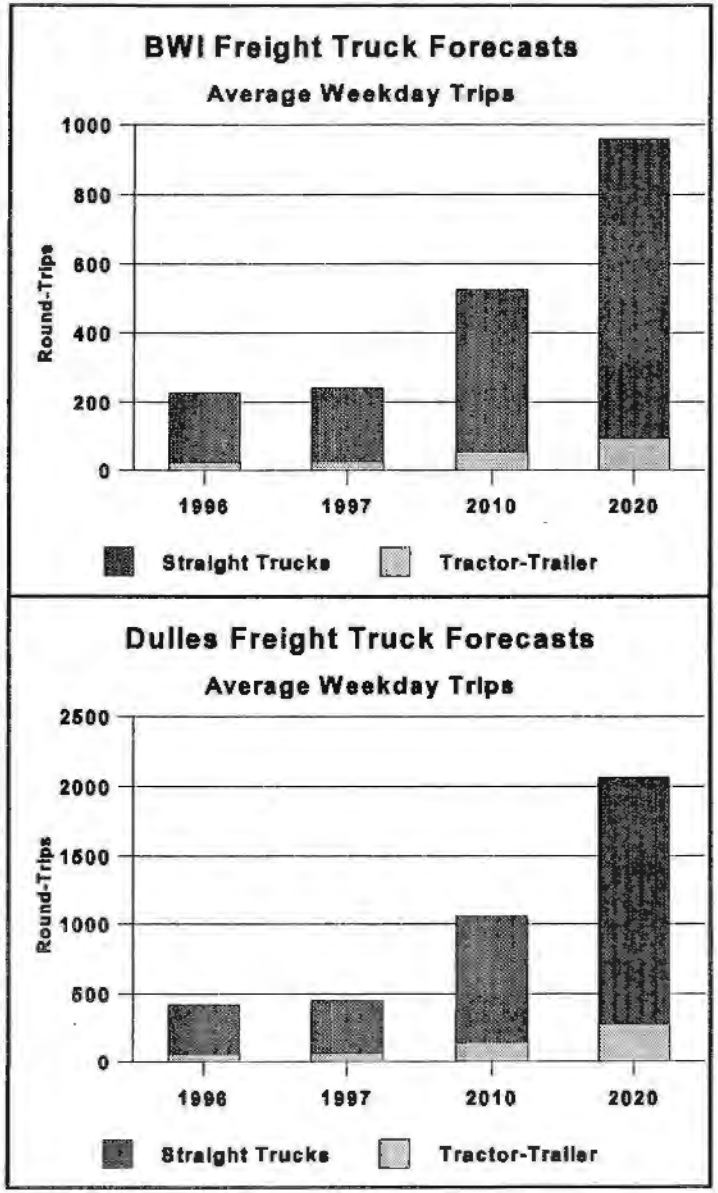
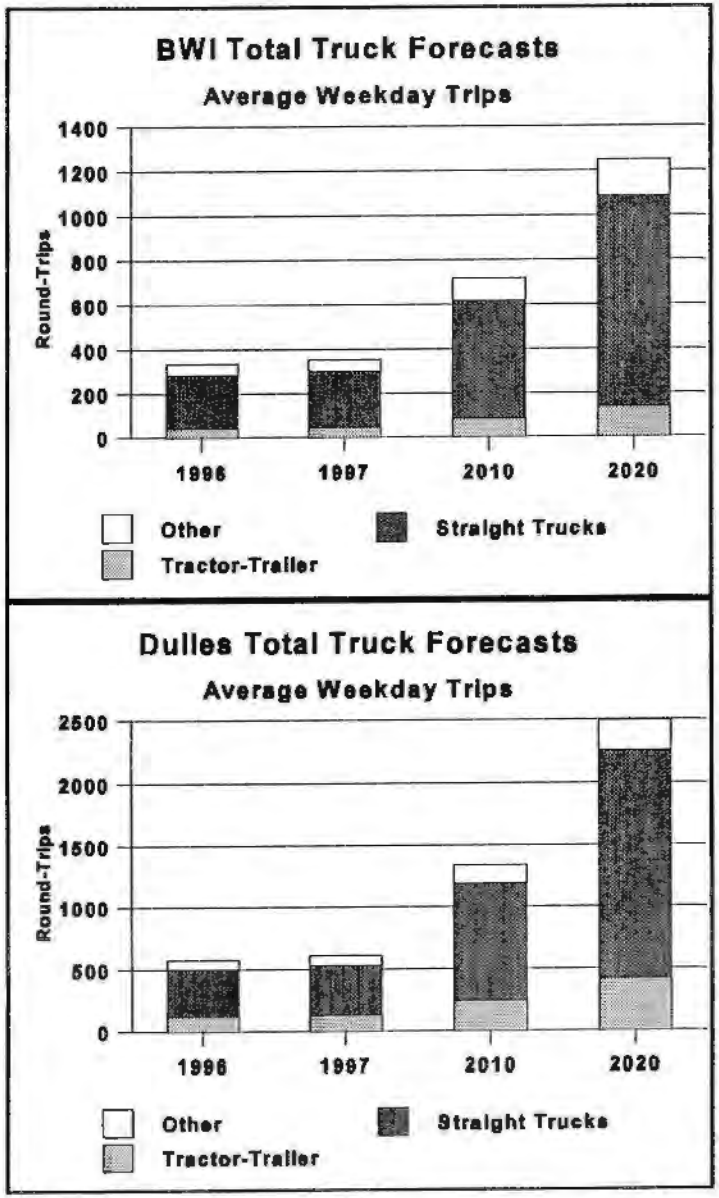


Figure 27



Total Air Cargo

Total air cargo vehicle traffic for BWI is estimated at 336 round-trips for an average weekday in 1996 and 1,249 round-trips in 2020. Annual vehicle traffic growth is 5.6 percent per year from 1996 to 2020. Total air cargo vehicle traffic for Dulles is projected at 578 round-trips in 1996 and 2,495 round-trips in 2020. Annual growth of 6.3 percent per year is projected. Straight trucks and vans are projected to account for approximately three-quarters of the forecast traffic for both airports. Figure 27 illustrates these projections for both airports. Table 19 provides a summary of the total air cargo truck activity forecasts. Appendix G provides further detail.

Table 19

Summary of Air Cargo Truck Activity Forecasts at BWI and Dulles Airports

	BWI				Dulles				Combined			
Average Weekday Trips	**1996**	**1997**	**2010**	**2020**	**1996**	**1997**	**2010**	**2020**	**1996**	**1997**	**2010**	**2020**
Mail												
Tractor-Trailer	19	20	31	43	61	63	97	136	80	83	128	179
Straight Truck	39	40	62	86	22	23	36	50	61	63	98	136
	58	60	93	129	83	86	133	186	141	146	226	315
Freight												
Tractor-Trailer	23	25	53	94	60	64	146	280	83	89	199	374
Straight Truck	205	217	472	865	360	384	910	1,787	565	601	1,382	2,652
	228	242	525	959	420	448	1,056	2,067	648	690	1,581	3,026
Total												
Tractor-Trailer	42	45	84	137	121	127	243	416	163	172	327	553
Straight Truck	244	257	534	951	382	407	946	1,837	626	664	1,480	2,788
Personal Vehicles	50	53	99	161	75	79	148	242	125	132	247	403
	336	355	717	1,249	578	613	1,337	2,495	914	968	2,054	3,744

Capacity/Traffic Analysis

A comparison between projected air cargo traffic and available terminal capacity at both BWI and Dulles Airports is summarized in Table 20. The estimates of capacity at each airport combine the air freight terminal estimates with an assumption that air mail capacity at both airports can and will be maintained at the current utilization level (92.3 percent) that was estimated for BWI.

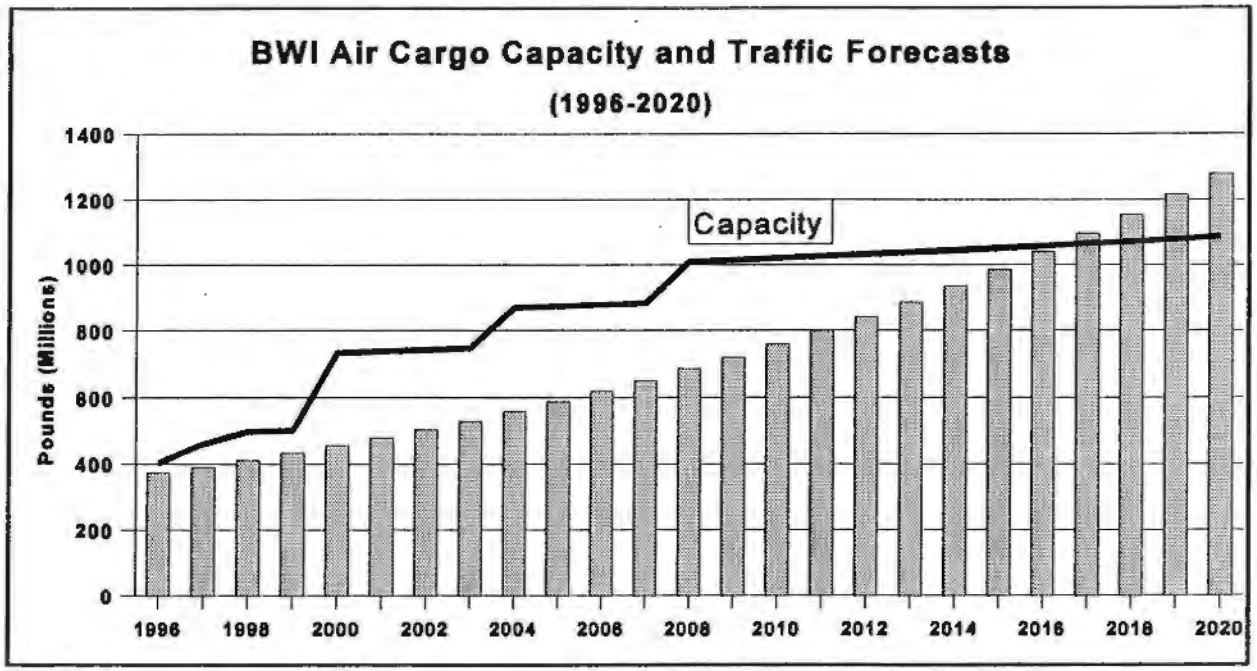
Table 20

Airport Capacity and Traffic Projections (Millions of Pounds)

	BWI				Dulles			
Year	Capacity	Traffic	Utilization	Shortfall	Capacity	Traffic	Utilization	Shortfall
1996	402.0	371.2	92.3%	---	808.8	647.6	80.1%	---
1997	461.5	390.3	84.6%	---	813.3	684.4	84.2%	---
1998	498.3	410.7	82.4%	---	818.0	724.3	88.5%	---
1999	502.0	432.2	86.1%	---	822.8	766.4	93.1%	---
2000	735.2	454.8	61.9%	---	1,123.4	811.0	72.2%	---
2001	739.1	478.7	64.8%	---	1,128.5	858.2	76.0%	---
2002	743.2	503.7	67.8%	---	1,133.8	908.1	80.1%	---
2003	747.5	530.1	70.9%	---	1,139.3	960.9	84.3%	---
2004	871.9	557.9	64.0%	---	1,145.0	1,016.8	88.8%	---
2005	876.5	587.1	67.0%	---	1,150.9	1,076.0	93.5%	---
2006	881.2	617.9	70.1%	---	1,157.0	1,138.6	98.4%	---
2007	886.0	650.2	73.4%	---	1,163.3	1,204.8	103.6%	41.5
2008	1,011.0	684.3	67.7%	---	1,465.4	1,274.9	87.0%	---
2009	1,016.2	720.1	70.9%	---	1,472.1	1,349.1	91.6%	---
2010	1,021.6	757.9	74.2%	---	1,479.1	1,427.6	96.5%	---
2011	1,027.2	798.7	77.8%	---	1,486.3	1,513.8	101.9%	27.5
2012	1,032.9	841.7	81.5%	---	1,493.7	1,605.2	107.5%	111.5
2013	1,038.9	887.1	85.4%	---	1,501.4	1,702.1	113.4%	200.7
2014	1,045.0	934.9	89.5%	---	1,509.4	1,804.9	119.6%	295.5
2015	1,051.4	985.3	93.7%	---	1,517.6	1,913.9	126.1%	396.3
2016	1,058.0	1,036.4	98.2%	---	1,526.1	2,029.4	133.0%	503.3
2017	1,084.7	1,094.3	102.8%	29.6	1,534.9	2,152.0	140.2%	617.1
2018	1,071.8	1,153.3	107.6%	81.5	1,544.0	2,281.9	147.8%	737.9
2019	1,079.0	1,215.5	112.6%	136.4	1,553.4	2,419.7	155.8%	866.3
2020	1,086.6	1,281.0	117.9%	194.4	1,563.1	2,565.8	164.1%	1,002.7

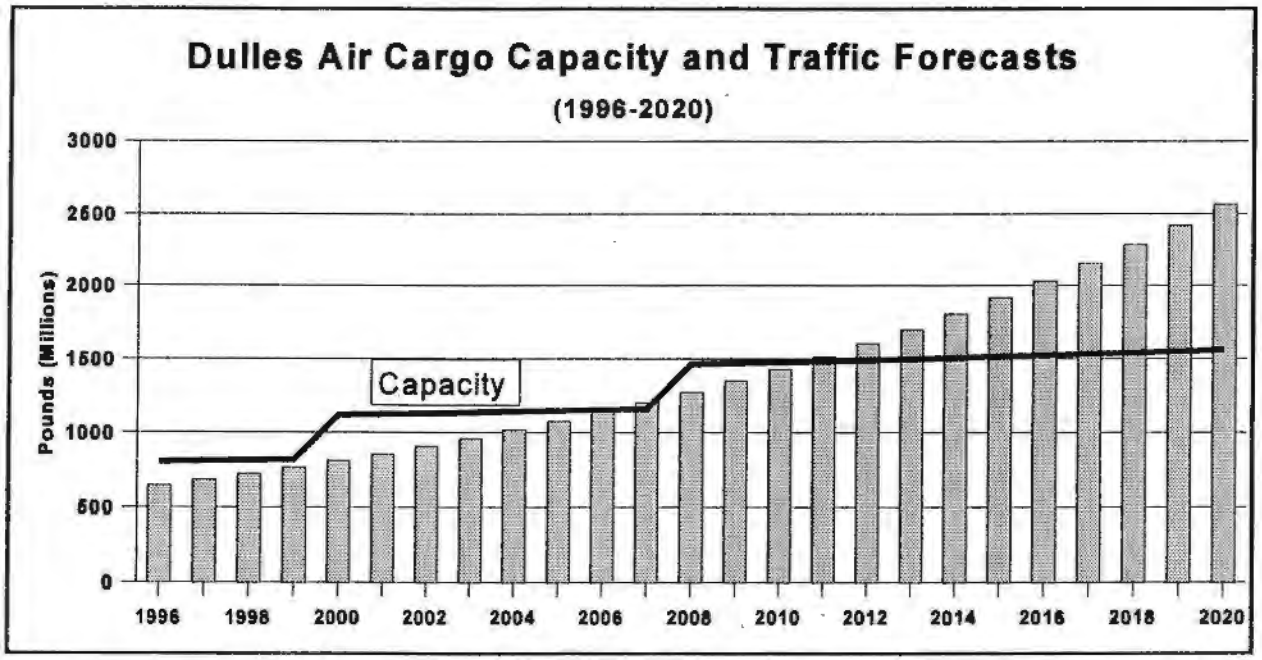
Air cargo capacity at BWI is projected to be able to handle air cargo traffic growth through the year 2017 with an additional 194 million pounds of capacity required by 2020. Facility utilization will drop from 92.3 percent in the base year to 61.9 percent in 2000 as new capacity becomes available. Utilization will be maintained below 75 percent through 2010, then climb to reach full utilization in 2017. Figure 28 illustrates air cargo capacity and traffic forecasts each year between 1996 and 2020 at BWI.

Figure 28



Planned expansion to Dulles' air cargo capacity is not currently scheduled as precisely as that at BWI, with new facilities projected to become available as demand warrants. Capacity is estimated to grow from a current level of 808.8 million pounds to over 1.5 billion pounds when Cargo Buildings #6 and #7 come online. The current utilization is projected at 80 percent with capacity constraints possible by the year 2005 when utilization exceeds 90 percent. Air cargo traffic is projected to reach maximum capacity for the current cargo area in 2011. (The final building planned for the current cargo area would be required prior to 2008 based on these projections.) The development of a new midfield area is planned to handle additional capacity requirements. Figure 29 illustrates air cargo capacity and traffic forecasts each year between 1996 and 2020 at Dulles.

Figure 29

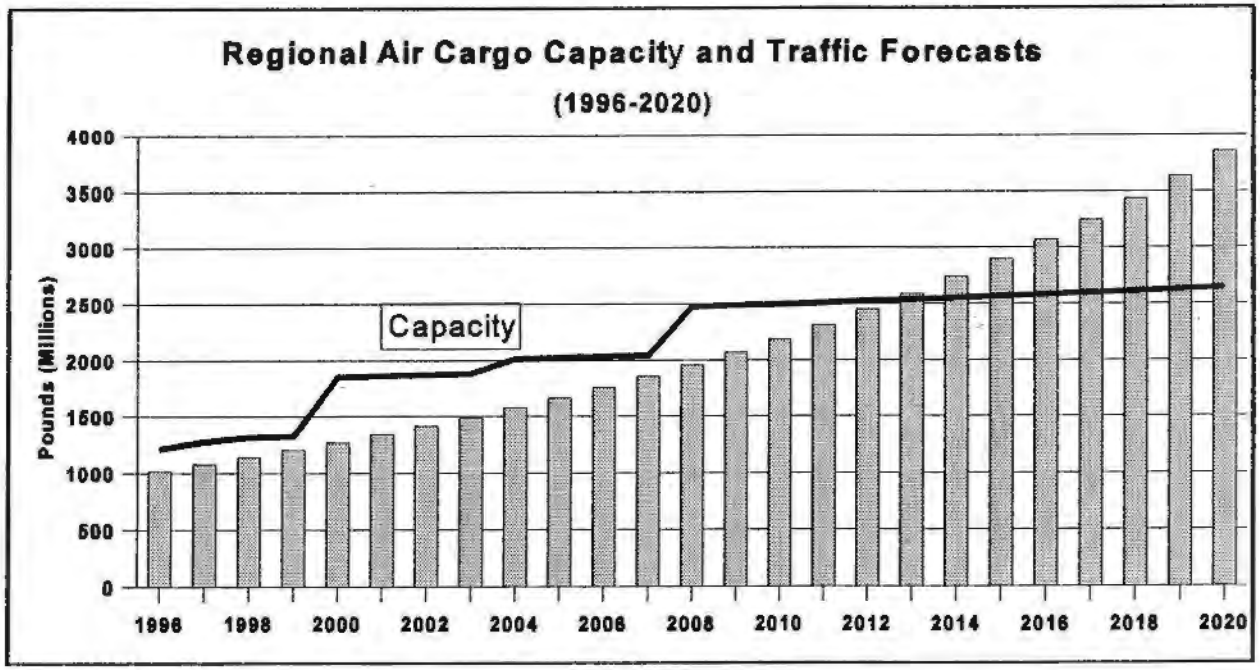


Combining the capacity and cargo traffic estimates for both airports, existing planned facility development should be adequate until after 2005 based on current development plans and after 2010 with accelerated development. Based on total cargo traffic estimates, an additional 1.2 billion pounds of capacity would be required by 2020. The horizons for the expected shortfalls at both BWI (the year 2017) and Dulles (the year 2011) provide sufficient time for the planning, design and construction of additional facilities to meet anticipated growth. Figure 30 illustrates regional air cargo capacity and traffic forecasts each year between 1996 and 2020, combining BWI and Dulles Airports.

Ground Access

Air cargo-related vehicle traffic accounts for a relatively minor share of total airport traffic and an even smaller share of regional highway use. Consequently, the projected growth in truck traffic to and from the cargo areas should not greatly affect overall road utilization. On the other hand, the projected growth in general vehicle traffic, both locally and regionally, could have a major impact on the efficiency of cargo operations. The capacity of specific elements of the ground access system (e.g., access gates and service roads) should be further analyzed to determine if the projected vehicle traffic increases can be handled.

Figure 30



Development Alternatives

The capacity/traffic analysis assumes no major changes in current operating patterns for carriers, truckers and other service providers. It may be possible to avoid or delay facility expansion and road congestion if significant efficiency measures are encouraged and facilitated. Possible measures which would greatly affect this analysis include:

- expansion of air transshipment operations which do not require terminal handling or ground access;
- development of regional container freight stations with direct airfield truck access which would also bypass the terminal and improve truck load factors;
- improvement and expansion of direct transfer between aircraft and off-airport facilities which have greater capacity and expansion potential;
- rehabilitation or replacement of older cargo terminals with higher capacity configurations or automation;
- higher utilization of off-peak operations to expand capacity; and
- rationalization of sweep and other local truck services.

VII. REGIONAL NETWORK ANALYSIS

VII. REGIONAL NETWORK ANALYSIS

Under the original scope of work for the Air Cargo Element of the Regional Airport System Plan, the consultant was to perform three tasks: (a) a regional air cargo demand analysis; (b) a review of air cargo facilities at BWI and Dulles Airports; and, (c) a regional needs assessment. COG staff was then responsible for conducting a network analysis to determine the impact air cargo-related traffic has on the regional transportation system. Based on the air cargo demand analysis performed by the consultant, the network analysis was to determine the effect that traffic generated by the current demand has on the current transportation network, as well as the effect that estimated future demand will have on transportation systems in place in the future.

As part of the needs assessment task, the consultant determined that air cargo-related traffic accounts for a relatively minor share of total traffic to and from the airports, and an even smaller share of total highway use. The projected growth in truck traffic to and from the facilities at BWI and Dulles Airports, therefore, should not greatly affect overall use of the regional highway system.

The Aviation Technical Subcommittee consequently decided that the original thinking on the network analysis task should be reversed. Instead of determining the impact of air cargo traffic on the regional transportation system, it was decided that the network analysis should concentrate on examining the effect that current and future vehicle traffic and congestion will have on truck traffic to and from the air cargo facilities.

Methodology

One of the most important aspects of the Ground Access Element of the Regional Airport System Plan was the incorporation of airport system and facility planning into the overall regional transportation planning process. The approach taken in that study was to adapt the traditional four-step transportation modeling process to specifically focus on airport-related travel. This process allows the impact on the regional transportation system of a major activity center to be estimated.

The travel demand modeling process produces estimates of average weekday travel over the transportation system. This modeling system provides sufficient detail for planning at the district level, and can focus in on a particular area to provide detailed data for zone level analysis. All traffic modeling is performed at the district level, with the resulting trip tables split to zone level, based on land activity, and assigned to the regional zone-level network.

The four-step process consists of trip generation, trip distribution, mode split and trip assignment[30]. If data is available to determine current demand, future demand (trip generation) can be projected, based on demographic forecasts for a particular year. Future demand can then be broken down by origin (trip distribution) and means of travel (mode split). Lastly, the future demand can be modeled on the future transportation network (trip

30. For a more detailed discussion of the application of this modeling process, see *Highway Access Study For Dulles and National Airport: 1987 Simulation and 2000 Forecasts*, October 1, 1991, Metropolitan Washington Council of Governments.

assignment) to determine its impact.

The results of the first three steps in the transportation modeling process are vehicle trip tables for the entire region, and for each of the three airports, showing the number of trips from each district to the airport. The last step in the process is to assign these trips to the transportation network, using the traffic assignment model.

An iterative, incremental capacity restraint technique is used to assign the total regional trip table to the network. Special computer software is used to assign each of the airport trip tables over the same paths as total trips. This procedure allows the total volume, the level of service and the number of airport-related trips to be estimated for each link in the transportation network. The reader is reminded that the link data presented are based on the results of a *regional* model that is not calibrated on an individual link basis.

Network Scenarios

Building upon the network analysis done for the Ground Access Element of the Regional Airport System Plan, the air cargo network analysis examined the year 1997 as the base case, and modeled scenarios for the years 2010 and 2020. The Aviation Technical Subcommittee decided that the baseline network scenarios for 1997, 2010 and 2020 would reflect the approved Constrained Long Range Plan (CLRP) for the region. In addition, one scenario for the year 2020 would be modeled, which would include highway improvements, over and above the CLRP, in the Western Transportation Corridor in Northern Virginia.

The transportation networks available for use in project planning analyses were developed for the Conformity Determination of the Constrained Long Range Plan (CLRP) and the annual Transportation Improvement Program (TIP) for the Washington Metropolitan Region, with the Requirements of the 1990 Clean Air Act Amendments (the Air Quality Conformity networks). The networks were developed from project inputs for the CLRP and the TIP, provided by state and local programming agencies. Networks for each year include in-place regionally significant highway and transit facilities, services and activities, and ongoing travel demand management or transportation system management activities.

The base case (1997) transportation network was the Air Quality Conformity network developed from inputs to the CLRP and the FY 1997-2002 Transportation Improvement Program. Only a few new major highways are included in the 1997 network. Among them, the portions of the Fairfax County Parkway, the Virginia 234 Bypass, the Prince William Parkway, and the privately financed Dulles Greenway between the airport and Leesburg are important facilities for air cargo access. A complete listing of the highway projects included in the 1997 network is contained in the July 1996 Air Quality Conformity document[31].

For the years 2010 and 2020, the Air Quality Conformity networks developed from inputs to the CLRP and the FY

31. *Conformity Determination of the Constrained Long Rage Plan and the FY97-2002 Transportation Improvement Program for the Washington Metropolitan Region with the Requirements of the 1990 Clean Air Act Amendments*, July 17, 1996, Metropolitan Washington Council of Governments.

Table 21

Major Highway Improvements in the 2010 Network	
Facility	***Segment/Improvement***
I-66	US 15 to VA 234, Widen to 6/8 lanes
Fairfax Co Parkway	VA 7 to US 1, Construction Completed
VA 28	US 29 to I-66, Widen to 6 lanes
Dulles Access Road	Airport to VA 123, Widen to 6 lanes
MD 201 Extended	Sunnyside Ave to Contee Rd, Construct 4 lanes
I-95	Relocated Interchange at Contee Rd
New York Avenue	Grade Separated Interchanges at Florida Ave and Bladensburg Rd
Major Highway Improvements in the 2020 Network	
Facility	***Segment/Improvement***
Tri-County Parkway	VA 234 to I-66, Construct 4 lanes
VA 28	Faquier Co Line to VA 215, widen to 4 lanes
US 15	US 29 to VA 7, Widen to 4 lanes
US 301	Relocated Waldorf Bypass
US 29	Sligo Creek Pkwy to Howard Co Line, Widen to 6 lanes
East Capitol Street	Grade Separatad Interchange at Benning Rd

1998-2003 TIP were used. All project submissions were reviewed and organized into network scenarios for appropriate forecast years, according to the project's completion date, estimated by the programming agency. Table 21 shows several highway projects in the 2010 and 2020 networks that might have an impact on access to the airports. A complete listing of the highway projects included in the 2010 and 2020 networks is contained in the July 1997 Air Quality Conformity document[32]. Figure 31 illustrates the major highway improvements included in the current Constrained Long Range Plan.

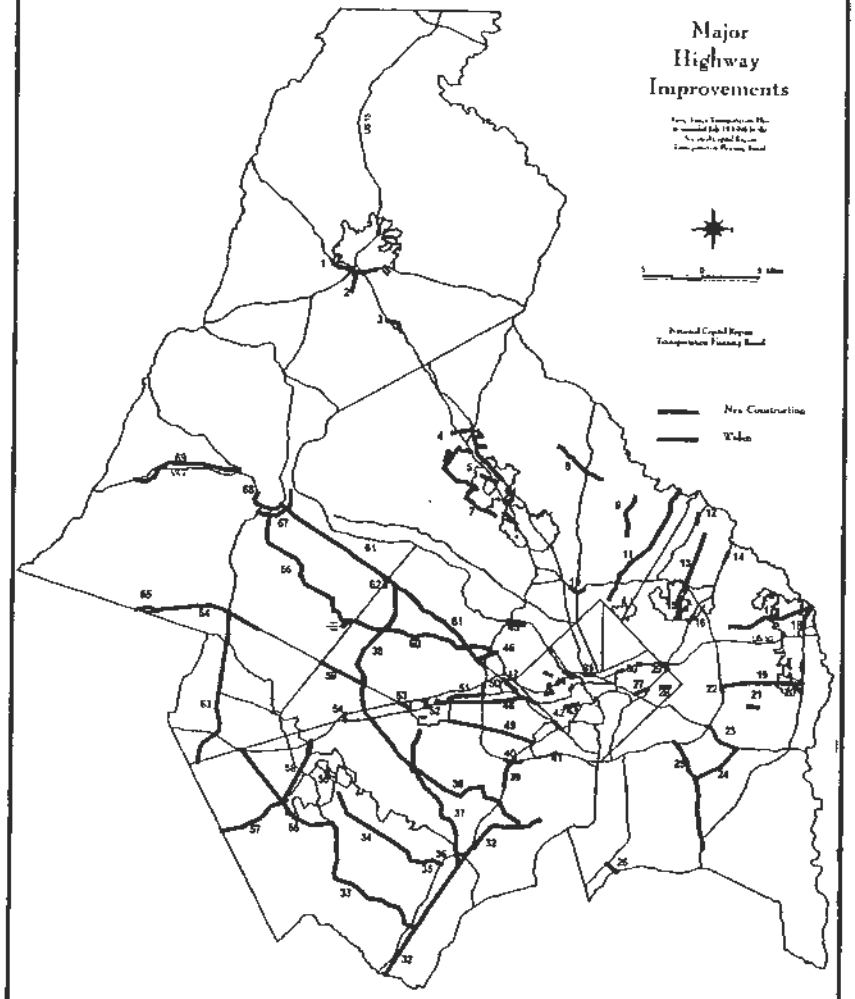
The final network scenario to be modeled included the year 2020 network with highway improvements in the Western Transportation Corridor. Comprehensive highway improvements in this corridor were not included in any of the available forecasting networks. With the concurrence of Fairfax, Prince William and Loudoun Counties, the TPB Transportation Technical Committee recommended that selected modeling assumptions from the Virginia Department of Transportation's Major Investment Study (MIS) for the Western Transportation Corridor be used for this particular network scenario. The improvements to be modeled in this corridor use Alternative 3.3 from the VDOT MIS, Upgrade/Link Existing and/or Planned Roadways, that was selected for detailed analysis.

As described in the Western Transportation Corridor MIS, "This alternative includes all components of the

32. *Air Quality Conformity Determination of the Constrained Long Rage Plan and the FY98-2003 Transportation Improvement Program for the Washington Metropolitan Region*, July 16, 1997, Metropolitan Washington Council of Governments.

Figure 31

Major Highway Improvements in the Constrained Long Range Plan



1994 CLRP Update

Baseline Alternative with additional road widening, realignment, and/or new links between roadways. This alternative seeks to meet the north-south travel needs of the study area by adding roadway linkages to roadway improvements already on the CLRP. All of the linkages considered in this alternative have been included in the counties' transportation plans." Appendix H contains a detailed description of the roadway improvements and linkages that are included in this alternative.

Select Link Analysis

Once the trip tables by purpose (the results of the first three steps in the transportation modeling process) are obtained, traffic is assigned to the networks using special computer software comprising the traffic assignment model. Various data are then produced for each link in the highway network, which can be used in a select link analysis. While these data are useful for comparative purposes, it is important to remember that the models are calibrated at the regional level, a much higher level than the individual highway links.

Washington Dulles International Airport

Regional average weekday traffic on select links of the highway network in the vicinity of Washington Dulles International Airport is presented in Table 22. Figure 32 is a schematic map showing which links are being analyzed. The networks examined were for the years 1997, 2010, 2020, plus one scenario for the year 2020 with highway improvements in the Western Transportation Corridor (2020/WTC).

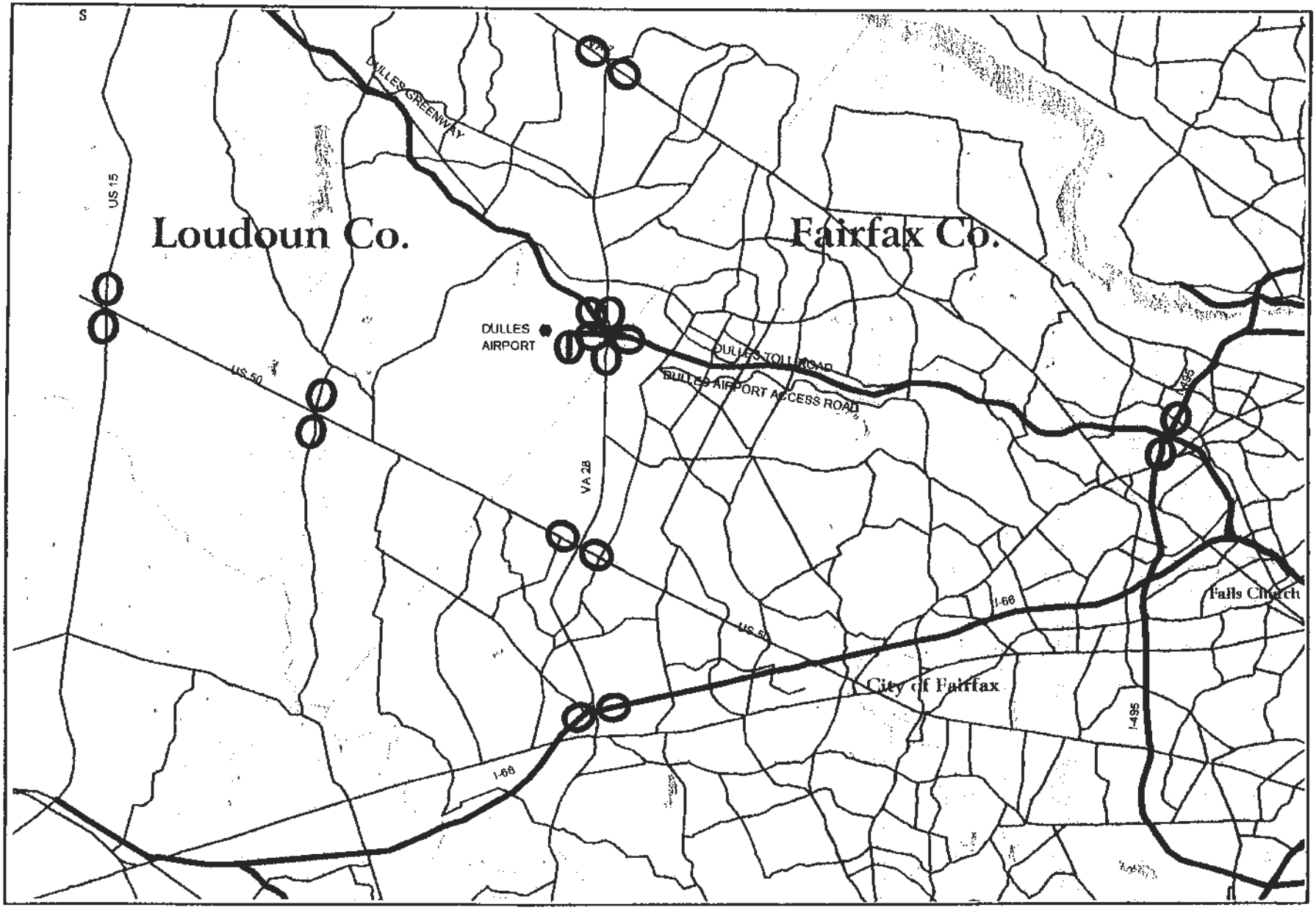
The most important observation to be made is that the

Table 22

Highway Link	1997 AWDT	2010 AWDT	2020 AWDT	2020/WTC AWDT
Airport Entrance Roadway, Rte 28 to Airport	57,600	74,800	97,800	98,600
Dulles Airport Access Highway, West of Rte 28	28,500	32,700	48,000	48,700
Dulles Toll Road, West of Rte 28	59,100	116,500	163,800	162,300
Dulles Toll Road, East of Rte 28	92,700	133,600	162,700	164,200
VA Rte 28, North of Dulles Airport Access Highway	48,200	60,900	72,200	70,600
VA Rte 28, South of Dulles Airport Access Highway	66,400	81,600	95,400	91,900
VA Rte 7, West of Rte 28	31,200	83,700	109,300	109,300
VA Rte 7, East of Rte 28	37,300	78,600	92,800	92,200
Capital Beltway (I-495), North of Access Highway	212,400	255,800	298,400	298,900
Capital Beltway (I-495), South of Access Highway	187,100	219,500	259,600	261,400
I-66, West of Rte 28	56,100	80,600	131,700	143,200
I-66, East of Rte 28	101,100	136,000	177,800	153,000
US 50, West of Rte 28	48,200	86,700	99,400	101,400
US 50, East of Rte 28	52,100	83,100	87,900	90,700
US 15, North of US 50	7,700	11,700	17,500	15,700
US 15, South of US 50	9,200	14,800	25,300	20,500
VA 659, North of US 50	8,900	12,000	19,600	22,400
VA 659, South of US 50	4,000	8,400	17,200	9,400

average weekday traffic on each of these links will increase significantly between 1997 and 2010, and between 2010 and 2020. The overall increases from 1997 to 2020 range from approximately 40 percent on

Figure 32


Loudoun Co.
Fairfax Co.
DULLES GREENWAY
US 15
DULLES AIRPORT
DULLES TOLL ROAD
DULLES AIRPORT ACCESS ROAD
VA 28
US 50
I-66
Falls Church
City of Fairfax
I-495

the sections of the Capital Beltway at the Dulles Airport Access Highway, to 70 percent on the Access Highway around VA Route 28, to more than 100 percent on VA Route 659 at US 50 (a 120 percent increase on the northern link and a 330 percent increase on the southern link). These increases in average weekday traffic will undoubtedly have an adverse impact on air cargo traffic going to and from Dulles Airport.

Perhaps a better measure of the impact that regional vehicular traffic will have on air cargo traffic is level-of-service. Level-of-service (LOS) is a standardized qualitative measure that describes operating conditions on each link of the highway system, within the flow of traffic, in terms of the motorists' perception. It is a description of perceived congestion on the transportation system. There are six level-of-service definitions that range from LOS A, the best operating condition, representing free flow, in which the motorist is unaffected by the presence of other traffic, to LOS F, the worst operating condition, representing forced breakdown, where the amount of traffic approaching a point exceeds the amount that can pass through that point.

The LOS described here represents overall operating conditions for a 24-hour period. While conditions may be worse during the peak hour of operation, 24-hour LOS is used to balance against air cargo operations, which are spread out over the entire day. LOS A through LOS D represent reasonably satisfactory travel conditions. This analysis, therefore, does not differentiate these levels. Those links operating at LOS E (operating conditions at or near the capacity level) and LOS F (forced or breakdown flow) are examined here.

Level-of-Service is determined by the classification of each link (freeway or principal arterial) and its volume-to-capacity ratio. Based on the network analysis, in the year 2010, the following links will be operating at LOS E or LOS F:

Freeways

- Capital Beltway, North of Access Highway
- Capital Beltway, South of Access Highway
- I-66, East of Rte 28
- Dulles Access Highway, Rte 28 to Airport
- Dulles Toll Road, West of Rte 28
- Dulles Toll Road, East of Rte 28

Principal Arterials

- Route 28, North of the Access Highway
- Route 28, South of the Access Highway
- Route 7, East of Rte 28
- US 50, West of Rte 28
- US 50, East of Rte 28

By the year 2020, the volume-to-capacity ratio for each of the above links will increase significantly, and the links on I-66, west of Route 28, on VA Route 7, west of Route 28 and US 15, north of US 50 will join the list. The severe congestion represented by the levels-of-service on nearly all of the roadway links analyzed in the Dulles Airport vicinity will have a detrimental impact on future air cargo traffic.

2020 Network with WTC Improvements

While the overall congestion forecast on the regional transportation network in the years 2010 and 2020 could have a significant impact on air cargo traffic, the results obtained from modeling the final network scenario are far

less conclusive. The average weekday traffic on the links for the year 2020 with the highway improvements in the Western Transportation Corridor, shown in Table 22, do indicate some movement. Most of the changes in AWDT represent less than one percent of the baseline 2020 figures, and can be considered "noise" in the modeling process.

A few of the figures, however, represent significant change, and warrant our attention. Most notably, on the I-66 link west of VA 28, the model projects a 8.7 percent increase in average weekday traffic, while the figures for the I-66 link east of VA 28 is forecast to decrease by almost 14 percent. On US 15, the links north and south of US 50 decrease by 10.3 percent and 19 percent, respectively. Similarly, on VA 28, both north and south of the Access Highway, and on US 50, east and west of VA 28, changes are predicted in the rage of two to four percent. These results, from modeling with a regional level of precision, are inconclusive at this time. The links on VA Route 659, a minor arterial, indicate wide ranging changes. Some of these changes, however, particularly with the future increases in congestion noted on the highway links in the vicinity of Dulles Airport, point to the validity of examining additional highway improvements in the Western Transportation Corridor at a subregional level of analysis.

Baltimore/Washington International Airport

Regional average weekday traffic on select links of the metropolitan Washington highway network that impact traffic to and from Baltimore/Washington International Airport is presented in Table 23. Figure 33 is a schematic map showing which links are being analyzed.

It is important to note that BWI Airport is physically located outside of the area for which COG currently does modeling. The links that were selected for analysis, while not specifically in the vicinity of the airport itself, would be those that carry much of the regional traffic to BWI Airport.

The important observation from Table 23 is that average weekday traffic on each of these links will increase significantly between 1997 and 2010, and, with two exceptions, again between 2010 and 2020. While the overall increases from 1997 to 2020 are not as dramatic as those seen on the highway links in the Dulles Airport vicinity, the range on the regional highway links that will carry traffic to BWI Airport is from 14 percent on the Capital Beltway east of I-95 to 64 percent on US 29 south of the Montgomery County/Howard County line. The majority of these links will experience an increase in average weekday traffic of more than 25 percent. These increases in average weekday traffic will most likely affect regional air cargo traffic going to and from BWI Airport.

An examination of level-of-service, based on the network analysis, indicates that the following links will operate at LOS E or LOS F in the year 2010:

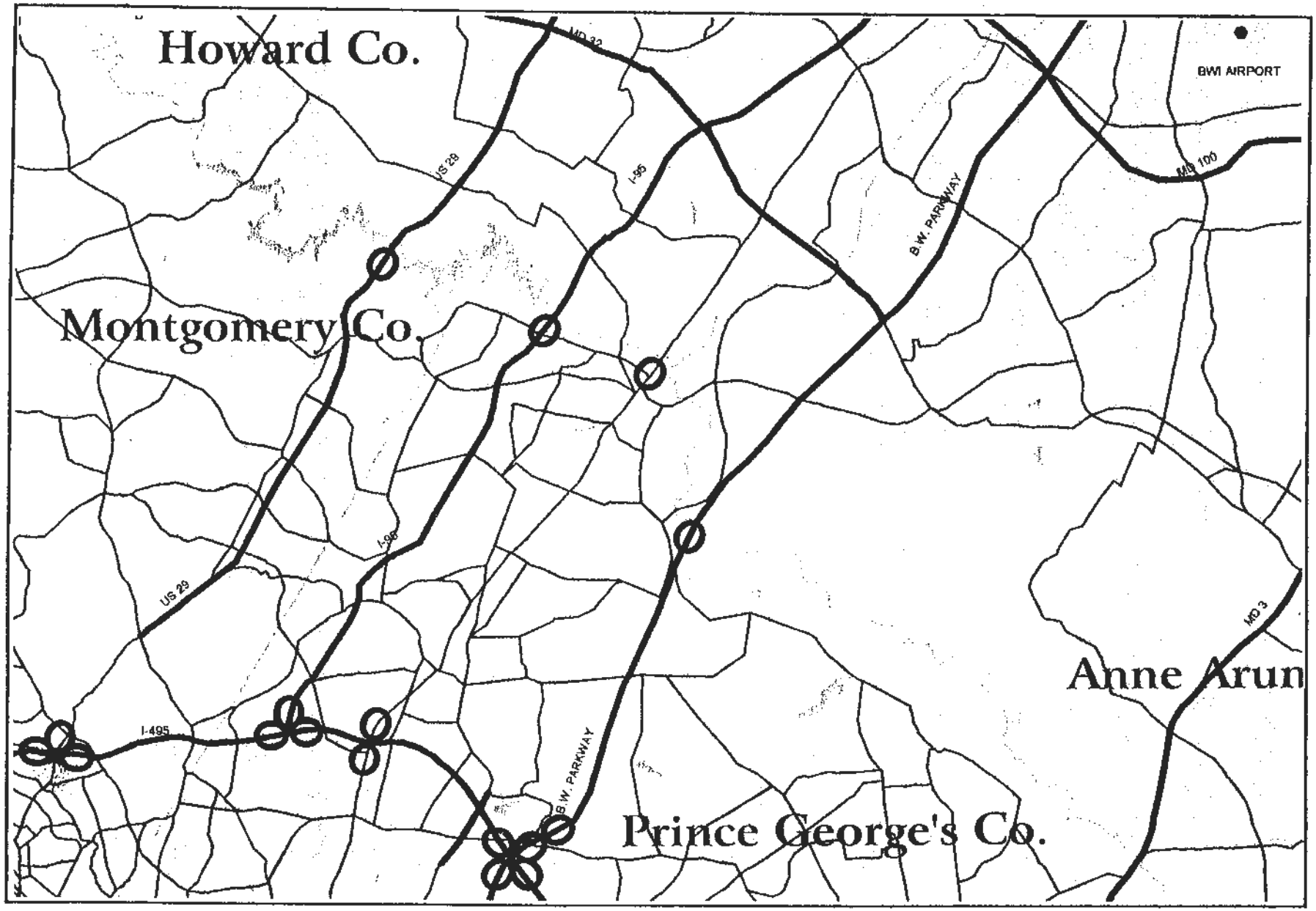
Freeways

- BW Parkway, North of I-495
- BW Parkway, South of I-495
- BW Parkway, North of Rte 193
- I-95, South of Prince George's Co. Line
- I-95, North of I-495
- Capital Beltway, East of BW Parkway
- Capital Beltway, West of BW Parkway

Table 23

Highway Link	1997 AWDT	2010 AWDT	2020 AWDT
US 1, South of Prince George's Co Line	27,000	29,100	35,100
US 1, North of Capital Beltway	53,600	57,400	62,700
US 1, South of Capital Beltway	63,600	71,800	73,900
BW Parkway, South of Prince George's Co Line	42,000	57,000	56,200
BW Parkway, North of Capital Beltway	116,200	151,600	165,200
BW Parkway, South of Capital Beltway	113,300	137,300	149,700
BW Parkway, North of Rte 193	88,000	121,000	138,700
I-95, South of Prince George's Co Line	116,900	144,500	146,700
I-95, North of Capital Beltway	166,100	194,600	205,700
US 29, South of Montgomery Co Line	24,100	30,900	39,600
US 29, North of Capital Beltway	69,900	79,000	97,200
Capital Beltway, East of BW Parkway	172,600	218,100	237,800
Capital Beltway, West of BW Parkway	212,800	254,700	278,000
Capital Beltway, East of I-95	168,200	193,600	191,800
Capital Beltway, West of I-95	232,900	267,300	290,500
Capital Beltway, East of US 29	181,000	205,800	221,000
Capital Beltway, West of US 29	189,000	212,600	228,400

Figure 33


Howard Co.
Montgomery Co.
Prince George's Co.
Anne Arun
BWI AIRPORT
MD 32
US 29
I-95
B.W. PARKWAY
MD 100
I-495
MD 3

- Capital Beltway, West of I-95
- Capital Beltway, East of US 29
- Capital Beltway, West of US 29

Principal Arterials

- US 1, North of I-495
- US 1, South of I-495
- US 29, North of I-495

By the year 2020, the volume-to-capacity ratio for each of the above links will increase, and the link on US 29, south of the Prince George's County/Howard County line will be added to the list. The severe congestion represented by the levels-of-service on the roadway links that carry regional traffic to BWI Airport will have a negative effect on future air cargo traffic.

VIII. RECOMMENDATIONS

VIII. RECOMMENDATIONS

The purpose of Volume III of the Washington-Baltimore Regional Airport System Plan is to provide a comprehensive study of the demand for air cargo in the region, along with an examination of the current and planned facilities at Baltimore/Washington International and Washington Dulles International Airports. Air cargo traffic is growing, and will continue to grow in the future. Most forecasts predict a tripling of demand worldwide by the year 2015. This growth is placing increased pressure on cargo facilities and access systems at airports throughout the world.

The approach taken in this study was to forecast regional air cargo demand for the years 2010 and 2020, based on current (1996) demand, regional projections and industry standards for the future. Air cargo facilities at BWI and Dulles Airports, both existing and planned, were evaluated, and a needs assessment was done, comparing the expected facilities to the projected demand.

This chapter presents recommendations for an improved air cargo "system" for the Washington-Baltimore region. The recommendations are framed in terms of observed characteristics of air cargo operations, both overall and specific to BWI and Dulles Airports. While Washington National Airport is an integral part of the airport system for the Washington-Baltimore region, the percentage of regional air cargo handled there is marginal, consisting predominantly of air mail carried in the bellies of passenger air craft. It, therefore, was not included in this air cargo analysis.

Regional Air Cargo Summary

BWI and Dulles Airports, combined, serve a medium-sized local air cargo market, and handle air cargo traffic for regional points, mostly to the south. Domestic freight is mostly concentrated in the local area except for the primary hub operators which must draw from larger regional markets to fill available air capacity. The domestic all-cargo carriers mostly concentrate on the local market due to the availability of direct services for nearby small-to-medium markets. Integrated heavy freight carriers serve a wider market area and concentrate services at fewer airports such as BWI, which has attracted many of these services. United's domestic hub and European gateway at Dulles account for a significant level of air transshipment cargo moving between domestic and international flights.

Based on assumptions concerning demand growth and operating patterns, total air cargo traffic at Dulles and BWI is projected to grow from over 1.0 billion pounds in 1996 to nearly 4.0 billion pounds in 2020. This represents an average annual growth of 5.7 percent. Growth by cargo type for the forecast period ranges from 3.4 percent per year for air mail to 5.5 percent per year for domestic freight and 7.7 percent for international freight.

Market leakage of domestic freight traffic from the eight-state market region to airports other than Dulles and BWI includes 12 percent of local traffic, 45 percent of regional pickup and delivery areas, and 86-93 percent of traffic for road feeder areas. Market leakage for international freight traffic is much higher, ranging from 44 percent for local points to 83 percent for regional pickup and delivery areas, and 93-96 percent of traffic for road feeder areas.

Current routing patterns reflect available aircraft capacity by market and the location and competitiveness of services at other airports.

Truck activity related to air cargo movement is determined by cargo throughput levels and operating characteristics for the various types of operations which transfer cargo at the airport. Air mail traffic is determined by the scheduled routes of USPS trucks, while air freight traffic combines a variety of sweep trucks to local truck terminals and warehouses and direct pickup and delivery routes to local and regional destinations. An additional category of cargo traffic is pickup and delivery of over-the-counter expedited shipments by couriers in automobiles, pickup trucks and other vehicles.

Baseline (1996) vehicle traffic levels are estimated at 336 daily round-trips for BWI and 578 round-trips for Dulles with straight trucks and vans accounting for over three-quarters of total trips for both airports. BWI truck traffic is projected to grow 5.6 percent per year to 1,250 round-trips per average weekday in 2020. Dulles volumes are estimated to grow at a higher level (6.3 percent) to a total of 2,494 round-trips per day in 2020.

The current level of air cargo-related vehicle traffic is insignificant when compared with total airport vehicle traffic and traffic levels on major local and regional routes. The projected increase in vehicle traffic levels should not have a significant impact on either regional congestion or expansion requirements. On the other hand, the projected increase in congestion on major access corridors in the metropolitan region could have a detrimental impact on the competitiveness of cargo services at both airports due to increased access costs and diminished service levels relative to other airports.

Throughout the interviews, analyses, and forecasting exercises that have been conducted while this study was underway, issues that have arisen seem to be aggregated into two separate categories: those that are related to air cargo terminals, parking areas, access roads and other facilities that are physically located on the airports or in their immediate vicinity; and, issues related to facilities that tend to be more regional in nature. The recommendations included in this chapter have been categorized in a similar manner.

Airport Vicinity Recommendations

As the air cargo industry continues to evolve, the design of air cargo terminals has changed. Simple, one-story shed-like structures have been replaced by multi-level buildings which have adequate interior space to accommodate different levels of automated handling systems. Additionally, the design of the air cargo terminals, especially at international airports like BWI and Dulles, have to provide for separation of domestic and international cargo traffic.

Many airports, including Dulles and BWI, are examining options for new cargo complexes which are tailored to the modern air cargo carrier, as opposed to most existing cargo areas which were developed piecemeal as a secondary airport use. These new complexes would not only improve the efficiency of cargo operations, but would also free up existing areas for other uses.

As airlines seek ways to control costs they are expanding their service areas through the increased use of road

feeder services. These over-the-road truck operations are a fully-integrated component of a full service package. As a result, air cargo facilities have had to accept a higher volume of "air" freight which arrives and departs by truck. This has forced air cargo terminal designers and operators to focus an increasing level of attention towards the landside component.

The current planning for expanding capacity at both BWI and Dulles includes new buildings at the existing air cargo areas and the potential development of new air cargo areas designed for particular types of users (e.g. all-cargo operators). A comparison of projected air cargo traffic levels with currently planned development indicates that regional capacity (both airports combined) should be adequate at least through the year 2007.

Full build out of currently planned buildings at Dulles Airport, which excludes a new cargo area, should provide adequate terminal capacity through 2011. An additional 1.2 billion pounds of capacity will be required by 2020.

The currently scheduled development of BWI capacity, which includes a new midfield area, is projected to keep utilization rates below 90 percent through 2014. An additional 193.1 million pounds of capacity will be required by 2020.

The horizons for the expected shortfalls in air cargo terminal capacity at BWI (the year 2017) and Dulles (the year 2011) provide sufficient time for the planning, design and construction of additional facilities to meet anticipated growth. It is, therefore, recommended that project planning for the implementation of the air cargo terminal facilities required to meet the projected shortfalls at both airports be undertaken in a timely manner.

The analysis of capacity requirements conducted for this study assumed that current activity levels and operating patterns will remain relatively constant. There are available efficiency options which could increase capacity without new facility development, or at the very least, forestall the need for new facility development.

It is recommended that an examination of potential efficiency measures, such as a reduction in air cargo terminal use through more direct transfers and off-airport handling, rehabilitation of older terminal areas, or more efficient use of truck services, be undertaken at both airports. A determination should then be made as to whether new facility development could be postponed.

The road systems on both airports are becoming increasingly congested. Trucks are having to compete for lane space with increasing movements by a wide variety of other vehicles including passenger automobiles of employees and visitors, employee shuttle buses, and service trucks. This has slowed down average speed, decreased safety and increased operating costs. In addition, parking for employees, visitors and trucks is becoming increasingly constrained. As more cargo is processed through the airports, the associated numbers of vehicles likewise increases. This situation is a growing concern in the air cargo complexes of both airports.

The expansion of off-airport facilities used by freight forwarders, customs brokers and even carriers is part of the search for lower costs and more space. This trend,

however, has increased the volume of vehicle traffic to and from the airports, further exacerbating the situation in the air cargo complexes at both BWI and Dulles. This situation is not expected to decline in the future.

Internal road access and on-site parking are required to reduce the congestion in and around air cargo terminal areas. It is recommended that both airports conduct analyses of their internal access systems to assure they can accommodate this component of vehicle traffic.

While truck traffic accounts for a small percentage of vehicle movements over a regional road and highway system, this traffic type is concentrated in the immediate vicinity of cargo terminals. As a result, turning radii, signal cycles, lane widths and the number of lanes have to be adjusted to reflect the difference in operating characteristics between passenger automobiles and trucks. Attention needs to be focused on this issue at both Dulles and BWI.

It is recommended that both airports work with the surrounding jurisdictions to analyze the geometry and general layout of roads which serve the air cargo terminals, in the airports' immediate vicinity, to assure that they are configured to meet the requirements of large trucks.

Regional Air Cargo Recommendations

As the use of road feeder services increases, especially as they serve broader regions, the focus of road access has to expand beyond the immediate service area of the two airports. Many of the airlines serving Dulles and BWI attract cargo from distant points to the west and south. As a result, linkages between the broader Interstate system and the more proximate highways and roads is of increasing concern.

The regional road and highway system surrounding both BWI and Dulles is becoming increasingly congested. In recent years, the overall volume of vehicular traffic has increased, creating problems for truck operations. Under current plans for road improvements, congestion is projected to increase significantly, particularly on main access routes to regional markets. Congestion on the Capital Beltway is an issue with which the entire region is familiar.

Regional access is heavily influenced by existing and projected highway congestion in the metropolitan area, more so than conditions directly on or around the airport. While much cargo activity occurs during off-peak periods, a significant portion of cargo pickups and deliveries are time-sensitive and occur during the peak commuting periods. Recent years have shown an uneven pattern in congestion, with much of the off-peak congestion affecting air cargo activity as well.

In industry interviews conducted by the consultant with shippers and consignees that use both airports, several issues related to regional access were repeatedly raised. A significant amount of truck traffic moves between BWI and Dulles, including international cargo connecting with flights from Dulles. Access between the two airports, particularly congestion on the Capital Beltway, was cited as a major problem.

The primary linkage between BWI Airport and regional markets, I-195, providing direct access to I-95 and the B-W Parkway, was cited as a significant advantage of this airport's location. Once on the regional roadway system, however, areawide congestion was noted by a majority of respondents as one of the impediments to air cargo movement. In it's report *Outlook 2020: Freight Mobility Issues and Recommendations for the 1997 Baltimore Regional Transportation Plan*, the Baltimore Metropolitan Council found that congestion on the regional highway system had a major impact on overall freight movement, including air cargo.

At Dulles Airport, an area of concern for off-airport cargo companies is the dependence on the Dulles Toll Road for access to points east. Vehicles going to and from these companies must use Route 28, which does not connect with the Dulles Access Highway. Trucks must therefore be routed via the Dulles Toll Road, which is typically congested during key morning and afternoon delivery periods. This routing is particularly difficult for trucks destined for the District of Columbia. Trucks often take a circuitous route to get into the city. Routing via the Toll Road also becomes expensive for companies running several dozen vehicles per day.

Another issue related to regional access that was stressed at Dulles is highway access to points west. With many of the airlines that serve Dulles attracting cargo from areas as distant as Tennessee and South Carolina, the linkage between the airport and the broader Interstate system to the west is of increasing concern.

Comparing the forecasts of air cargo demand for the eight-state regional market with the forecasts of the air cargo traffic at BWI and Dulles combined, it can be seen that the percentage of the regional air cargo market that will be captured by these two airports is expected to diminish in the future. As discussed earlier, the percentage of market leakage tends to grow as the shipper's dependence on the regional highway system increases.

MARKET LEAKAGE			
Air Freight (lbs)	**1996**	**2010**	**2020**
Eight-State Regional Market	4.39 mill	10.46 mill	19.68 mill
Market Captured by BWI & Dulles	1.02 mill	2.19 mill	3.85 mill
Percentage	23.2%	20.9%	19.5%

There are many factors involved in the market leakage that occurs, for both domestic freight and international freight. These include available aircraft capacity by market, the competitiveness of services at other airports, the primary gateway status of particular airports for specific markets and incentives for forwarders and brokers to consolidate shipments. The one factor over which the region can potentially maintain control, and which was repeatedly mentioned by the shippers and consignees interviewed, is airport access.

In comments to the Vision Planning Steering Committee, James Wilding, General Manager of the Metropolitan Washington Airports Authority stated that, with the multiple airport strategy that has been pursued over the years, this region has more raw capacity for aviation

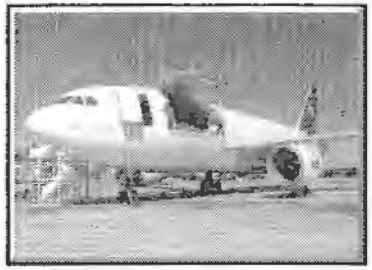
growth (including air cargo) than any other region in the country. In addition, the basic financial structure is in place to meet future needs. Mr. Wilding urged the committee to be aware of, and sensitive to, the very important issue of access to the airports in their vision planning process.

There are several significant highway facilities included in the Constrained Long Range Transportation Plan for the National Capital Region that will have direct impact on air cargo access to Baltimore/Washington International and Washington Dulles International Airports. Improvements such as the widening of the Dulles Access Road, Virginia Routes 7 and 28 and US Route 50 in Virginia, and the widening of US 29 and reconstruction of several major interchanges on the BW Parkway and the Capital Beltway will significantly enhance future air cargo access to the airports.

The analysis done for this study, nonetheless, indicates that the travel demand placed on the highway system by the years 2010 and 2020 will cause serious deterioration in airport accessibility. The future growth of air cargo demand in the Washington-Baltimore Region will depend in part on our success in reducing congestion on regional highways as well as roadways in and around the airports, and maintaining a high level of accessibility to both BWI and Dulles Airports.

It is recommended that the area jurisdictions work together to identify opportunities that are financially beneficial to the region for improving access to the commercial airports in the Washington-Baltimore Region.

APPENDICES



APPENDIX A

Origin/Destination Market Areas

LIST OF ORIGIN/DESTINATION MARKET AREAS BY ANALYSIS GROUP

Area Group		Market Area Code	Market Area Description	Central Point	IAD Miles	IAD Time (Mins.)	IAD Avg MPH	BWI Miles	BWI Time (Mins.)	BWI Avg MPH	Land Area (Sq. Miles)
1. Local P&D Area											
Washington, DC	DCA	DC01	Washington, DC *	Washington, DC	30	32	56	31	34	55	61.4
Montgomery Co (MD)	MDA	MD01	Montgomery County *	Gaithersburg	35	37	57	44	48	56	494.6
Prince Georges Co (MD)	MDB	MD02	Prince Georges County *	Bowie	48	53	54	26	29	54	486.4
BWI Area (MD)	MDC	MD04	Anne Arundel County *	Annapolis	64	69	56	20	27	44	416.0
	MDC	MD05	Howard County *	Columbia	47	53	53	16	19	51	252.2
	MDC	MD06	Baltimore (city) *	Baltimore	64	74	52	9	14	39	80.8
No. of Baltimore (MD)	MDD	MD09	Harford County *	Bel Air	91	109	50	36	49	44	440.4
	MDD	MD10	Baltimore County *	Towson	71	87	49	20	32	36	598.6
	MDD	MD11	Carroll County *	Westminster	77	87	53	36	46	47	449.2
Frederick Area (MD)	MDE	MD12	Frederick County *	Frederick	58	62	56	49	57	52	662.9
Charles Co (MD)	MDF	MD03	Charles County *	La Plata	81	82	45	56	75	45	481.1
Northern VA	VAA	VA01	Fairfax County *	Fairfax	15	16	56	49	54	54	403.8
	VAA	VA02	Alexandria (city) *	Alexandria (city)	32	37	52	37	42	53	15.3
	VAA	VA03	Arlington County *	Seven Corners	21	25	50	39	43	54	25.9
Western Suburbs	VAB	VA04	Loudoun County *	Leesburg	16	19	51	67	76	53	519.9
	VAB	VA06	Fauquier County *	Warrenton	35	40	53	77	86	54	650.3
	VAB	VA08	Clarke County *	Berryville	42	48	53	88	104	51	176.6
I-95 Corridor No. (VA)	VAC	VA05	Pr. William County *	Manassas	19	21	54	61	67	55	350.2
	VAC	VA07	Stafford County *	Stafford	67	90	45	86	109	47	270.0
	VAC	VA12	Fredericksburg Area *	Fredericksburg	63	73	52	83	96	52	411.4
2. Regional P&D Area											
MD Eastern Shore/NE	MDG	MD07	Eastern Shore (N)	Chestertown	109	123	53	86	81	48	1241.0
	MDG	MD08	Eastern Shore (S)	Salisbury	152	175	52	108	132	49	1735.2
	MDG	MD15	Cecil County	Elkton	115	138	50	80	78	46	348.2
Hagerstown Area (MD)	MDH	MD13	Washington County	Hagerstown	81	88	55	72	83	52	458.2
Southern MD	MDJ	MD16	St. Mary's/Calvert Counties	Lexington Park	94	108	52	89	102	52	576.5
South Central PA	PAB	PA03	South Central	Harrisburg	138	158	52	89	107	50	10131.4
Upper Shenandoah (VA)	VAD	VA09	Warren County	Front Royal	61	66	55	103	113	55	213.7
	VAD	VA24	Frederick County	Winchester	54	63	51	101	119	51	423.9
Culpeper Area (VA)	VAJ	VA11	Culpeper Area	Culpeper	80	89	52	102	115	53	1311.0
Northeast WV	WVA	WV01	Northeast (1)	Martinsburg	70	83	51	92	104	53	759.8

LIST OF ORIGIN/DESTINATION MARKET AREAS BY ANALYSIS GROUP

Area Group	Market Area Code	Market Area Description	Central Point	IAD Miles	IAD Time (Mins.)	IAD Avg. MPH	BWI Miles	BWI Time (Mins.)	BWI Avg MPH	Land Area (Sq. Miles)
3. Road Feeder Area (Primary)										
Western MD	MDI	MD14 Western	Cumberland	144	158	55	135	151	54	1073 4
Eastern NC (RDU)	NCA	NC01 Northeast	Greenville	293	327	54	313	347	54	11597 1
	NCA	NC02 Raleigh-Durham Area	Raleigh-Durham	277	316	53	297	335	53	7073 6
	NCA	NC06 Southeast	Wilmington	388	432	54	407	452	54	9131 5
Central NC (GSO)	NCB	NC03 Greensboro Area	Greensboro	291	342	51	341	378	54	4988 0
Central VA	VAE	VA16 Charlottesville Area	Charlottesville	107	126	51	149	172	52	1674 6
	VAE	VA19 Central	Lynchsburg	173	203	51	215	249	52	4304 1
Roanoke Area (VA)	VAF	VA18 Roanoke Area	Roanoke	224	247	54	269	293	55	3092 4
	VAF	VA22 West Central	Danville	243	287	51	288	334	52	3402 0
Eastern VA	VAG	VA13 Eastern	Tappahannock	111	129	52	120	139	52	2740 9
	VAG	VA14 Eastern Shore	Accomack	208	273	46	164	231	43	682 0
Richmond Area (VA)	VAH	VA17 Richmond Area	Richmond	117	132	53	138	152	54	2562 1
	VAH	VA20 East Central	Emporia	185	207	54	204	227	54	4508 0
Hampton Roads Area (VA)	VAI	VA21 Hampton Roads Area	Norfolk	205	232	53	225	252	54	1633 1
Lower Shenandoah Valley (VA)	VAK	VA10 Shenadoah (1)	Harrisonburg	118	128	55	160	174	55	1692 1
	VAK	VA15 Shenadoah (2)	Staunton	143	156	55	185	202	55	2562 3
4. Road Feeder Area (Secondary)										
State of Delaware	DEA	DE01 North	Wilmington	136	160	51	81	99	49	426 3
	DEA	DE02 Central	Dover	130	149	52	86	106	49	590 7
	DEA	DE03 South	Georgetown	137	156	53	93	114	49	807.7
Southern NC (CLT)	NCC	NC05 Charlotte Area	Charlotte	380	443	51	429	477	54	5822.4
Western NC	NCD	NC04 Western	Asheville	449	496	54	491	542	54	10107.0
Southern NJ	NJA	NJ01 Southern	Camden	168	195	52	113	133	51	2160 7
Philadelphia Area (PA)	PAA	PA01 Southeast	Philadelphia	168	196	51	111	135	49	1410 0
Pittsburgh Area (PA)	PAD	PA05 Southwest	Pittsburgh	234	280	50	244	275	53	9986.7
Southwest VA	VAL	VA23 Southwest	Bristol	359	390	55	401	436	55	5992 7
Other WV	WVB	WV02 Northeast (2)	Moorefield	111	125	53	153	171	54	2728 2
	WVB	WV03 Northern	Morgantown	198	218	54	201	222	54	9788 9
	WVB	WV04 Southern	Charleston	302	347	52	307	310	65	10809 7
5. All Other										
Central/Northern NJ	NJB	NJ02 Central	Trenton	202	235	52	147	175	50	2449 6
	NJB	NJ03 Northern	Morristown	253	292	52	198	232	51	2778 6
Northern PA	PAC	PA02 Northeast	Scranton	255	284	54	206	223	55	7157.7
	PAC	PA04 North Central	Williamsport	223	259	52	180	214	50	6687 1
	PAC	PA06 Northwest	Tionesta	301	339	53	292	334	52	9448 9

* Included in Washington-Baltimore Study Region

APPENDIX B

Baseline and Forecast Air Freight Traffic

ESTIMATED BASELINE AIR CARGO DEMAND BY O/D AREA (1996)

O/D Area	Domestic (000 Lbs.)	Domestic % of Total	Canada (000 Lbs.)	Canada % of Total	Overseas (000 Lbs.)	Overseas % of Total	Total (000 Lbs.)	Total % of Total
Washington, DC	25,273	0.8%	280	0.4%	9,956	0.8%	35,509	0.8%
Montgomery Co. (MD)	26,063	0.9%	773	1.1%	13,359	1.0%	40,195	0.9%
Prince Georges Co. (MD)	14,657	0.5%	413	0.6%	6,509	0.5%	21,578	0.5%
BWI Area (MD)	46,488	1.5%	1,440	2.0%	24,002	1.9%	71,931	1.6%
No. of Baltimore (MD)	37,434	1.2%	1,183	1.7%	19,753	1.5%	58,370	1.3%
Frederick Area (MD)	7,294	0.2%	189	0.3%	3,553	0.3%	11,036	0.3%
Charles Co. (MD)	2,514	0.1%	50	0.1%	886	0.1%	3,450	0.1%
Northern VA	34,333	1.1%	749	1.0%	17,015	1.3%	52,097	1.2%
Western Suburbs	8,592	0.3%	130	0.2%	2,474	0.2%	11,196	0.3%
I-95 Corridor No. (VA)	10,772	0.4%	244	0.3%	5,271	0.4%	16,288	0.4%
MD Eastern Shore/NE	22,850	0.8%	441	0.6%	9,821	0.8%	33,111	0.8%
Hagerstown Area (MD)	7,566	0.2%	178	0.2%	5,046	0.4%	12,791	0.3%
Southern MD	3,058	0.1%	59	0.1%	984	0.1%	4,101	0.1%
South Central PA	235,717	7.8%	4,869	6.8%	90,615	7.0%	331,202	7.5%
Upper Shenandoah (VA)	9,039	0.3%	255	0.4%	3,471	0.3%	12,765	0.3%
Culpeper Area (VA)	3,953	0.1%	55	0.1%	1,230	0.1%	5,238	0.1%
Northeast WV	3,242	0.1%	177	0.2%	1,792	0.1%	5,211	0.1%
Western MD	4,770	0.2%	94	0.1%	2,497	0.2%	7,362	0.2%
Eastern NC (RDU)	332,849	11.0%	5,552	7.7%	131,931	10.2%	470,333	10.7%
Central NC (GSO)	125,007	4.1%	2,412	3.4%	58,130	4.5%	185,549	4.2%
Central VA	35,783	1.2%	963	1.3%	11,952	0.9%	48,699	1.1%
Roanoke Area (VA)	46,816	1.6%	1,734	2.4%	21,103	1.6%	71,653	1.6%
Eastern VA	10,486	0.3%	100	0.1%	3,107	0.2%	13,693	0.3%
Richmond Area (VA)	48,083	1.6%	2,039	2.8%	28,505	2.2%	78,627	1.8%
Hampton Roads Area (VA)	58,364	1.9%	1,273	1.8%	23,383	1.8%	83,019	1.9%
Lower Shenandoah Valley (VA)	27,463	0.9%	681	0.9%	10,668	0.8%	38,811	0.9%
State of Delaware	39,361	1.3%	1,754	2.4%	28,595	2.2%	69,710	1.6%
Southern NC (CLT)	155,200	5.1%	3,540	4.9%	78,890	6.1%	237,630	5.4%
Western NC	113,059	3.7%	1,823	2.5%	44,648	3.5%	159,530	3.6%
Southern NJ	184,893	6.1%	2,711	3.8%	56,144	4.3%	243,748	5.5%
Philadelphia Area (PA)	190,798	6.3%	4,860	6.8%	77,646	6.0%	273,304	6.2%
Pittsburgh Area (PA)	151,848	5.0%	3,712	5.2%	57,903	4.5%	213,463	4.9%
Southwest VA	29,920	1.0%	588	0.8%	11,210	0.9%	41,719	0.9%
Other WV	41,870	1.4%	2,748	3.8%	19,875	1.5%	64,493	1.5%
Central/Northern NJ	713,164	23.5%	18,508	25.6%	326,704	25.3%	1,056,376	24.1%
Northern PA	220,022	7.3%	5,093	7.1%	83,012	6.4%	308,127	7.0%
	3,030,599	100.0%	71,672	100.0%	1,291,644	100.0%	4,393,915	100.0%
Local	213,420	7.0%	5,451	7.6%	102,779	8.0%	321,651	7.3%
Regional P&D	285,425	9.4%	6,034	8.4%	112,959	8.7%	404,418	9.2%
Road Feeder Areas (Primary)	691,620	22.8%	14,848	20.7%	291,277	22.6%	997,745	22.7%
Road Feeder Areas (Secondary)	906,948	29.9%	21,738	30.3%	374,912	29.0%	1,303,597	29.7%
All Other Regional Areas	933,186	30.8%	23,601	32.9%	409,716	31.7%	1,366,503	31.1%
	3,030,599	100.0%	71,672	100.0%	1,291,644	100.0%	4,393,915	100.0%
Share of All Traffic	69.0%		1.6%		29.4%		100.0%	
U.S. Total	27,439,182		584,562		10,155,979		38,179,723	
Regional Share of U.S. Total	11.0%		12.3%		12.7%		11.5%	

ESTIMATED BASELINE AIR CARGO DEMAND BY MARKET AREA (1996)
Market Area: ALL MARKETS

	U.S. Total		Regional Market			Local		Regional P&D		RFAs (Primary)		RFAs (Secondary)		All Other Areas	
	Total Weight	% of All Markets	Total Weight	% of U.S.	% of All Markets	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region
	(Weight in Thousands of Pounds)														
U.S. Domestic	27,439,182	71.9%	3,030,599	11.0%	69.0%	213,420	7.0%	285,425	9.4%	691,620	22.8%	908,948	29.9%	933,188	30.8%
Canada	584,562	1.5%	71,672	12.3%	1.6%	5,451	7.6%	6,034	8.4%	14,648	20.7%	21,738	30.3%	23,601	32.9%
Latin America	1,935,191	5.1%	250,442	12.9%	5.7%	13,977	5.6%	19,419	7.8%	81,521	32.6%	79,501	31.7%	56,025	22.4%
Europe	3,793,931	9.9%	567,807	15.0%	12.9%	47,245	8.3%	50,452	8.9%	121,245	21.4%	161,769	28.5%	187,096	33.0%
Middle East	235,110	0.6%	37,942	16.1%	0.9%	2,776	7.3%	2,296	6.1%	4,738	12.5%	8,083	21.3%	20,048	52.8%
South Asia	235,257	0.6%	43,275	18.4%	1.0%	4,427	10.2%	2,731	6.3%	8,407	14.8%	10,422	24.1%	19,288	44.6%
Northeast Asia	2,792,711	7.3%	265,989	9.5%	6.1%	22,049	8.3%	23,444	8.8%	54,344	20.4%	78,272	29.4%	87,880	33.0%
Southeast Asia	859,525	2.3%	87,532	10.2%	2.0%	8,593	9.8%	10,942	12.5%	14,748	16.8%	25,954	29.7%	27,295	31.2%
Southwest Pacific	212,308	0.6%	23,844	11.2%	0.5%	1,469	6.2%	2,199	9.2%	5,256	22.0%	7,213	30.3%	7,706	32.3%
Africa	91,883	0.2%	14,813	16.1%	0.3%	2,241	15.1%	1,477	10.0%	3,019	20.4%	3,698	25.0%	4,376	29.6%
Overseas Total	10,155,912	26.6%	1,291,844	12.7%	29.4%	102,779	8.0%	112,959	8.7%	291,277	22.6%	374,912	29.0%	409,716	31.7%
	38,179,656	100.0%	4,393,915	11.5%	100.0%	321,651	7.3%	404,418	9.2%	997,745	22.7%	1,303,597	29.7%	1,366,503	31.1%

ESTIMATED BASELINE AIR CARGO DEMAND (1996)
By Market O/D Group and Region

	INBOUND						OUTBOUND					
	Domestic	U.S. - Canada	Overseas	Total	% of Sub-Region	% of Total Region	Domestic	U.S. - Canada	Overseas	Total	% of Sub-Region	% of Total Region
	(Weight in Thousands of Pounds)											
Washington, DC	10,834	98	5,298	16,230	8.3%	0.7%	14,440	181	4,658	19,278	15.3%	0.9%
Montgomery Co. (MD)	16,171	189	8,074	24,435	12.5%	1.1%	9,892	583	5,284	15,760	12.5%	0.8%
Prince Georges Co. (MD)	10,481	96	5,048	15,623	8.0%	0.7%	4,176	317	1,463	5,956	4.7%	0.3%
BWI Area (MD)	28,082	249	12,539	40,870	20.9%	1.8%	18,406	1,192	11,463	31,060	24.7%	1.5%
No. of Baltimore (MD)	24,912	207	10,931	36,050	18.4%	1.6%	12,523	978	8,822	22,320	17.8%	1.1%
Frederick Area (MD)	4,922	42	1,837	6,800	3.5%	0.3%	2,372	148	1,717	4,236	3.4%	0.2%
Charles Co. (MD)	1,834	14	704	2,552	1.3%	0.1%	680	36	183	898	0.7%	0.0%
State Sub-Total - Maryland	86,402	797	39,131	126,330	64.5%	5.4%	48,049	3,251	28,931	80,231	63.8%	3.9%
Northern VA	22,827	249	13,505	36,581	18.7%	1.6%	11,506	500	3,511	15,517	12.3%	0.7%
Western Suburbs	4,117	39	1,666	5,822	3.0%	0.3%	4,475	91	808	5,374	4.3%	0.3%
I-95 Corridor No. (VA)	6,974	76	3,893	10,943	5.6%	0.5%	3,798	168	1,378	5,345	4.3%	0.3%
State Sub-Total - Virginia	33,917	364	19,063	53,345	27.2%	2.3%	19,779	760	5,697	26,236	20.9%	1.3%
1. Local P&D Area	131,153	1,259	63,493	195,905	100.0%	8.4%	82,267	4,192	39,286	125,746	100.0%	6.1%
MD Eastern Shore/NE	16,650	93	5,491	22,235	11.3%	1.0%	6,189	348	4,329	10,878	5.3%	0.5%
Hagerstown Area (MD)	4,661	37	2,150	6,847	3.5%	0.3%	2,906	142	2,896	5,943	2.9%	0.3%
Southern MD	2,149	15	701	2,868	1.5%	0.1%	909	44	283	1,235	0.6%	0.1%
State Sub-Total - Maryland	23,460	145	8,343	31,948	16.2%	1.4%	10,014	533	7,508	18,055	8.7%	0.9%
South Central PA	108,910	815	43,002	152,727	77.4%	6.8%	126,807	4,055	47,613	178,475	86.2%	8.6%
Upper Shenandoah (VA)	4,264	39	1,824	6,127	3.1%	0.3%	4,775	215	1,647	6,637	3.2%	0.3%
Culpeper Area (VA)	2,022	14	774	2,810	1.4%	0.1%	1,931	41	456	2,427	1.2%	0.1%
State Sub-Total - Virginia	6,286	53	2,598	8,938	4.5%	0.4%	6,706	256	2,103	9,065	4.4%	0.4%
Northeast WV	2,389	19	1,369	3,777	1.9%	0.2%	852	159	423	1,434	0.7%	0.1%
2. Regional P&D Area	141,046	1,032	55,312	197,390	100.0%	8.5%	144,379	5,003	57,647	207,029	100.0%	10.0%
Western MD	2,881	20	1,408	4,309	0.8%	0.2%	1,889	74	1,089	3,052	0.7%	0.1%
Eastern NC (RDU)	166,980	909	69,573	257,491	47.7%	11.1%	145,870	4,613	62,359	212,841	46.4%	10.3%
Central NC (GSO)	68,444	425	28,487	97,356	18.1%	4.2%	56,562	1,987	29,643	88,193	19.2%	4.3%
State Sub-Total - North Carolina	255,424	1,364	98,060	354,848	65.8%	15.3%	202,432	6,600	92,002	301,034	65.7%	14.5%
Roanoke Area (VA)	22,132	204	11,121	33,457	6.2%	1.4%	26,683	1,530	9,982	38,196	8.3%	1.8%
Eastern VA	7,588	28	2,378	9,995	1.9%	0.4%	2,898	71	729	3,698	0.8%	0.2%
Richmond Area (VA)	28,808	235	13,596	42,640	7.9%	1.8%	19,275	1,803	14,909	35,987	7.9%	1.7%
Hampton Roads Area (VA)	33,913	337	15,311	49,561	9.2%	2.1%	24,451	936	8,072	33,459	7.3%	1.6%
Lower Shenandoah Valley (VA)	16,879	84	6,169	23,132	4.3%	1.0%	10,564	596	4,499	15,679	3.4%	0.8%
State Sub-Total - Virginia	124,018	1,034	55,132	180,184	33.4%	7.6%	104,875	5,756	43,587	154,318	33.7%	7.5%

ESTIMATED BASELINE AIR CARGO DEMAND (1996)
By Market O/D Group and Region

	INBOUND						OUTBOUND					
	Domestic	U.S. - Canada	Overseas	Total	% of Sub-Region	% of Total Region	Domestic	U.S. - Canada	Overseas	Total	% of Sub-Region	% of Total Region
	(Weight in Thousands of Pounds)											
3 Road Feeder Area (Primary)	382,323	2,418	154,600	539,341	100.0%	23.2%	309,297	12,430	136,678	458,404	100.0%	22.2%
State of Delaware	25,680	191	10,067	35,927	5.4%	1.5%	13,681	1,564	18,538	33,782	5.3%	1.6%
Southern NC (CLT)	91,888	553	37,414	129,856	19.5%	5.6%	63,312	2,986	41,476	107,774	16.0%	5.2%
Western NC	56,662	323	22,041	79,025	11.9%	3.4%	58,397	1,500	22,608	80,505	12.6%	3.9%
State Sub-Total - North Carolina	148,550	876	59,455	208,881	31.4%	9.0%	119,708	4,487	64,084	188,279	29.5%	9.1%
Southern NJ	102,938	383	34,684	138,005	20.8%	5.9%	81,954	2,329	21,460	105,742	16.5%	5.1%
Philadelphia Area (PA)	81,672	792	38,888	121,351	18.3%	5.2%	109,126	4,068	38,758	151,953	23.8%	7.3%
Pittsburgh Area (PA)	64,336	630	28,966	93,932	14.1%	4.0%	87,512	3,083	28,937	119,531	18.7%	5.8%
State Sub-Total - Pennsylvania	146,008	1,422	67,854	215,284	32.4%	9.3%	196,638	7,151	67,695	271,484	42.5%	13.1%
Southwest VA	13,640	112	6,419	20,172	3.0%	0.9%	16,280	476	4,791	21,547	3.4%	1.0%
Other WV	31,080	287	14,967	46,334	7.0%	2.0%	10,790	2,461	4,908	18,159	2.8%	0.9%
4 Road Feeder Area (Secondary)	467,896	3,270	193,437	664,603	100.0%	28.6%	439,052	18,467	181,475	638,995	100.0%	30.9%
Central/Northern NJ	415,091	2,173	183,263	600,526	82.6%	25.8%	298,073	16,335	143,441	457,850	71.6%	22.1%
Northern PA	88,230	791	37,590	126,610	17.4%	5.4%	131,793	4,302	45,423	181,517	28.4%	8.8%
5 All Other	503,320	2,964	220,852	727,137	100.0%	31.3%	429,860	20,637	188,884	639,367	100.0%	30.9%
Regional Market Areas	1,625,738	10,943	687,694	2,324,375		12.1%	1,404,861	60,729	603,950	2,069,540		10.9%
All Other U.S.	12,093,853	84,081	4,673,681	16,851,616		87.9%	12,314,730	428,809	4,190,654	16,934,193		89.1%
U.S. Total	13,719,591	95,024	5,361,375	19,175,991		100.0%	13,719,591	489,538	4,794,604	19,003,733		100.0%

ESTIMATED BASELINE AIR CARGO DEMAND BY COMMODITY GROUP (1996)
Market Area: ALL MARKETS

	U.S. Total	Regional Market Total Weight	Regional Market % of U.S.	Local Total Weight	Local % of U.S.	Regional P&D Total Weight	Regional P&D % of U.S.	RFAs (Primary) Total Weight	RFAs (Primary) % of U.S.	RFAs (Secondary) Total Weight	RFAs (Secondary) % of U.S.	All Other Areas Total Weight	All Other Areas % of U.S.
				(Weight in Thousands of Pounds)									
AGRICULTURAL PRODUCTS	13,106,704	1,137,979	8.7%	55,922	4.9%	109,249	9.6%	330,459	29.0%	341,770	30.0%	300,579	26.4%
MINING	704,751	101,980	14.5%	4,399	4.3%	3,342	3.3%	19,126	18.8%	38,516	37.8%	36,595	35.9%
FOOD AND KINDRED PRODUCTS	409,969	36,566	8.9%	2,834	7.7%	4,580	12.5%	6,107	16.7%	9,510	26.0%	13,535	37.0%
TOBACCO PRODUCTS	33,157	14,614	44.1%	185	1.3%	326	2.2%	12,156	83.2%	1,336	9.1%	611	4.2%
TEXTILE MILL PRODUCTS	352,022	86,154	24.5%	2,646	3.1%	8,194	9.5%	28,554	33.1%	27,498	31.9%	19,262	22.4%
APPAREL AND OTHER FINISHED FABRIC PRODUCT	1,457,411	278,218	19.0%	25,344	9.2%	19,482	7.1%	65,185	23.6%	71,408	25.9%	94,798	34.3%
LUMBER AND WOOD PRODUCTS, EXCEPT FURNIT	56,118	7,093	12.6%	541	7.6%	769	10.8%	1,730	24.4%	1,867	26.3%	2,186	30.8%
FURNITURE AND FIXTURES	64,868	8,929	10.7%	805	11.6%	459	6.6%	1,593	23.0%	2,068	29.9%	2,003	28.9%
PAPER AND ALLIED PRODUCTS	356,039	48,022	13.5%	2,605	5.4%	4,083	8.5%	8,951	18.6%	12,697	26.4%	19,685	41.0%
PRINTING, PUBLISHING, AND ALLIED INDUSTRIES	710,726	129,812	18.3%	16,743	12.9%	11,365	8.8%	15,876	12.2%	32,137	24.8%	53,691	41.4%
CHEMICALS AND ALLIED PRODUCTS	1,250,436	285,586	22.8%	20,309	7.1%	17,294	6.1%	45,837	16.1%	79,729	27.9%	122,418	42.9%
PETROLEUM REFINING AND RELATED INDUSTRIES	46,743	5,166	11.1%	324	6.3%	278	5.4%	413	8.0%	2,514	48.7%	1,637	31.7%
RUBBER AND MISCELLANEOUS PLASTICS PRODU	912,175	126,829	13.9%	8,798	6.9%	12,287	9.7%	26,192	20.7%	36,351	28.7%	43,201	34.1%
LEATHER AND LEATHER PRODUCTS	324,614	42,054	13.0%	5,052	12.0%	3,322	7.9%	6,775	16.1%	10,977	26.1%	15,928	37.9%
STONE, CLAY, GLASS, AND CONCRETE PRODUCT	239,129	34,276	14.3%	2,924	8.5%	3,238	9.4%	5,870	17.1%	12,544	36.6%	9,699	28.3%
PRIMARY METAL INDUSTRIES	425,788	72,875	17.1%	2,443	3.4%	5,966	8.2%	10,590	14.5%	23,958	32.9%	29,917	41.1%
FABRICATED METAL PRODUCTS,EXC MACHINERY/	652,226	94,075	14.4%	5,811	6.2%	12,582	13.4%	15,494	16.5%	27,733	29.5%	32,474	34.5%
INDUSTRIAL/COMMERCIAL MACHINERY,COMPUTE	3,156,203	285,820	9.1%	15,837	5.5%	31,575	11.0%	72,010	25.2%	87,718	30.7%	78,680	27.5%
ELECTRONIC & OTHER ELECTRIC EQPT,EXC COM	5,375,630	616,088	11.5%	44,793	7.3%	68,653	11.1%	149,210	24.2%	170,711	27.7%	182,721	29.7%
TRANSPORTATION EQUIPMENT	2,754,604	252,876	9.2%	22,280	8.8%	22,058	8.7%	66,898	26.5%	79,683	31.5%	61,956	24.5%
MEASURING, ANALYZING, AND CONTROLLING INS	1,390,700	177,903	12.8%	19,090	10.7%	12,693	7.1%	25,175	14.2%	57,215	32.2%	63,730	35.8%
MISCELLANEOUS MANUFACTURING INDUSTRIES	500,886	57,571	11.4%	7,216	12.5%	4,325	7.5%	11,324	19.7%	15,572	27.0%	19,135	33.2%
PUBLIC ADMINISTRATION/OTHER	3,895,706	497,433	12.8%	54,750	11.0%	48,317	9.7%	72,217	14.5%	160,083	32.2%	162,066	32.6%
	38,179,723	4,393,915	11.5%	321,651	7.3%	404,418	9.2%	997,745	22.7%	1,303,597	29.7%	1,366,503	31.1%

ESTIMATED BASELINE AIR CARGO DEMAND BY COMMODITY GROUP (1996)
Market Area: ALL INTERNATIONAL MARKETS

	U.S. Total	Regional Market Total Weight	Regional Market % of U.S.	Local Total Weight	Local % of U.S.	Regional P&D Total Weight	Regional P&D % of U.S.	RFAs (Primary) Total Weight	RFAs (Primary) % of U.S.	RFAs (Secondary) Total Weight	RFAs (Secondary) % of U.S.	All Other Areas Total Weight	All Other Areas % of U.S.
	(Weight in Thousands of Pounds)												
AGRICULTURAL PRODUCTS	1,336,579	147,015	11.0%	7,554	5.1%	15,552	10.6%	43,561	29.6%	44,438	30.2%	35,908	24.4%
MINING	38,710	5,079	13.1%	227	4.5%	132	2.6%	1,216	23.9%	2,039	40.1%	1,465	28.6%
FOOD AND KINDRED PRODUCTS	228,301	18,386	8.1%	1,447	7.9%	2,670	14.5%	2,694	14.7%	4,722	25.7%	6,853	37.3%
TOBACCO PRODUCTS	21,691	9,396	43.3%	133	1.4%	295	3.1%	7,901	84.1%	668	7.1%	400	4.3%
TEXTILE MILL PRODUCTS	240,970	61,480	25.5%	1,898	3.1%	5,773	9.4%	20,987	34.1%	19,877	32.3%	12,946	21.1%
APPAREL AND OTHER FINISHED FABRIC PRODUCT	1,006,779	184,848	18.4%	20,079	10.9%	10,614	5.7%	43,521	23.5%	47,732	25.8%	62,902	34.0%
LUMBER AND WOOD PRODUCTS, EXCEPT FURNIT	39,387	5,062	12.9%	433	8.6%	559	11.0%	1,187	23.4%	1,309	25.9%	1,574	31.1%
FURNITURE AND FIXTURES	44,282	4,688	10.5%	496	10.6%	253	5.4%	1,200	25.7%	1,390	29.6%	1,330	28.5%
PAPER AND ALLIED PRODUCTS	180,827	23,839	13.2%	894	3.7%	1,918	8.0%	4,777	20.0%	6,944	29.1%	9,307	39.0%
PRINTING, PUBLISHING, AND ALLIED INDUSTRIES	206,104	45,680	22.2%	5,614	12.3%	3,305	7.2%	6,255	13.7%	9,918	21.7%	20,588	45.1%
CHEMICALS AND ALLIED PRODUCTS	598,511	122,213	20.4%	9,498	7.8%	7,780	6.4%	19,281	15.8%	39,014	31.9%	46,642	38.2%
PETROLEUM REFINING AND RELATED INDUSTRIES	16,612	2,615	15.7%	181	6.9%	114	4.4%	206	7.9%	1,202	46.0%	912	34.9%
RUBBER AND MISCELLANEOUS PLASTICS PRODU	251,062	32,188	12.8%	2,460	7.6%	3,178	9.9%	6,508	20.2%	10,121	31.4%	9,922	30.6%
LEATHER AND LEATHER PRODUCTS	281,930	36,475	12.9%	4,620	12.7%	2,732	7.5%	6,015	16.5%	9,558	26.2%	13,550	37.2%
STONE, CLAY, GLASS, AND CONCRETE PRODUCT	172,851	22,894	13.2%	2,130	9.3%	2,126	9.3%	3,978	17.4%	8,208	35.8%	6,454	28.2%
PRIMARY METAL INDUSTRIES	282,879	49,524	18.9%	1,415	2.9%	3,857	7.6%	6,956	14.0%	16,130	32.6%	21,167	42.7%
FABRICATED METAL PRODUCTS,EXC MACHINERY/	360,497	43,718	12.1%	3,214	7.4%	4,379	10.0%	9,748	22.3%	12,226	28.0%	14,151	32.4%
INDUSTRIAL/COMMERCIAL MACHINERY,COMPUTE	1,877,793	165,464	8.8%	9,319	5.6%	17,094	10.3%	45,333	27.4%	50,947	30.8%	42,771	25.8%
ELECTRONIC & OTHER ELECTRIC EQPT,EXC COM	1,389,564	147,643	10.6%	12,672	8.6%	19,625	13.3%	27,758	18.8%	42,064	28.5%	45,525	30.8%
TRANSPORTATION EQUIPMENT	505,944	39,350	7.8%	3,610	9.2%	2,840	7.2%	9,554	24.3%	10,440	26.5%	12,905	32.8%
MEASURING, ANALYZING, AND CONTROLLING INS	576,141	61,102	10.6%	6,794	11.1%	3,691	6.0%	10,052	16.5%	18,555	30.4%	22,010	36.0%
MISCELLANEOUS MANUFACTURING INDUSTRIES	358,752	42,019	11.7%	5,690	13.5%	3,085	7.3%	8,652	20.6%	11,412	27.2%	13,181	31.4%
PUBLIC ADMINISTRATION/OTHER	160,012	20,984	13.1%	2,402	11.4%	1,387	6.6%	3,943	18.8%	5,999	28.6%	7,254	34.6%
	10,155,979	1,291,644	12.7%	102,779	8.0%	112,959	8.7%	291,277	22.6%	374,912	29.0%	409,718	31.7%

ESTIMATED FORECAST AIR CARGO DEMAND BY O/D AREA (2010)

O/D Area	Domestic (000 Lbs.)	Domestic % of Total	Canada (000 Lbs.)	Canada % of Total	Overseas (000 Lbs.)	Overseas % of Total	Total (000 Lbs.)	Total % of Total	Average Annual Growth (1996-2010) Domestic	Canada	Overseas	Total
Washington, DC	55,688	0.9%	978	0.4%	27,043	0.7%	83,709	0.8%	5.8%	9.4%	7.4%	6.3%
Montgomery Co. (MD)	50,779	0.8%	2,644	1.0%	34,513	0.9%	87,936	0.8%	4.9%	9.2%	7.0%	5.8%
Prince Georges Co. (MD)	30,516	0.5%	1,497	0.6%	17,561	0.5%	49,574	0.5%	5.4%	9.6%	7.3%	6.1%
BWI Area (MD)	99,952	1.5%	5,197	2.0%	68,604	1.9%	173,753	1.7%	5.6%	9.6%	7.8%	6.5%
No. of Baltimore (MD)	82,278	1.3%	4,275	1.7%	56,194	1.5%	142,748	1.4%	5.8%	9.6%	7.8%	6.6%
Frederick Area (MD)	14,997	0.2%	650	0.3%	9,236	0.3%	24,882	0.2%	5.3%	9.2%	7.1%	6.0%
Charles Co. (MD)	5,377	0.1%	176	0.1%	2,375	0.1%	7,929	0.1%	5.6%	9.5%	7.3%	6.1%
Northern VA	67,005	1.0%	2,531	1.0%	45,964	1.2%	115,501	1.1%	4.9%	9.1%	7.4%	5.9%
Western Suburbs	16,689	0.3%	429	0.2%	6,480	0.2%	23,597	0.2%	4.9%	6.9%	7.1%	5.5%
I-95 Corridor No. (VA)	22,222	0.3%	838	0.3%	14,331	0.4%	37,391	0.4%	5.3%	9.2%	7.4%	6.1%
MD Eastern Shore/NE	49,680	0.8%	1,515	0.6%	26,581	0.7%	77,975	0.7%	5.7%	9.2%	7.4%	6.3%
Hagerstown Area (MD)	16,635	0.3%	628	0.2%	15,174	0.4%	32,437	0.3%	5.8%	9.4%	8.2%	6.9%
Southern MD	6,460	0.1%	206	0.1%	2,512	0.1%	9,178	0.1%	5.5%	9.4%	6.9%	5.9%
South Central PA	492,033	7.5%	17,055	6.7%	252,719	6.9%	761,806	7.3%	5.4%	9.4%	7.6%	6.1%
Upper Shenandoah (VA)	18,389	0.3%	922	0.4%	9,555	0.3%	28,866	0.3%	5.2%	9.6%	7.5%	6.0%
Culpeper Area (VA)	8,721	0.1%	191	0.1%	3,492	0.1%	12,404	0.1%	5.8%	9.3%	7.7%	6.4%
Northeast WV	7,108	0.1%	688	0.3%	5,106	0.1%	12,901	0.1%	5.8%	10.2%	7.8%	6.7%
Western MD	11,184	0.2%	339	0.1%	7,664	0.2%	19,187	0.2%	6.3%	9.6%	8.3%	7.1%
Eastern NC (RDU)	739,815	11.3%	19,433	7.6%	380,531	10.3%	1,139,779	10.9%	5.9%	9.4%	7.9%	6.5%
Central NC (GSO)	270,241	4.1%	8,458	3.3%	172,169	4.7%	450,867	4.3%	5.7%	9.4%	8.1%	6.5%
Central VA	65,980	1.0%	3,459	1.4%	32,001	0.9%	101,441	1.0%	4.5%	9.6%	7.3%	5.4%
Roanoke Area (VA)	98,459	1.5%	6,495	2.5%	60,064	1.6%	165,018	1.6%	5.1%	9.9%	7.8%	6.1%
Eastern VA	24,463	0.4%	348	0.1%	8,795	0.2%	33,607	0.3%	6.2%	9.3%	7.7%	6.6%
Richmond Area (VA)	101,624	1.6%	7,712	3.0%	83,111	2.3%	192,447	1.8%	5.5%	10.0%	7.9%	6.6%
Hampton Roads Area (VA)	122,886	1.9%	4,412	1.7%	62,780	1.7%	190,078	1.8%	5.5%	9.3%	7.3%	6.1%
Lower Shenandoah Valley (VA)	61,118	0.9%	2,545	1.0%	30,056	0.8%	93,719	0.9%	5.9%	9.9%	7.7%	6.5%
State of Delaware	89,637	1.4%	6,618	2.6%	85,014	2.3%	181,269	1.7%	6.1%	9.9%	8.1%	7.1%
Southern NC (CLT)	342,154	5.2%	12,642	4.9%	234,582	6.4%	589,377	5.6%	5.8%	9.5%	8.1%	6.7%
Western NC	248,725	3.8%	6,381	2.5%	132,381	3.6%	387,487	3.7%	5.8%	9.4%	8.1%	6.5%
Southern NJ	422,968	6.5%	9,135	3.6%	160,495	4.4%	592,598	5.7%	6.1%	9.1%	7.8%	6.6%
Philadelphia Area (PA)	389,736	6.0%	17,391	6.8%	216,682	5.9%	623,809	6.0%	5.2%	9.5%	7.6%	6.1%
Pittsburgh Area (PA)	314,033	4.8%	13,299	5.2%	161,084	4.4%	488,416	4.7%	5.3%	9.5%	7.6%	6.1%
Southwest VA	62,217	1.0%	2,073	0.8%	30,159	0.8%	94,448	0.9%	5.4%	9.4%	7.3%	6.0%
Other WV	91,808	1.4%	10,691	4.2%	56,409	1.5%	158,908	1.5%	5.8%	10.2%	7.7%	6.7%
Central/Northern NJ	1,565,731	24.0%	66,005	25.8%	936,557	25.5%	2,568,293	24.6%	5.8%	9.5%	7.8%	6.5%
Northern PA	454,771	7.0%	18,147	7.1%	229,659	6.2%	702,576	6.7%	5.3%	9.5%	7.5%	6.1%
	6,522,281	100.0%	256,002	100.0%	3,677,631	100.0%	10,455,914	100.0%	5.6%	9.5%	7.8%	6.4%
Local	445,503	6.8%	19,216	7.5%	282,301	7.7%	747,020	7.1%	5.4%	9.4%	7.5%	6.2%
Regional P&D	599,226	9.2%	21,204	8.3%	315,138	8.6%	935,567	8.9%	5.4%	9.4%	7.6%	6.2%
Road Feeder Areas (Primary)	1,495,770	22.9%	53,202	20.8%	837,171	22.8%	2,386,144	22.8%	5.7%	9.5%	7.8%	6.4%
Road Feeder Areas (Secondary)	1,961,279	30.1%	78,229	30.6%	1,076,806	29.3%	3,116,314	29.8%	5.7%	9.6%	7.8%	6.4%
All Other Regional Areas	2,020,502	31.0%	84,151	32.9%	1,166,216	31.7%	3,270,870	31.3%	5.7%	9.5%	7.8%	6.4%
	6,522,281	100.0%	256,002	100.0%	3,677,631	100.0%	10,455,914	100.0%	5.6%	9.5%	7.8%	6.4%
Share of All Traffic	62.4%		2.4%		35.2%		100.0%					
U.S. Total	59,165,760		2,005,108		28,424,199		89,595,067		5.6%	9.2%	7.6%	6.3%
Regional Share of U.S. Total	11.0%		12.8%		12.9%		11.7%					

ESTIMATED FORECAST AIR CARGO DEMAND BY MARKET AREA (2010)
Market Area: ALL MARKETS

	U.S. Total		Regional Market			Local		Regional P&D		RFAs (Primary)		RFAs (Secondary)		All Other Areas	
	Total Weight	% of All Markets	Total Weight	% of U.S.	% of All Markets	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region	Total Weight	% of Region
	(Weight in Thousands of Pounds)														
U S Domestic	59,165,760	66.0%	8,522,281	23.8%	62.4%	445,503	6.8%	599,226	9.2%	1,496,770	22.9%	1,981,279	30.1%	2,020,502	31.0%
Canada	2,005,107	2.2%	256,002	43.8%	2.4%	19,216	7.5%	21,204	8.3%	53,202	20.8%	76,229	30.6%	64,151	32.9%
Latin America	5,456,209	6.1%	732,567	37.9%	7.0%	40,372	5.5%	54,141	7.4%	250,388	34.2%	230,948	31.5%	156,718	21.4%
Europe	9,694,846	10.8%	1,513,122	39.9%	14.5%	121,622	8.0%	131,922	8.7%	320,346	21.2%	435,465	28.8%	503,768	33.3%
Middle East	537,457	0.6%	92,892	39.5%	0.9%	7,059	7.6%	5,474	5.9%	12,080	13.0%	19,833	21.4%	48,435	52.1%
South Asia	812,837	0.9%	156,020	65.9%	1.5%	16,091	10.4%	9,296	6.0%	22,758	14.7%	37,104	23.9%	69,771	45.0%
Northeast Asia	8,084,689	9.0%	767,575	27.5%	7.3%	57,037	7.4%	68,635	8.9%	157,204	20.5%	231,373	30.1%	253,326	33.0%
Southeast Asia	3,065,641	3.4%	312,043	36.3%	3.0%	31,163	10.0%	36,370	11.7%	53,697	17.2%	92,166	29.5%	98,647	31.6%
Southwest Pacific	586,023	0.7%	71,060	33.5%	0.7%	4,260	6.0%	6,140	8.6%	14,475	20.4%	21,253	29.9%	24,932	35.1%
Africa	188,430	0.2%	33,352	36.3%	0.3%	4,697	14.1%	3,160	9.5%	6,213	18.6%	8,664	26.0%	10,618	31.8%
Overseas Total	28,424,132	31.7%	3,677,631	12.9%	35.2%	282,301	7.7%	315,138	8.6%	637,171	22.8%	1,076,806	29.3%	1,166,216	31.7%
	89,595,000	100.0%	10,455,914	11.7%	100.0%	747,020	7.1%	935,567	8.9%	2,366,144	22.6%	3,116,314	29.8%	3,270,870	31.3%

ESTIMATED FORECAST AIR CARGO DEMAND (2010)
By Market O/D Group and Region

	INBOUND						OUTBOUND					
	Domestic	U.S.-Canada	Overseas	Total	% of Sub-Region	% of Total Region	Domestic	U.S.-Canada	Overseas	Total	% of Sub-Region	% of Total Region
	(Weight in Thousands of Pounds)											
Washington, DC	22,833	246	13,662	36,741	8.2%	0.7%	32,855	732	13,381	46,968	15.6%	0.9%
Montgomery Co. (MD)	32,271	498	20,679	53,448	12.0%	1.0%	18,507	2,148	13,834	34,490	11.5%	0.7%
Prince Georges Co. (MD)	22,236	243	13,030	35,508	7.9%	0.7%	8,281	1,254	4,531	14,066	4.7%	0.3%
BWI Area (MD)	60,738	618	32,674	94,030	21.0%	1.7%	30,214	4,579	35,930	79,724	26.5%	1.6%
No. of Baltimore (MD)	54,730	511	28,589	83,830	18.8%	1.5%	27,548	3,764	27,605	58,918	19.6%	1.2%
Frederick Area (MD)	10,598	106	4,660	15,364	3.4%	0.3%	4,399	544	4,576	9,518	3.2%	0.2%
Charles Co. (MD)	3,975	36	1,798	5,809	1.3%	0.1%	1,402	141	578	2,120	0.7%	0.0%
State Sub-Total - Maryland	184,548	2,009	101,429	287,987	64.5%	5.3%	89,351	12,431	87,054	188,836	66.2%	4.0%
Northern VA	47,801	638	35,283	83,722	18.7%	1.5%	19,204	1,893	10,681	31,778	10.6%	0.6%
Western Suburbs	8,777	100	4,237	13,114	2.9%	0.2%	7,912	329	2,242	10,483	3.5%	0.2%
I-95 Corridor No. (VA)	14,817	193	10,143	25,154	5.6%	0.5%	7,404	645	4,188	12,237	4.1%	0.2%
State Sub-Total - Virginia	71,395	931	49,664	121,990	27.3%	2.2%	34,520	2,867	17,111	54,499	18.1%	1.1%
1. Local P&D Area	278,777	3,166	164,755	446,718	100.0%	8.2%	166,726	16,030	117,546	300,302	100.0%	6.0%
MD Eastern Shore/NE	37,444	232	14,463	52,139	11.4%	1.0%	12,436	1,282	12,118	25,836	5.4%	0.5%
Hagerstown Area (MD)	10,350	68	5,355	15,793	3.4%	0.3%	6,285	539	9,819	16,643	3.5%	0.3%
Southern MD	4,681	39	1,785	6,504	1.4%	0.1%	1,779	167	728	2,674	0.6%	0.1%
State Sub-Total - Maryland	52,475	360	21,602	74,437	16.2%	1.4%	20,500	1,989	22,684	45,153	9.5%	0.9%
South Central PA	241,578	2,029	111,469	355,077	77.3%	6.5%	250,454	16,026	141,249	406,729	85.4%	8.1%
Upper Shenandoah (VA)	9,336	97	4,770	14,203	3.1%	0.3%	9,053	825	4,785	14,663	3.1%	0.3%
Culpeper Area (VA)	4,557	34	2,001	6,592	1.4%	0.1%	4,164	157	1,491	5,812	1.2%	0.1%
State Sub-Total - Virginia	13,893	131	6,771	20,795	4.5%	0.4%	13,217	982	6,275	20,475	4.3%	0.4%
Northeast WV	5,291	44	3,638	8,973	2.0%	0.2%	1,817	644	1,468	3,929	0.8%	0.1%
2. Regional P&D Area	313,237	2,563	143,481	459,282	100.0%	8.5%	285,989	18,640	171,656	476,286	100.0%	9.5%
Western MD	6,508	49	3,774	10,330	0.8%	0.2%	4,677	291	3,890	8,857	0.8%	0.2%
Eastern NC (RDU)	422,460	2,341	189,145	613,946	46.2%	11.3%	317,355	17,092	191,386	525,833	47.2%	10.5%
Central NC (GSO)	151,351	1,073	76,046	228,470	18.0%	4.2%	118,890	7,384	96,123	222,397	20.0%	4.4%
State Sub-Total - North Carolina	573,811	3,414	265,191	842,416	66.2%	15.5%	436,245	24,477	287,509	748,230	67.2%	14.9%
Roanoke Area (VA)	48,498	517	28,547	77,561	6.1%	1.4%	49,981	5,979	31,517	87,456	7.9%	1.7%
Eastern VA	17,769	67	6,344	24,181	1.9%	0.4%	6,694	281	2,451	9,428	0.8%	0.2%
Richmond Area (VA)	63,626	582	35,804	99,812	7.8%	1.8%	37,999	7,131	47,508	92,638	8.3%	1.8%
Hampton Roads Area (VA)	73,859	833	39,621	114,313	9.0%	2.1%	49,027	3,579	23,159	75,765	6.8%	1.5%
Lower Shenandoah Valley (VA)	38,999	201	16,365	55,565	4.4%	1.0%	22,119	2,344	13,691	38,154	3.4%	0.8%
State Sub-Total - Virginia	273,900	2,570	143,228	419,699	33.0%	7.7%	200,630	22,402	133,579	356,611	32.0%	7.1%

ESTIMATED FORECAST AIR CARGO DEMAND (2010)
By Market O/D Group and Region

	INBOUND						OUTBOUND					
	Domestic	U S - Canada	Overseas	Total	% of Sub-Region	% of Total Region	Domestic	U S.- Canada	Overseas	Total	% of Sub-Region	% of Total Region
	(Weight in Thousands of Pounds)											
3 Road Feeder Area (Primary)	854,219	6,033	412,193	1,272,444	100 0%	23 4%	641,552	47,169	424,978	1,113,699	100 0%	22 1%
State of Delaware	58,487	468	26,330	85,284	5.5%	1.6%	31,151	6,150	58,684	95,985	6.2%	1 9%
Southern NC (CLT)	205,868	1,372	100,075	307,316	19.7%	5.7%	136,285	11,270	134,507	282,062	18 1%	5.6%
Western NC	126,338	810	58,882	186,030	12 0%	3.4%	122,387	5,571	73,499	201,457	12.9%	4 0%
State Sub-Total - North Carolina	332,208	2,182	158,957	493,346	31.7%	9 1%	258,673	16,840	208,006	483,519	31 0%	9 6%
Southern NJ	236,720	931	90,691	328,343	21.1%	6 0%	186,248	8,204	69,803	264,255	16 9%	5.3%
Philadelphia Area (PA)	177,075	1,987	101,225	280,288	18 0%	5.2%	212,681	15,403	115,457	343,522	22 0%	6 8%
Pittsburgh Area (PA)	138,566	1,564	74,507	214,638	13.8%	4 0%	175,467	11,735	86,577	273,779	17 6%	5 4%
State Sub-Total - Pennsylvania	315,642	3,551	175,732	494,926	31 8%	9 1%	388,128	27,138	202,034	617,300	39 6%	12 3%
Southwest VA	30,208	273	16,796	47,278	3 0%	0 9%	32,009	1,799	13,363	47,170	3 0%	0 9%
Other WV	67,618	686	39,070	107,374	6 9%	2 0%	24,190	10,004	17,309	51,534	3 3%	1 0%
4 Road Feeder Area (Secondary)	1,040,881	8,092	507,577	1,556,550	100 0%	28 7%	920,398	70,137	569,229	1,559,763	100 0%	31 0%
Central/Northern NJ	918,692	5,339	476,167	1,400,199	82 7%	25 8%	849,039	60,668	458,390	1,168,095	74 0%	23 2%
Northern PA	193,120	1,972	97,247	292,339	17 3%	5.4%	261,651	16,175	132,412	410,238	26 0%	8.2%
5 All Other	1,109,813	7,311	575,414	1,692,537	100 0%	31 2%	910,600	78,841	590,802	1,578,332	100 0%	31 4%
Regional Market Areas	3,598,926	27,185	1,803,420	5,427,532		12 4%	2,925,354	228,817	1,874,212	5,028,383		11 0%
All Other U S	25,985,954	202,436	12,208,514	38,396,903		87 6%	26,657,526	1,546,670	12,538,054	40,742,250		89 0%
U S Total	29,582,880	229,621	14,011,933	43,824,434		100 0%	29,582,880	1,775,487	14,412,266	45,770,633		100 0%

ESTIMATED FORECAST AIR CARGO DEMAND BY COMMODITY GROUP (2010)
Market Area: ALL MARKETS

	U.S. Total	Regional Market Total Weight	Regional Market % of U.S.	Local Total Weight	Local % of U.S.	Regional P&D Total Weight	Regional P&D % of U.S.	RFAs (Primary) Total Weight	RFAs (Primary) % of U.S.	RFAs (Secondary) Total Weight	RFAs (Secondary) % of U.S.	All Other Areas Total Weight	All Other Areas % of U.S.
				(Weight in Thousands of Pounds)									
AGRICULTURAL PRODUCTS	13,108,704	2,843,042	21.7%	139,577	4.9%	271,510	9.5%	829,042	29.2%	855,435	30.1%	747,478	26.3%
MINING	704,751	325,259	46.2%	14,043	4.3%	10,566	3.2%	61,385	18.9%	122,904	37.8%	116,361	35.8%
FOOD AND KINDRED PRODUCTS	409,969	98,946	24.1%	7,370	7.4%	13,364	13.5%	16,559	16.7%	25,529	25.8%	36,125	36.5%
TOBACCO PRODUCTS	33,157	39,919	120.4%	384	1.0%	1,077	2.7%	34,011	85.2%	2,995	7.5%	1,451	3.6%
TEXTILE MILL PRODUCTS	352,022	260,984	74.1%	7,423	2.8%	24,876	9.5%	91,234	35.0%	88,052	33.7%	49,399	18.9%
APPAREL AND OTHER FINISHED FABRIC PRODUCT	1,457,411	853,151	58.5%	77,976	9.1%	57,925	6.8%	205,440	24.1%	220,648	25.9%	291,161	34.1%
LUMBER AND WOOD PRODUCTS, EXCEPT FURNIT	56,118	18,222	32.5%	1,443	7.9%	2,169	11.9%	4,168	22.9%	4,630	25.4%	5,814	31.9%
FURNITURE AND FIXTURES	64,888	20,220	31.2%	2,256	11.2%	1,366	6.8%	4,584	22.7%	6,142	30.4%	5,872	29.0%
PAPER AND ALLIED PRODUCTS	356,039	152,008	42.7%	7,806	5.1%	13,108	8.6%	27,632	18.2%	40,034	26.3%	63,429	41.7%
PRINTING, PUBLISHING, AND ALLIED INDUSTRIES	710,726	304,699	42.9%	39,113	12.8%	26,161	8.6%	38,010	12.5%	73,078	24.0%	128,338	42.1%
CHEMICALS AND ALLIED PRODUCTS	1,250,436	916,045	73.3%	66,591	7.3%	55,560	6.1%	148,366	16.2%	256,794	28.0%	388,714	42.4%
PETROLEUM REFINING AND RELATED INDUSTRIES	46,743	13,977	29.9%	871	6.2%	809	5.8%	981	7.0%	6,982	50.0%	4,334	31.0%
RUBBER AND MISCELLANEOUS PLASTICS PRODU	912,175	294,437	32.3%	20,733	7.0%	28,453	9.7%	60,551	20.6%	84,763	28.8%	99,937	33.9%
LEATHER AND LEATHER PRODUCTS	324,614	80,010	24.6%	9,470	11.8%	6,648	8.3%	12,809	16.0%	21,035	26.3%	30,048	37.6%
STONE, CLAY, GLASS, AND CONCRETE PRODUCT	239,129	89,600	37.5%	7,676	8.6%	9,023	10.1%	14,814	16.5%	34,958	39.0%	24,030	26.8%
PRIMARY METAL INDUSTRIES	425,788	252,442	59.3%	8,128	3.2%	20,449	8.1%	36,663	14.5%	83,631	33.1%	103,571	41.0%
FABRICATED METAL PRODUCTS,EXC MACHINERY/	652,226	269,830	41.4%	16,700	6.2%	35,065	13.0%	45,559	16.9%	78,886	29.2%	93,640	34.7%
INDUSTRIAL/COMMERCIAL MACHINERY,COMPUTE	3,156,203	573,887	18.2%	31,743	5.5%	62,937	11.0%	146,290	25.5%	177,161	30.9%	155,756	27.1%
ELECTRONIC & OTHER ELECTRIC EQPT,EXC COM	5,375,630	947,997	17.6%	70,609	7.4%	110,633	11.7%	219,771	23.2%	264,232	27.9%	282,752	29.8%
TRANSPORTATION EQUIPMENT	2,754,604	637,729	23.2%	55,689	8.7%	55,935	8.8%	170,363	26.7%	200,934	31.5%	154,809	24.3%
MEASURING, ANALYZING, AND CONTROLLING INS	1,390,700	425,855	30.6%	45,078	10.6%	29,491	6.9%	60,643	14.2%	137,415	32.3%	153,228	36.0%
MISCELLANEOUS MANUFACTURING INDUSTRIES	503,986	112,041	22.2%	13,958	12.5%	8,573	7.7%	22,131	19.8%	30,106	26.9%	37,272	33.3%
PUBLIC ADMINISTRATION/OTHER	3,895,706	925,614	23.8%	102,383	11.1%	89,871	9.7%	135,117	14.6%	300,888	32.5%	297,355	32.1%
	2,565,441	10,455,914	407.6%	747,020	7.1%	935,567	8.9%	2,386,144	22.8%	3,116,314	29.8%	3,270,870	31.3%

ESTIMATED FORECAST AIR CARGO DEMAND BY COMMODITY GROUP (2010)

Market Area: ALL INTERNATIONAL MARKETS

	U.S. Total	Regional Market Total Weight	Regional Market % of U.S.	Local Total Weight	Local % of U.S.	Regional P&D Total Weight	Regional P&D % of U.S.	RFAs (Primary) Total Weight	RFAs (Primary) % of U.S.	RFAs (Secondary) Total Weight	RFAs (Secondary) % of U.S.	All Other Areas Total Weight	All Other Areas % of U.S.
				(Weight in Thousands of Pounds)									
AGRICULTURAL PRODUCTS	1,336,579	435,386	32.8%	22,039	5.1%	43,875	10.1%	131,835	30.3%	133,071	30.6%	104,568	24.0%
MINING	38,710	19,586	50.6%	884	4.5%	444	2.3%	4,899	25.0%	7,816	39.9%	5,541	28.3%
FOOD AND KINDRED PRODUCTS	228,301	49,404	21.6%	3,549	7.2%	8,132	16.5%	7,144	14.5%	12,504	25.3%	18,075	36.6%
TOBACCO PRODUCTS	21,691	30,590	141.0%	292	1.0%	1,022	3.3%	26,406	86.3%	1,802	5.9%	1,068	3.5%
TEXTILE MILL PRODUCTS	240,970	198,394	82.3%	5,539	2.8%	18,698	9.4%	72,039	36.3%	68,722	34.6%	33,396	16.8%
APPAREL AND OTHER FINISHED FABRIC PRODUCT	1,006,779	613,707	61.0%	64,189	10.5%	34,686	5.7%	148,690	24.2%	158,810	25.8%	207,522	33.8%
LUMBER AND WOOD PRODUCTS, EXCEPT FURNIT	39,387	14,095	35.8%	1,230	8.7%	1,744	12.4%	3,067	21.8%	3,497	24.8%	4,558	32.3%
FURNITURE AND FIXTURES	44,282	14,084	31.8%	1,465	10.4%	798	5.7%	3,528	25.0%	4,254	30.2%	4,041	28.7%
PAPER AND ALLIED PRODUCTS	180,827	82,903	45.8%	2,899	3.5%	6,887	8.3%	15,717	19.0%	23,581	28.4%	33,840	40.8%
PRINTING, PUBLISHING, AND ALLIED INDUSTRIES	206,104	134,187	65.1%	16,568	12.3%	9,840	7.3%	18,491	13.8%	28,057	20.9%	61,230	45.6%
CHEMICALS AND ALLIED PRODUCTS	598,511	437,557	73.1%	35,096	8.0%	28,068	6.4%	68,671	15.7%	138,343	31.6%	167,188	38.2%
PETROLEUM REFINING AND RELATED INDUSTRIES	16,612	5,610	33.8%	515	9.2%	248	4.4%	464	8.3%	2,430	43.3%	1,956	34.9%
RUBBER AND MISCELLANEOUS PLASTICS PRODU	251,062	92,591	36.9%	7,220	7.8%	9,041	9.8%	18,541	20.0%	28,805	31.1%	28,985	31.3%
LEATHER AND LEATHER PRODUCTS	281,930	71,470	25.4%	8,827	12.4%	5,751	8.0%	11,659	16.3%	18,875	26.4%	26,358	36.9%
STONE, CLAY, GLASS, AND CONCRETE PRODUCT	172,851	65,326	37.8%	6,167	9.4%	6,551	10.0%	10,635	16.3%	24,584	37.6%	17,388	26.6%
PRIMARY METAL INDUSTRIES	262,679	182,016	69.3%	5,025	2.8%	14,072	7.7%	25,539	14.0%	59,836	32.9%	77,544	42.6%
FABRICATED METAL PRODUCTS,EXC MACHINERY/	360,497	132,019	36.6%	9,713	7.4%	13,498	10.2%	29,859	22.6%	37,258	28.2%	41,691	31.6%
INDUSTRIAL/COMMERCIAL MACHINERY,COMPUTE	1,877,793	383,718	20.4%	21,658	5.6%	40,264	10.5%	103,033	26.9%	119,214	31.1%	99,549	25.9%
ELECTRONIC & OTHER ELECTRIC EQPT,EXC COM	1,389,564	324,090	23.3%	27,518	8.5%	45,268	14.0%	58,302	18.0%	92,911	28.7%	100,091	30.9%
TRANSPORTATION EQUIPMENT	505,944	103,106	20.4%	9,037	8.8%	7,753	7.5%	28,802	28.0%	27,521	26.7%	31,994	31.0%
MEASURING, ANALYZING, AND CONTROLLING INS	576,141	169,408	29.4%	18,093	10.7%	9,780	5.8%	27,483	16.2%	52,618	31.1%	61,434	36.3%
MISCELLANEOUS MANUFACTURING INDUSTRIES	358,752	90,389	25.2%	11,831	13.1%	6,852	7.6%	18,364	20.3%	24,303	26.9%	29,019	32.1%
PUBLIC ADMINISTRATION/OTHER	160,012	27,994	17.5%	2,936	10.5%	1,899	6.8%	5,785	20.7%	8,195	29.3%	9,179	32.8%
	35,088,455	3,677,631	10.5%	282,301	7.7%	315,138	8.6%	837,171	22.8%	1,076,806	29.3%	1,186,216	31.7%

APPENDIX C

Air Mail Truck Capacity and Traffic

Air Mail Center Truck Capacity and Traffic Estimates

		Truck Capacity								
		Daily Estimate (Cu. Ft.)			Share by Airport			Share by Market		
ODGRP	AREANAME	BWI	IAD	Total	BWI	IAD	Total	BWI	IAD	Total
VAA	Northern VA/I-95 Corridor No.	0	150,075	150,075	0.0%	47.4%	26.6%	0.0%	100.0%	100.0%
MDC	BWI Area	113,400	0	113,400	45.7%	0.0%	20.1%	100.0%	0.0%	100.0%
DCA	Washington, DC	16,400	56,100	72,500	6.6%	17.7%	12.8%	22.6%	77.4%	100.0%
VAB	Loudoun/Fauquier Co. (VA)	0	33,225	33,225	0.0%	10.5%	5.9%	0.0%	100.0%	100.0%
MDA	Montgomery Co. (MD)	13,200	4,800	18,000	5.3%	1.5%	3.2%	73.3%	26.7%	100.0%
MDB	Prince Georges Co. (MD)	13,200	4,800	18,000	5.3%	1.5%	3.2%	73.3%	26.7%	100.0%
MDE	Frederick Area (MD)	12,695	0	12,695	5.1%	0.0%	2.2%	100.0%	0.0%	100.0%
MDD	No. of Baltimore	7,200	0	7,200	2.9%	0.0%	1.3%	100.0%	0.0%	100.0%
MDF	Southern MD	31,200	9,600	40,800	12.6%	3.0%	7.2%	76.5%	23.5%	100.0%
PAB	South Central PA	16,800	0	16,800	6.8%	0.0%	3.0%	100.0%	0.0%	100.0%
MDG	MD Eastern Shore	16,000	0	16,000	6.4%	0.0%	2.8%	100.0%	0.0%	100.0%
MDH	Hagerstown Area (MD)	4,400	0	4,400	1.8%	0.0%	0.8%	100.0%	0.0%	100.0%
VAF	Roanoke Area	0	21,600	21,600	0.0%	6.8%	3.8%	0.0%	100.0%	100.0%
VAE	Charlottesville Area	0	20,500	20,500	0.0%	6.5%	3.6%	0.0%	100.0%	100.0%
VAI	Hampton Roads Area	0	10,800	10,800	0.0%	3.4%	1.9%	0.0%	100.0%	100.0%
VAH	Richmond Area	0	5,400	5,400	0.0%	1.7%	1.0%	0.0%	100.0%	100.0%
MDI	Western MD	3,200	0	3,200	1.3%	0.0%	0.6%	100.0%	0.0%	100.0%
WVA	Northeast WV	585	0	585	0.2%	0.0%	0.1%	100.0%	0.0%	100.0%
		248,280	316,900	565,180	100.0%	100.0%	100.0%	43.9%	56.1%	100.0%

		Truck Trips			Annual Traffic (000 Lbs.)					
		Daily One-Way Trips			1995			1996		
ODGRP	AREANAME	BWI	IAD	Total	BWI	IAD	Total	BWI	IAD	Total
VAA	Northern VA/I-95 Corridor No.	0	69	69	0	54,014	54,014	0	57,898	57,898
MDC	BWI Area	38	0	38	42,594	0	42,594	43,163	0	43,163
DCA	Washington, DC	8	27	35	6,160	20,191	26,351	6,242	21,643	27,885
VAB	Loudoun/Fauquier Co. (VA)	0	16	16	0	11,958	11,958	0	12,818	12,818
MDA	Montgomery Co. (MD)	6	4	10	4,958	1,728	6,686	5,024	1,852	6,876
MDB	Prince Georges Co. (MD)	6	4	10	4,958	1,728	6,686	5,024	1,852	6,876
MDE	Frederick Area (MD)	6	0	6	4,768	0	4,768	4,832	0	4,832
MDD	No. of Baltimore	2	0	2	2,704	0	2,704	2,740	0	2,740
MDF	Southern MD	12	6	18	11,719	3,455	15,174	11,875	3,704	15,579
PAB	South Central PA	6	0	6	6,310	0	6,310	6,394	0	6,394
MDG	MD Eastern Shore	13	0	13	6,010	0	6,010	6,090	0	6,090
MDH	Hagerstown Area (MD)	3	0	3	1,653	0	1,653	1,675	0	1,675
VAF	Roanoke Area	0	8	8	0	7,774	7,774	0	8,333	8,333
VAE	Charlottesville Area	0	9	9	0	7,378	7,378	0	7,909	7,909
VAI	Hampton Roads Area	0	4	4	0	3,887	3,887	0	4,167	4,167
VAH	Richmond Area	0	2	2	0	1,944	1,944	0	2,083	2,083
MDI	Western MD	2	0	2	1,202	0	1,202	1,218	0	1,218
WVA	Northeast WV	1	0	1	220	0	220	223	0	223
		103	148	251	93,256	114,057	207,313	94,501	122,259	216,760
	Local				66,143	89,619	155,762	67,026	96,063	163,089
	Regional P&D				25,692	3,455	29,147	26,035	3,704	29,738
	Road Feeder Areas (Primary)				1,422	20,983	22,405	1,441	22,492	23,933

APPENDIX D

Regional Air Cargo Estimates

REGIONAL FREIGHT AND MAIL DEMAND BY MARKET AREA AND TYPE (1996-2020)

	1996	1997	2010	2020	Forecast Annual Growth (1996-2010)
Domestic					
Local	213.4	224.9	445.5	753.6	5.4%
Regional P&D	285.4	301.0	599.2	1,017.8	5.4%
Road Feeder Areas (Primary)	691.6	730.8	1,495.8	2,595.1	5.7%
Road Feeder Arees (Secondary)	906.9	958.3	1,961.3	3,402.5	5.7%
All Other Regional Areas	933.2	986.1	2,020.5	3,508.3	5.7%
	3,030.6	3,201.1	6,522.3	11,277.2	5.6%
Canada					
Local	5.5	6.0	19.2	47.3	9.4%
Regional P&D	6.0	6.6	21.2	52.0	9.4%
Road Feeder Areas (Primary)	14.8	16.3	53.2	132.4	9.5%
Road Feeder Areas (Secondary)	21.7	23.8	78.2	195.3	9.6%
All Other Regional Areas	23.6	25.8	84.2	208.7	9.5%
	71.7	78.5	256.0	635.6	9.5%
Overseas					
Local	102.8	110.5	282.3	581.0	7.5%
Regional P&D	113.0	121.5	315.1	655.8	7.6%
Road Feeder Areas (Primary)	291.3	314.1	837.2	1,779.6	7.8%
Road Feeder Areas (Secondary)	374.9	404.3	1,076.8	2,287.9	7.8%
All Other Regional Areas	409.7	441.5	1,166.2	2,461.9	7.8%
	1,291.6	1,391.9	3,677.6	7,766.1	7.6%
Total Freight					
Local	321.7	341.4	747.0	1,381.8	6.2%
Regional P&D	404.4	429.1	935.6	1,725.8	6.2%
Road Feeder Areas (Primary)	997.7	1,061.2	2,386.1	4,507.0	6.4%
Road Feeder Areas (Secondary)	1,303.6	1,386.4	3,116.3	5,885.6	6.4%
All Other Regional Areas	1,366.5	1,453.5	3,270.9	6,178.9	6.4%
	4,393.9	4,671.5	10,455.9	19,679.0	6.4%
Mail					
Local	163.1	168.6	260.4	363.8	3.4%
Regional P&D	29.7	30.7	47.5	66.3	3.4%
Road Feeder Areas (Primary)	23.9	24.7	38.2	53.4	3.4%
	216.8	224.1	346.2	483.6	3.4%
Total Freight and Mail					
Local	484.7	510.0	1,007.5	1,745.7	5.4%
Regional P&D	434.2	459.9	983.1	1,792.0	6.0%
Road Feeder Areas (Primary)	1,021.7	1,085.9	2,424.4	4,560.4	6.4%
Road Feeder Areas (Secondary)	1,303.6	1,386.4	3,116.3	5,885.6	6.4%
All Other Regional Areas	1,366.5	1,453.5	3,270.9	6,178.9	6.4%
	4,610.7	4,895.6	10,802.1	20,162.6	6.3%

APPENDIX E

Air Cargo Facilities at BWI and Dulles

BWI AIR CARGO FACILITIES (July 1996)

Building	Bay	Building Area (sq. ft) Cargo Warehouse	Office/ Other	Total		Truck Parking & Ramp Type	Area (sf)	Tenant/Occupant
Main Cargo Area								
A	1,2	481	770	1,251		Paved	1,560	SeaSchott
	3-10	4,463	650	5,113		Paved	8,840	Vacant
	11-12	600	679	1,279		Paved	2,080	Eastern Air Transport
	13-14	590	710	1,300		Paved	2,080	Emo Trans GA
	15-18	1,254	3,838	5,092		Paved	6,300	Vacant
		7,388	6,647	14,035			20,860	
B	1-10	10,345	2,628	12,973		Paved	10,400	World Wide Refrigerated Cargo
	11-12	2,600	0	2,600		Paved	2,080	Vacant
	13-17	4,552	1,680	6,232		Paved	5,200	Miami Aircraft
	18-21	4,154	705	4,859				Northwest
	22-25	4,102	1,073	5,174				Fire Rescue
	26-29	4,030	868	4,898		Paved	4,160	Delta
	30-31	2,123	0	2,123				U.S. Customs
	32	0	7,767	7,767				U.S. Customs, USF&W, Brokers, Vacant (886 sf)
		31,906	14,721	46,626			21,840	
C	1-4	3,900	1,173	5,073		Paved	4,122	Southwest
	5-8	5,120	0	5,120		Paved	4,122	Vacant
	9-10	1,412	708	2,120				J.S. Connor (FF)
	11-34	25,799	5,200	30,999				USPS
		36,231	7,081	43,312			8,244	
D*		45,000	15,000	60,000	*		30,000	USAir, UPS, Emery, FedEx
E*		37,120	12,373	49,493			NA	BAX, FedEx
		14,797	0	14,797			NA	USPS
		51,917	12,373	64,290	*		32,145	
Area Total		172,441	55,822	228,263			113,089	
Elm Road Area **								
107		3,577	30,902	34,479		Exterior Space	57,063	United (Maint.), USAir (AC+Maint.)
111		1,958	10,520	12,478		Exterior Space	26,915	Signature, Henson, Ogden
112		1,037	25,201	26,238		Paved	32,664	United, TWA, Airborne (non-AC)
Area Total		6,572	66,623	73,195			116,642	
Cargo-related		134,316	49,549	183,865				
USPS		40,596	5,200	45,796				
Elm St. Non-Cargo		0	66,623	66,623				
Fire & Rescue		4,102	1,073	5,174				
		179,013	122,445	301,458				

* Assumes 75% of total space for warehouse and parking/building ratio of .50.

** Buildings include non-cargo warehouse and other space.

DULLES AIR CARGO FACILITIES (April 1996)

Building	Bay	Building Area (sq. ft)	Tenant/Occupant
#1	1-3	2,178	Non-cargo
	4-6	2,192	ATS (Ground Handler)
	7-13	5,102	Non-cargo
	14-20	5,102	Airborne
	21	730	Unused (Estimated)
	22-30	6,370	WTT, TWA
	31-36	4,450	Non-cargo
		26,124	
#2	37-40	3,100	Non-cargo
	41-71	24,782	ACI, UPS, John S. Connor, Wall Shipping
		27,882	
#3	72-75	2,700	Non-cargo
	76-77	1,500	S. Shapiro
	78-80	2,500	Non-cargo
	81-85	3,500	Federal Forwarding, Global Trans.
	86-97	9,000	Non-cargo
	98-115	13,500	British Airways
		32,700	
#4	116-133	13,155	Airschott, Gateway
	134-145	9,000	Non-cargo
	146-151	4,500	Continental
		26,655	
#5	1-30	99,511	FedEx
	31-36	18,200	Lufthansa
	37-40	4,323	U.S. Customs
	41	6,400	Miami Aircraft (Ground Handler)
	42-56	64,000	Vacant (estimated)
	57-61	22,820	Air France + Mezzanine Offices (1,920 sf)
	62-64	5,850	Victory Van
	65-90	61,605	United Airlines
		282,709	

	Building Space (sf)	
	Cargo	Total
#1	13,664	26,124
#2	24,782	27,882
#3	18,500	32,700
#4	17,655	26,655
	74,601	113,361
#5	282,709	282,709
	357,310	396,070

APPENDIX F

Truck Activity Forecasts at BWI and Dulles

AIR FREIGHT TRUCK ACTIVITY FORECASTS FOR BWI AND DULLES

	BWI			IAD		
	Domestic	Inter-national	Total	Domestic	Inter-national	Total
Baseline (1996)						
Annual Traffic by O/D Region (000 Lbs.)						
Local O&D	79,134	10,556	89,689	108,856	50,362	159,217.6
Regional Truck O&D	158,268	17,593	175,860	217,712	83,936	301,648.1
Air Transshipment	11,100	0	11,100	51,563	40,611	92,174.7
	248,502	28,148	276,650	378,132	174,909	553,040
Share of Traffic via Local Sweep Truck by O/D Region						
Local O&D	*20.0%*	*75.0%*		*15.0%*	*75.0%*	
Regional Truck O&D	*40.0%*	*50.0%*		*25.0%*	*35.0%*	
Tractor-Trailer Share of Traffic by Service Type						
Off-Airport Sweep	*5.0%*	*5.0%*		*10.0%*	*10.0%*	
Local Direct	*25.0%*	*25.0%*		*20.0%*	*25.0%*	
Regional Direct	*90.0%*	*90.0%*		*90.0%*	*90.0%*	
Average Load per One-Way Trip						
Tractor-Trailer (Sweep)	*2,000*	*2,000*		*2,000*	*2,000*	
Tractor-Trailer (Direct)	*10,000*	*10,000*		*10,000*	*10,000*	
Straight Truck/Van (Sweep)	*1,000*	*1,000*		*1,000*	*1,000*	
Straight Truck/Van (Direct)	*3,000*	*3,000*		*3,000*	*3,000*	
Annual Traffic by Service Type (000 Lbs.)						
Off-Airport Sweep	79,134	16,713	95,847	70,756	67,149	137,905
Local Direct	63,307	2,639	65,946	92,528	12,590	105,118
Regional Direct	94,961	8,796	103,757	163,284	54,558	217,842
	237,401	28,148	265,550	326,568	134,297	460,866
Annual Traffic by VehicleType (000 Lbs.)						
Tractor-Trailer (Sweep)	3,957	836	4,792	7,076	6,715	13,791
Tractor-Trailer (Direct)	101,291	8,576	109,868	165,461	52,250	217,711
Straight Truck/Van (Sweep)	75,177	15,877	91,055	63,681	60,434	124,115
Straight Truck/Van (Direct)	56,976	2,859	59,835	90,351	14,899	105,249
	237,401	28,148	265,550	326,568	134,297	460,866
Average Round Trips by Vehicle Type						
-Annual						
Tractor-Trailer	6,054	1,275	7,329	10,042	8,582	18,624
Straight Truck/Van	47,085	16,830	63,915	46,899	65,400	112,299
	53,138	18,106	71,244	56,941	73,982	130,923
-Weekly						
Tractor-Trailer	116	25	141	193	165	358
Straight Truck/Van	905	324	1,229	902	1,258	2,160
	1,022	348	1,370	1,095	1,423	2,518
- Per Weekday (assuming weekend avg.=50% of weekday)						
Tractor-Trailer	19	4	23	32	28	60
Straight Truck/Van	151	54	205	150	210	360
	170	58	228	183	237	420

AIR FREIGHT TRUCK ACTIVITY FORECASTS FOR BWI AND DULLES

	BWI			IAD		
	Domestic	Inter-national	Total	Domestic	Inter-national	Total
Forecast (1997-2020)						
Annual Growth Rate (1996-2020)	5.5%	7.7%		5.5%	7.7%	
Average Round Trips by Vehicle Type (1997)						
-Annual						
Tractor-Trailer	6,387	1,374	7,760	10,594	9,243	19,838
Straight Truck/Van	49,674	18,126	67,801	49,478	70,436	119,914
	56,061	19,500	75,561	60,073	79,679	139,752
-Weekly						
Tractor-Trailer	123	26	149	204	178	381
Straight Truck/Van	955	349	1,304	952	1,355	2,306
	1,078	375	1,453	1,155	1,532	2,688
- Per Weekday (assuming weekend avg.=50% of weekday)						
Tractor-Trailer	20	4	25	34	30	64
Straight Truck/Van	159	58	217	159	226	384
	180	62	242	193	255	448
Average Round Trips by Vehicle Type (2010)						
-Annual						
Tractor-Trailer	12,810	3,603	16,413	21,250	24,245	45,495
Straight Truck/Van	99,635	47,546	147,181	99,242	184,756	283,998
	112,446	51,149	163,595	120,492	209,001	329,493
-Weekly						
Tractor-Trailer	246	69	316	409	466	875
Straight Truck/Van	1,916	914	2,830	1,909	3,553	5,461
	2,162	984	3,146	2,317	4,019	6,336
- Per Weekday (assuming weekend avg.=50% of weekday)						
Tractor-Trailer	41	12	53	68	78	146
Straight Truck/Van	319	152	472	318	592	910
	360	164	524	386	670	1,056
Average Round Trips by Vehicle Type (2020)						
-Annual						
Tractor-Trailer	21,882	7,566	29,447	36,298	50,908	87,206
Straight Truck/Van	170,192	99,832	270,024	169,520	387,931	557,451
	192,073	107,398	299,471	205,818	438,840	644,657
-Weekly						
Tractor-Trailer	421	145	566	698	979	1,677
Straight Truck/Van	3,273	1,920	5,193	3,260	7,460	10,720
	3,694	2,065	5,759	3,958	8,439	12,397
- Per Weekday (assuming weekend avg.=50% of weekday)						
Tractor-Trailer	70	24	94	116	163	280
Straight Truck/Van	545	320	865	543	1,243	1,787
	616	344	960	660	1,407	2,066

AIR MAIL TRUCK ACTIVITY FORECASTS FOR BWI AND DULLES

	BWI				IAD			
	1996	1997	2010	2020	1996	1997	2010	2020
Total Traffic (Million Lbs.)	94,501	97,714	150,912	210,829	122,259	126,416	195,240	272,756
Tractor-Trailer Share of Total Trips	33.5%	33.5%	33.5%	33.5%	73.0%	73.0%	73.0%	73.0%
Typical Weekday 1-way Trips	103.0	106.5	164.5	229.8	148.0	153.0	236.3	330.2
Ratio of Typical Weekly-to-Daily Trips *	6.2	6.2	6.2	6.2	8.2	6.2	6.2	6.2
Ratio of Actual-to-Typical Daily Trips **	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
Annual Round Trips								
Tractor-Trailer Trips	6,257	6,470	9,993	13,960	19,593	20,259	31,289	43,711
Straight Truck Trips	12,422	12,844	19,836	27,712	7,247	7,493	11,573	16,167
	18,679	19,314	29,829	41,672	26,840	27,752	42,861	59,879
Average Round Trips per Week								
Tractor-Trailer Trips	120	124	192	268	377	390	602	841
Straight Truck Trips	239	247	381	533	139	144	223	311
	359	371	574	801	516	534	824	1,152
Average Weekday Round Trips								
Tractor-Trailer Trips	19	20	31	43	61	63	97	136
Straight Truck Trips	39	40	62	86	22	23	36	50
	58	60	93	129	83	86	133	186

	BWI/IAD Combined			
	1996	1997	2010	2020
Total Traffic (Million Lbs.)	216,760	224,130	346,152	483,584
Annual Round Trips				
Tractor-Trailer Trips	25,851	26,729	41,282	57,672
Straight Truck Trips	19,668	20,337	31,409	43,879
	45,519	47,066	72,691	101,551
Average Round Trips per Week				
Tractor-Trailer Trips	497	514	794	1,109
Straight Truck Trips	378	391	604	844
	875	905	1,398	1,953
Average Weekday Round Trips				
Tractor-Trailer Trips	80	83	128	179
Straight Truck Trips	61	63	97	136
	141	146	225	315

* Assumes Sunday traffic is 20% of average Mon-Sat. traffic.

** Assumes peak quarter traffic is 150% of average for other quarters.

APPENDIX G

Summary of Truck Activity Forecasts at BWI and Dulles

SUMMARY OF AIR CARGO TRUCK ACTIVITY FORECASTS FOR BWI AND DULLES

	BWI				IAD				BWI & IAD Combined			
	1996	1997	2010	2020	1996	1997	2010	2020	1996	1997	2010	2020
Annual Trips												
Mail												
Tractor-Trailer	6,257	6,470	9,993	13,960	19,593	20,259	31,289	43,711	25,851	26,729	41,282	57,672
Straight Truck	12,422	12,844	19,836	27,712	7,247	7,493	11,573	16,167	19,668	20,337	31,409	43,879
	18,679	19,314	29,829	41,672	26,840	27,752	42,861	59,879	45,519	47,066	72,691	101,551
Freight												
Tractor-Trailer	7,329	7,760	16,413	29,447	18,624	19,838	45,495	87,205	25,954	27,598	61,909	116,653
Straight Truck	63,915	67,801	147,181	270,024	112,299	119,914	283,998	557,451	176,214	187,715	431,179	827,475
	71,244	75,561	163,595	299,471	130,923	139,752	329,493	644,657	202,168	215,313	493,088	944,129
Total												
Tractor-Trailer	13,587	14,231	26,406	43,408	38,217	40,097	76,784	130,917	51,804	54,327	103,190	174,325
Straight Truck	76,337	80,644	167,018	297,736	119,548	127,407	295,571	573,619	195,882	208,052	462,588	871,355
Over-the-Counter Personal Vehicles *	15,600	16,380	30,887	50,312	23,400	24,570	46,330	75,467	39,000	40,950	77,217	125,779
	105,523	111,255	224,311	391,455	181,163	192,074	418,685	780,003	286,686	303,329	642,996	1,171,458
Average Trips per Week												
Mail												
Tractor-Trailer	120	124	192	268	377	390	602	841	497	514	794	1,109
Straight Truck	239	247	381	533	139	144	223	311	378	391	604	844
	359	371	574	801	516	534	824	1,152	875	905	1,398	1,953
Freight												
Tractor-Trailer	141	149	316	566	358	381	875	1,677	499	531	1,191	2,243
Straight Truck	1,229	1,304	2,830	5,193	2,160	2,306	5,461	10,720	3,389	3,610	8,292	15,913
	1,370	1,453	3,146	5,759	2,518	2,688	6,336	12,397	3,888	4,141	9,482	18,156
Total												
Tractor-Trailer	141	149	316	566	358	381	875	1,677	499	531	1,191	2,243
Straight Truck	1,349	1,428	3,023	5,461	2,536	2,696	6,063	11,561	3,888	4,124	9,086	17,022
Over-the-Counter Personal Vehicles	300	315	594	968	450	473	891	1,451	750	788	1,485	2,419
	1,790	1,893	3,932	6,995	3,345	3,550	7,829	14,689	5,135	5,442	11,761	21,684
Average Weekday Trips												
Mail												
Tractor-Trailer	19	20	31	43	61	63	97	136	80	83	128	179
Straight Truck	39	40	62	88	22	23	36	50	61	63	97	136
	58	60	93	129	83	86	133	186	141	146	225	315
Freight												
Tractor-Trailer	23	25	53	94	60	64	146	280	83	88	198	374
Straight Truck	205	217	472	866	360	384	910	1,787	565	602	1,382	2,652
	228	242	524	960	420	448	1,056	2,066	648	690	1,580	3,026
Total												
Tractor-Trailer	23	25	53	94	60	64	146	280	83	88	198	374
Straight Truck	224	237	503	909	421	447	1,007	1,922	645	685	1,510	2,831
Over-the-Counter Personal Vehicles	50	53	99	161	75	79	148	242	125	131	247	403
	298	315	654	1,164	555	590	1,302	2,444	853	904	1,956	3,608
Average Annual Growth Rate from 1996		5.7%	5.8%	5.8%		6.1%	6.3%	6.4%		6.0%	6.1%	6.2%

* Assumes average weekday traffic of 50 for BWI and 75 for IAD, weekly traffic at 6 times average weekday, and 5% annual growth.

APPENDIX H

Western Transportation Corridor Network Scenario

3.3 UPGRADE/LINK EXISTING AND/OR PLANNED ROADWAYS ALTERNATIVE

This alternative includes all components of the Baseline Alternative with additional road widening, realignment, and/or new links between roadways. This alternative seeks to meet the north-south travel needs of the study area by adding roadway linkages to roadway improvements already on the CLRP.

All of the linkages in this alternative have been included in the counties' transportation plans. This alternative will be modeled to determine if it has merit given the CLRP improvements selected and the potential new linkages from the county plans.

The roadway improvements and linkages are described for each county in the study area and then by connection to the adjoining county. Figure 8 shows the improvements and linkages that are being considered as part of this alternative.

Loudoun County

Two north-south segments are included for this alternative in Loudoun County. The western segment (Segment 12) is the upgrading of VA 659 (two to four lanes) from VA 7 to the Prince William County line. VA 659 is to be realigned around the Village of Arcola and enter Prince William County west of existing VA 659. This improvement is part of the CLRP.

The eastern segment (Segment 13) includes the CLRP improvements to VA 607 from VA 7 to the Dulles Greenway interchange, which is already constructed for VA 607. This segment would continue south from the Dulles Greenway to U.S. Route 50 as the Loudoun Parkway, which is to be studied in the CLRP as a four-lane facility. This linkage would continue to the south of U.S. Route 50 to I-66 as four-lan facility called the Tri-County Parkway, which also is to be studied (in the CLRP). This linkage would end at I-66 just east of the I-66 crossing of Bull Run. The southern most portion of the Tri-County Parkway is in Fairfax County.

Fairfax County

A portion of what is known as the Tri-County Parkway is located in the western corner of Fairfax County. The segment (Segment 13) from Loudoun County that ends at I-66 in Fairfax County would continue to the south as the VA 28 Bypass of Manassas (six lanes), which is part of the CLRP.

Prince William County

There are two entry points into Prince William County from the north that are part of this alternative. The VA 28 Bypass continues from Fairfax County to the VA 235 Bypass (Segment 13). The other segment (Segment 12) extends from VA 659 in Loudoun County, which would be a new linkage to I-66 that would bisect the area between the Manassas National Battlefield Park and the Conway Robinson State Forest. This segment would continue to the south along the VA 234 Bypass (to six lanes as part of the CLRP) to VA 28 and an interchange with the VA 28 Bypass. From this point in the county, two travel options are possible to the south — along VA 28 to southwest and into Faquier County or continuing south on the VA 234 Bypass to exiasting 234 south of the City of Manassas.

This latter segment would continue to the southeast along existing VA 234 to I-95. The improvements to VA 234 include four- and six-lane sections that are part of the CLRP.

An additional segment along this route is a connection to Hoadly Road, then to Dale Boulevard and eventually a connection to I-95. Hoadly Road is to be improved to four lanes and Dale Boulevard will have four- and six-lane sections as part of the CLRP.

Another segment, beginning at the Prince William Parkway interchange at I-95, is part of this alternative. This segment would use the eventual six-lanes of the Parkway to reach Liberia Avenue just south of the City of Manassas. Liberia Avenue is currently being upgraded to four lanes as part of the CLRP. This segment would follow Liberia Avenue to existing VA 28. Existing VA 28 would provide the connection to the north through Fairfax and Loudoun Counties to VA 7.

Fauquier County

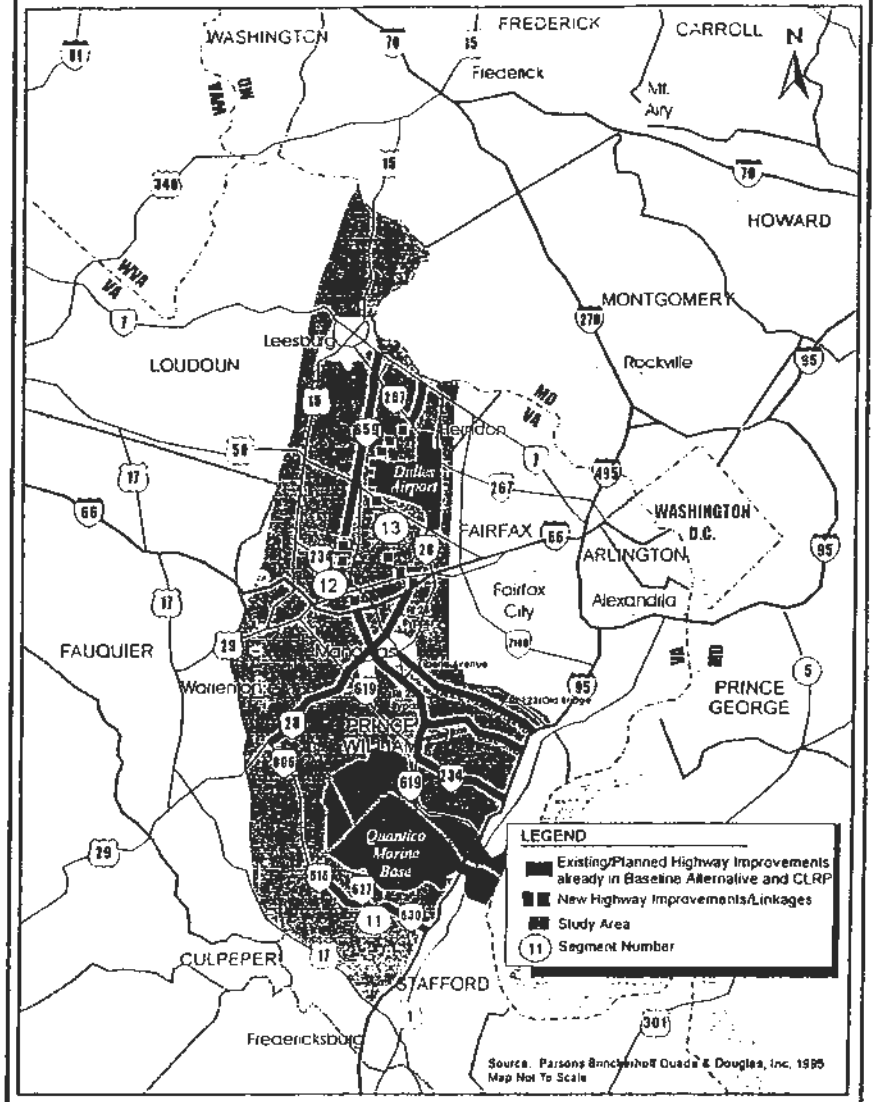
There is one option in Fauquier County that is part of this alternative. VA 28 is to be improved from two to four lanes from U.S. 29 to the Fauquier County line.

Stafford County

The improvements that are part of this alternative (Segment 11) include widening VA 648 and VA 630 from two to four lanes. Improving VA 627 from its intersection with VA 630 west toward the Fauquier County border also is part of this alternative.

The roadway improvements in Stafford County that are part of this alternative do not directly connect to other improvements to form a north/south linkage, but they connect to existing roadways to provide a north-south linkage. Existing roadways, such as VA 616 of VA 806 could be used to make connections to VA 28 in Fauquier County.

FIGURE 8



Upgrade/Link Existing and/or Planned Roadway Alternative

APPENDIX I

Transportation Planning Board Resolution

TPB R16-98
March 18, 1998

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS
NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD
777 North Capitol Street, N.E.
WASHINGTON, D.C. 20002-4239

RESOLUTION ON 1997 WASHINGTON-BALTIMORE REGIONAL AIRPORT SYSTEM PLAN, VOLUME III - AIR CARGO

WHEREAS, since 1975, the National Capital Region Transportation Planning Board (TPB) has sponsored a Continuous Airport System Planning (CASP) program, with grant assistance from the Federal Aviation Administration (FAA), and in cooperation with the Maryland Aviation Administration, the Metropolitan Washington Airports Authority, and the Virginia Department of Aviation; and,

WHEREAS, on June 15, 1988, the TPB adopted the Washington-Baltimore Regional Airport System Plan, Volume I - Commercial Airports, and on September 21, 1994, the TPB adopted the Washington-Baltimore Regional Airport System Plan, Volume II - Ground Access, and directed that the CASP program complete a comprehensive study of air cargo goods movement in the region; and,

WHEREAS, FAA Advisory Circular 150/5050-5 recommends that the CASP program sponsor engage in work which assures that the Plan remains responsive to the current air transportation needs of the area; and,

WHEREAS, the Intermodal Surface Transportation Efficiency Act of 1991 includes 15 planning factors that must be considered as part of the planning process for all metropolitan areas, one of which requires consideration of the efficient movement of freight; and,

WHEREAS, these 15 planning factors have been incorporated into the Policy Element of the TPB's Constrained Long-Range Transportation Plan for the National Capital Region, one objective of which is to implement methods to enhance the efficient movement of freight, and the TPB has released a Draft Consensus Transportation Vision which includes a policy goal to support options for international and inter-regional travel and commerce, with maintaining access to all of the region's major airports for both people and goods as a strategy to achieve this goal; and,

WHEREAS, the TPB staff has engaged in extensive airport systems planning and air cargo work, with continuing technical guidance from the Aviation Technical

Subcommittee and appropriate staff of local governments, the states, the commercial airports, and other interested parties; and,

WHEREAS, the draft Air Cargo Element, Volume III of the Regional Airport System Plan, has received widespread review and evaluation through the Aviation Technical Subcommittee and the TPB Technical Committee, as part of the CASP process; and,

WHEREAS, the TPB was briefed on the air cargo study on February 18, 1998 and the comments received have been addressed in the final version,

NOW, THEREFORE, BE IT RESOLVED THAT the National Capital Region Transportation Planning Board adopts the Air Cargo Element as Volume III of the Washington-Baltimore Regional Airport System Plan, and incorporates it by reference as part of the Constrained Long-Range Transportation Plan for the National Capital Region.

(ADOPTED BY THE NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD AT ITS REGULAR MEETING ON MARCH 18, 1998.)