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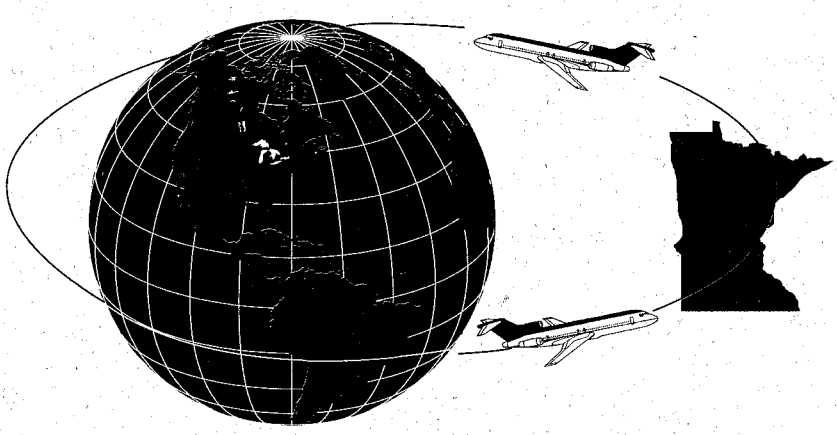

Shifting Global Airline Service and the Local Community

UNIVERSITY OF MINNESOTA

CENTER FOR TRANSPORTATION STUDIES

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This report presents results from a one-year study investigating the allocation, organization, and importance of international passenger and freight service among US cities. Minneapolis-St. Paul International Airport (MSP) serves as a case study throughout.

The study addressed specific causes and effects of the international air service MSP currently enjoys. The goal of this report is to inform public policy decision-makers, business leaders, and private citizens about international air service at MSP: the regulatory framework that shapes the international service map, connections between such service and urban development, and Minneapolis/St. Paul's standing among other Midwestern cities in terms of access to major foreign destinations.

The final section of this report comments on the tenuous nature of nonstop international service in today's liberal international environment, current efforts to enhance international service to the Twin Cities, and questions that remain unanswered about the Twin Cities place on the international service map.

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Final Report

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EXECUTIVE SUMMARY

This report investigates the allocation, organization, and importance of international passenger and freight service among U.S. cities. The causes and effects of international air service at Minneapolis-St. Paul International Airport (MSP) provide examples throughout. Specific chapters address the regulatory framework that shapes the international service map, connections between such service and the local community, the relative significance of air service markets around the world, and Minneapolis/St. Paul's standing among other Midwestern cities in terms of access to major foreign destinations.

Minneapolis-St. Paul has nonstop passenger and direct cargo service to destinations in Canada, Europe, and Asia. Northwest Airlines and its global partner, KLM-Royal Dutch Airlines, operate many of these flights. The existence of one of Northwest Airlines' major domestic hubs at the Twin Cities and the implementation of new, liberal traffic-rights agreements with foreign governments have combined to help Minneapolis-St. Paul achieve this relatively high level of international service for a metropolitan area of only 2.5 million people.

Route, industry, and local initiative regulatory issues influence which U.S. cities have international routes and how service is allocated among them. Nonbinding international agreements and U.S. government laws and regulations during the post-World War II period have determined international route structures, thereby controlling access of U.S. metropolitan areas to new service. Service between nations has been decided on a bilateral basis among individual nation-pairs. Industry regulation and local initiative issues have grown increasingly important to U.S. airports seeking to expand their international service in light of liberal bilateral agreements implemented in the past ten years. Federal efforts to regulate joint ownership and codesharing arrangements among U.S. and foreign carriers while simultaneously allowing exceptions to these rules have given some carriers (and therefore the cities they serve) advantages on the international playing field. These issues, as well as efforts to empower local communities seeking greater

international service, combine to make a complex, dynamic regulatory environment in which international air service is determined.

International air service supports strong employment, tax revenue, and business revenue in the regions that it serves. The third chapter of this report documents literature that helps explain the significance of transportation (and particularly international air transportation) to urban development processes historically. It then explores several interpretations of how airport activity supports the economies served. The final section of Chapter 3 comments on some of the more intangible impacts of international air service. All three sections help support the case for international air access's importance to Minneapolis and St. Paul.

The distribution of air passenger and cargo traffic around the world and the location of the largest markets for U.S. originating and destined international traffic indicate places to which service is likely to be particularly important in the future. In the fourth chapter of this report, an overview of industry traffic patterns and available data sources precedes sections devoted specifically to foreign airport passenger traffic, national- level passenger volumes, and cargo traffic respectively. Total cargo- and passenger-traffic distributions indicate the dominance of European and Asian cities, while Caribbean and Central American markets are more significant in terms of passenger traffic to and from the U.S. In general, major foreign traffic centers are associated with countries that are currently economically prosperous and/or have histories of state-supported civil aviation.

Air service to and from major foreign passenger and cargo markets and eleven cities in the Midwest varies in quantity, geographic scope, and diversity of service providers. Chicago dominates the region as an international traffic center, but smaller metropolitan areas enjoy niches associated with their major home-based carriers. Analysis includes documentation of aggregate service at Midwest cities with international service, but focuses more heavily on unique local market and international airline route network features that define the service available at each city. While the sheer size of some metropolitan areas like Chicago generates traffic to support international service, the location of domestic hub activity for a U.S. carrier is a valuable ingredient

for service at mid-sized cities. The Midwest has eight metropolitan areas with populations of between one and three million, yet these cities have widely-varying service profiles based on the orientation of their economies and the presence or absence of domestic airline hub activity. The distribution of international routes among Midwest Cities reflects both of these issues and offers insights into what characteristics make international passenger and cargo routes viable.

The international air service map is more complex than ever before because of flexible agreements among nation pairs, intricate marketing and other collaborative agreements among U.S. and foreign airlines, and the reduction of technological barriers that previously dictated route networks. International routes are the product of the conflicting agendas of four sectors. First, profit maximizing carriers seek to operate combinations of routes that provide the greatest return for their investment, regardless of the effects on places served. Airport operators, local governments, and their boosters seek to improve the well-being of the local community through increased air service and the tangible and intangible economic benefits it provides. Consumers of cargo and passenger service want the best service possible at the lowest cost, regardless of the routes or modes that doing so requires. Finally, federal policy-makers seek to balance the wishes of all three of these interests as well as foreign governments and their airlines to ensure a safe, strong international air service system that preserves U.S. interests.

CHAPTER 1
INTRODUCTION

In the next two years, Minnesota lawmakers and state officials will choose to expand air-service capacity at Minneapolis-St. Paul either through renovations at the current Minneapolis-St. Paul International Airport (MSP) site or construction of a new airport facility in Dakota County. Forecasters estimate a 24 percent expansion in total aircraft takeoffs and landings at MSP by the year 2020 to a total of over 500,000 operations annually. Aircraft operations for international routes are expected to increase 500 percent during the same period, substantially outpacing domestic traffic growth [1]. This report documents the unique determinants and consequences of international service to U.S. cities, using Minneapolis-St. Paul as an example throughout to provide a comprehensive understanding of local, regional, national, and global issues surrounding international air service.

1.1 REPORT ORGANIZATION

To reach an informed decision about the future site of Twin Cities airport activity requires a thorough understanding of the allocation, organization, and importance of international passenger and freight service. This study addresses the specific causes and effects of the international air service MSP currently enjoys. The goal of this report is to inform public policy decision-makers, business leaders, and private citizens about international air service at MSP: the regulatory framework that shapes the international service map, the connections between such service and urban development, the relative significance of air-service markets around the world, and Minneapolis-St. Paul's standing among other Midwestern cities in terms of access to major foreign destinations.

The report concludes with comments on current efforts to enhance international service to the Twin Cities, the tenuous nature of nonstop international service in today's liberal international environment, and questions that remain unanswered about the Twin Cities place on the

international air-service map. Readers will find the appendices useful for clarifying specific terms and issues throughout: a glossary of selected terms is included as Appendix A, Appendix B provides additional insights into hub and spoke route organization, Appendix C clarifies code sharing issues and lists airline codes, and Appendices D and E provide summary data tables. As background, the report begins with an overview of existing international service at MSP.

1.2 INTERNATIONAL SERVICE AT MINNEAPOLIS-ST PAUL

Minneapolis and St. Paul's passenger connectivity to domestic and foreign cities has fared quite well since deregulation of the domestic airline industry in 1978. As a major domestic hub for Northwest Airlines, Inc. (Northwest), MSP has been spared the fate of many smaller cities that have lost much or all of their jet service. In the post-deregulation era, U.S. air carriers have used hub and spoke route organization to maximize economies of scale and scope across their systems, feeding most of their passenger traffic through several key cities. Minneapolis-St. Paul and St. Louis are among those cities that have gained nonstop destinations during this era, as Northwest and Trans World Airlines, Inc. (TWA) concentrate much of their domestic east-west service through these cities respectively. Today, certificated air carriers offer nonstop service between Minneapolis-St. Paul and over one hundred domestic destinations [2].

Scheduled international flights from Minneapolis-St. Paul reach five countries without making any intermediate stops at other U.S. cities, making MSP a gateway for international traffic. Not surprisingly, Canada is the Twin Cities' biggest international route partner. Since approval of a new agreement between the U.S. and Canada early in 1995, MSP gained passenger service to a wider range of Canadian destinations than most other U.S. airports. Nonstop scheduled service is available daily to seven points in Canada with jet service, and Thunder Bay, Ontario with smaller aircraft. Although Northwest dominated service to major Canadian cities from the Twin Cities through summer of 1995, Air Canada began successful nonstop service to Toronto in fall.

The Twin Cities' strongest scheduled overseas connection is to Amsterdam; Northwest and KLM-Royal Dutch Airlines (KLM) offer a total of fourteen nonstop flights each week. In

addition, Northwest operates a daily nonstop to London's Gatwick Airport, and one weekly nonstop flight each to Frankfurt and Tokyo [3]. Sun Country Airlines, the Twin Cities' largest charter carrier, operates nonstop international service on a non-scheduled basis to Mexico and nations in the Caribbean largely for vacation traffic. This report does not examine charter services specifically, although Chapter 4 includes some charter data in aggregate figures.

Nonstop flights are the most attractive flight option for passengers in terms of time, comfort, and convenience, yet direct flights comprise a majority of the Twin Cities' international service. In the past five years, destinations served with one or more intermediate stops have included Malaysia, Ontario (Canada), Paris, Singapore, Stockholm, and Toronto, in addition to the destinations mentioned above [4]. At certain intermediate stops, however, passengers must make "equipment changes," rendering that route less attractive than it first appears. In fact, connections to other aircraft on flights operated by the originating carrier at gateways elsewhere in the U.S. can involve less elapsed time for the traveler than direct flights.

Minneapolis-St. Paul's international cargo service mirrors its passenger service in many ways. All of the wide-body passenger aircraft flying nonstop on transoceanic routes have some cargo capacity available. Direct passenger flights to Paris and Singapore also carry cargo. Aircraft with no seating for passengers (all-cargo aircraft) operate nonstop between Minneapolis-St. Paul and Winnipeg and Toronto, but not to any transoceanic (overseas) markets. Wide-body all-cargo service operates with between one and five stops between MSP and Bangkok, Seoul, Singapore, and Tokyo [5]. The truck route between Minneapolis-St. Paul and Chicago's O'Hare International Airport is an easy overnight trip, allowing next day overseas service to a wide variety of destinations through Chicago. Because truck service of some length is necessary to transport cargo to the gateway airport, a longer trip to reach Chicago rather than MSP for a nonstop, all-cargo flight to Paris (for example) is not detrimental. Guaranteed traffic at Chicago and easy access from O'Hare to the Twin Cities make carriers unlikely to serve overseas destinations from MSP--profit-seeking airlines do not wish to serve simply lucrative markets, but want to serve the *most* lucrative routes.

MSP's total air cargo handled by volume increased nearly 50 percent between 1990 and 1994 [6]. The MAC hopes to make MSP an attractive international gateway for cargo service between Las Vegas, Baltimore, Hartford (CT), and other U.S. cities lacking nonstop overseas connections to Europe or Asia. Air cargo service, and particularly overseas air cargo service, is undoubtedly a key component to MSP's international operations; it is considered in this report as data allow.

This introductory chapter has explained the organization of this report and documented current service available to firms and citizens from Minneapolis-St. Paul. Next, Chapter 2 explores government-related issues that influence the allocation and organization of international air service.

CHAPTER 2
REGULATORY FRAMEWORK

Nonstop international air service to U.S. cities has proliferated in the past fifty years. An important factor in the growth in the number of cities served has been the changing nature of international aviation governance. Multinational agreements under which both passenger and cargo air service are conducted took their earliest lead from maritime law--long before transoceanic flight was technologically feasible. The application of maritime port access and line regulation to air transportation framed multinational dialogue regarding airspace sovereignty and foreign air carrier rights in the first half of the twentieth century. Through the mid-1940s the U.S. was only peripherally involved in European attempts to coordinate international civil aviation. The era of international regulation since World War II, however, has been dominated by U.S. interests.

Nonbinding international agreements and U.S. government laws and regulations during the postwar period have influenced international route structures, thereby controlling access of U.S. metropolitan areas to new service. Multinational agreements have not been reached; service between nations has been decided on a bilateral basis among individual nation-pairs. International service at Minneapolis-St. Paul has expanded and contracted as U.S. dominance in bilateral negotiations has changed. Resulting agreements have varied from liberal compacts which do not specify the number of carriers and flights between identified city-pairs, to more restrictive agreements which allow a greater number of cities to be served at carefully regulated levels. These developments in aviation governance have directly affected international service at Minneapolis-St. Paul and other Midwestern cities.

In addition to reviewing the post-war changes in the bilateral agreement system, this chapter considers airline industry regulation and local initiative issues that have grown increasingly important to U.S. airports seeking to expand their international service. Federal efforts to regulate joint ownership and code sharing arrangements among U.S. and foreign carriers while simultaneously allowing exceptions to these rules have given some carriers (and therefore the cities

they serve) advantages on the international playing field. The 1989 "Cities" resolution was one effort to further empower individual cities to fight for international routes, followed by the formation of U.S. Airports for Better International Air Service (USA-BIAS). Sections relating these initiatives to international route network development follow the bilateral agreement system discussion below.

2.1 ROUTE REGULATION: THE BILATERAL AGREEMENT SYSTEM

Modern international aviation governance began in the mid-1940s. Limited specific agreements had been made among small or contiguous nations much earlier, but overseas and long-distance flying were not technologically feasible for commercial traffic at a large scale until after World War II. This report section addresses the foundation of the bilateral agreement system that was laid during and after World War II, the development of three major types of bilateral agreements in the past fifty years since the Chicago Convention, and the relationship between agreement type and overseas service available to U.S. cities.

2.1.1 History

The political, economic, and technological ramifications of World War II shaped the negotiating positions of the post-war actors involved in establishing multinational civil aviation guidelines. On all three fronts, the U.S. took the lead. Safely isolated from combat activity, the U.S. had seen growth rather than destruction of its political power, economic base, and technological expertise during the war. Several aspects of the world order emerging in the mid-1940s logically left the U.S. predisposed for leadership in the modern age of air transportation [7].

Politically, the victorious nations naturally held the upper hand, and the U.S. dominated this group. The establishment of "Lend-Lease," a program under which the U.S. loaned monetary, supply, and transport support to the British before the U.S. was directly involved in fighting, had given the U.S. some negotiating power over the United Kingdom (UK). In fact, the Atlantic Charter signed by Churchill and Roosevelt in 1940 included an agreement to promote a

liberal economy of regulated capitalism in the post-war era. The U.S. sought to apply this agreement to civil aviation in order to secure landing rights for its aircraft on British soil throughout her post-war empire. Imperial Airways (IA), the flag carrier of the UK, wished to protect its monopoly status on routes connecting the UK's post-war colonial holdings, but the airline was not in a strong position vis-a-vis Pan American Airways (Pan Am) and other U.S. carriers that wanted access to more overseas markets. The U.S. government sought guidelines flexible enough to allow its airlines to serve markets around the world that were under an IA monopoly.

U.S. political dominance after World War II mirrored its relative economic strength. Wartime production had stimulated economic recovery from the Great Depression. The Soviet economy was devastated both by wartime destruction and the side-effects of the Stalinist regime, and government policies during this period strove to make the Soviet Union more self-sufficient and independent rather than promote cooperation with other nations around the world. Western European allies were deep in debt from the war effort, and faced the costly task of rebuilding their war-torn nations. In contrast, the U.S. had suffered relatively small population losses and had experienced little combat on its own soil. Airlines like Pan Am, TWA, and Northwest gained experience in overseas service as they helped in the war effort, and were well-equipped to continue serving the supply routes established in Africa, Asia, and across the Atlantic and Pacific oceans. While the air capacity and technology of all nations with some air-service capacity before World War II improved during the war, research and development on all technology not central to the war effort suffered during this time. Additionally, much was lost in human expertise and aircraft/facility destruction.

Not only did the U.S. continue to refine its already advanced aircraft during the war effort, it also implemented new technology on a regular basis throughout. Three airlines gained experience on longer-haul overseas routes: Northwest used the innovative "top-of-the-world" route to Asia over the North Pole, TWA served the North Atlantic, and Pan Am continued to expand in Latin America and Africa as the war effort permitted [8]. While Britain had produced its own aircraft for commercial purposes until the war, Boeing and McDonnell-Douglas aircraft had

already surpassed British efforts in terms of capacity, duration of flight, and fuel efficiency by 1945.

American political, economic, and technological strength after World War II made liberal multinational agreements attractive to the U.S. The U.S. government advocated free trade on behalf of its airlines seeking to use their technological advantage to establish themselves in overseas markets where native carriers lacked the capacity to serve long-haul routes. U.S. representatives brought this agenda to Chicago in 1945 for a meeting on international aviation governance that has come to be known as The Chicago Convention. Although the basic U.S. policy objective of developing liberal aviation agreements has remained the same since the Convention, the U.S. ability to achieve that goal has varied. Likewise, the pattern of U.S. cities serving as gateways to foreign markets has varied according to U.S. success in bilateral negotiations. The U.S. government negotiates on behalf of all U.S. airlines, while its foreign counterparts often are acting as negotiating agents for their single flag carrier. This was a conflict of interests at the Chicago Convention, and remains so today.

The Chicago Convention and its amendments serve as the framework under which participating nations reach agreements on routing, capacity, and pricing of scheduled international service (both passenger and freight). Governments and airlines from around the world signed the compact. Air carriers conforming to the agreement's precepts became members of the new International Air Transport Association (IATA), with the option of functioning within its pricing guidelines. Agreements among nations negotiated on behalf of airlines are bilateral in nature. Attempts to create enforceable multilateral agreements have failed thus far. Agreements are often renegotiated periodically at the discretion of both parties. This flexibility among nation-pair agreements resulted from the lack of consensus among participants in the Convention, and later the IATA.

The Convention yielded five "freedoms" of international traffic which became the language of bilateral negotiations and agreements. A sixth freedom combines third and fourth freedom

rights among two different foreign countries. Subject to intergovernmental approval on a case by case basis, the Chicago Convention granted airlines:

1) The right to use the airspace of another country without landing;
2) The right to land for servicing or non-commercial (emergency) purposes;
3) The right to discharge passengers and cargo from the home country in the foreign country;
4) The right to pick up passengers and cargo in a foreign country bound for the home country;
5) The right to pick up passengers and cargo in a foreign country and convey them to yet another country; and
6) The right to transport passengers and cargo from one foreign country to another by routing thorough the home country [9].

Figure 1 graphically depicts the four freedoms involving enplaning or deplaning passengers in a foreign country. The degree to which these rights apply varies among nation pairs. They are not multinationally approved, but form the basis for all bilateral agreements. The Office of International Aviation within the U.S. Department of Transportation estimates that the U.S. currently participates in seventy bilateral agreements [10]. The U.S. has separate agreements with each of these foreign nations, dictating the amount, type, and routing of service with varying degrees of specificity. Bilateral agreements are not necessary in the case of every trading partner with which the U.S. exchanges service: if no bilateral agreement is negotiated, the principles of comity and reciprocity govern air service between countries. Comity and reciprocity are applied in many spheres of intergovernmental relations, and allow more flexibility among partners. Markets in which the U.S. has no bilateral agreement tend to be served by minor routes for which there is little competition among U.S. carriers.

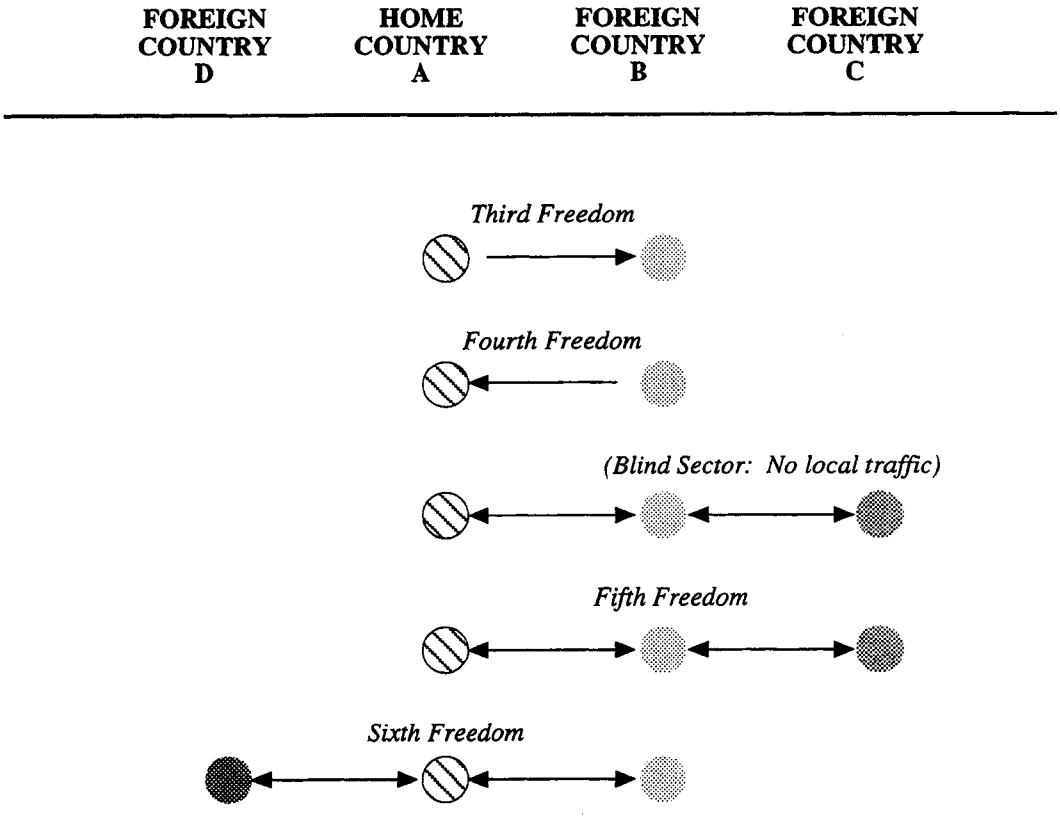

Figure 2.1 Examples of Chicago Convention Traffic Freedoms. The rights of an airline to carry traffic from its own country to a foreign country and home again from that foreign point are reciprocal among many nations; these form the most basic of bilateral rights (third and fourth freedoms). Negotiations determine the number of carriers serving the routes, the frequency of service, and the methods by which markets within each country will be designated. Fourth freedom rights may also allow a carrier to carry through traffic from one foreign country (C) to its own country (A) via another foreign country (B); however, the carrier from Country A cannot carry local traffic between B and C (Flight segment BC is referred to as a "blind" sector). Under fifth freedom agreements a carrier from country A can carry local traffic between foreign countries B and C. An example of the sixth freedom right is when a U.S. carrier seeks to serve a route from Madrid to Buenos Aires via Miami, carrying through-traffic between Europe and South America as well as passengers traveling between Europe and the U.S. or the U.S. and South America. Adapted from [11] (Gellman Research Associates, Inc. (1994). *A Study of International Airline Code Sharing.* Prepared for Office of Aviation and International Economics, Office of the Secretary of Transportation, U.S. Department of Transportation. Washington, DC: GRA, Inc., p. 21.).

2.1.2 Agreement Types

In 1946 the U.S. concluded negotiations for the first bilateral agreement under the auspices of the Chicago Convention. The UK and U.S. established the Bermuda Agreement (so named because the document was signed in Bermuda), which went into effect in 1947 and became the basis for most U.S. bilaterals negotiated in the next thirty years (often referred to as Bermuda I agreements). In this first of two Bermuda accords, the UK and UK agreed to the negotiation of specific routes on a case by case basis, but also to the freedom from rigid regulation of capacity on the routes once jointly determined. This was a compromise between the protectionist position of the UK and the liberal position of the U.S. [12].

Bermuda I agreements generally share (1) a lack of specification of the number of carriers that can operate the approved service, (2) the ability of U.S. carriers (or a single U.S. carrier) to serve the overseas destinations agreed upon from any U.S. city, (3) full ownership by nationals of the trading nation's airline, and (4) specification of how pricing is to be determined. The rights outlined in the Chicago Convention and the Bermuda I bilateral agreements were the first non-technological determinants of the U.S. distribution of gateway cities. In the context of air-service, gateway cities are those metropolitan areas with nonstop service to foreign destinations. New York, Miami, Los Angeles, and Anchorage have been traditional gateway cities in the U.S.; routes bound for overseas destinations generally stop nowhere else in the U.S. after departing these cities.

The Bermuda I era allowed Northwest to begin overseas service from MSP. Tokyo service started first in the summer of 1947, followed by Seoul, Shanghai, and Manila via Edmonton and Anchorage. A few years later, Taipei was substituted for Shanghai. Northwest had flown a similar route on behalf of the U.S. military effort in Asia during the war [13].

More than twenty years later, MSP acquired its first direct, one-stop service to Europe. In June of 1969, Northwest and Pan Am began jointly operating a route to London via Detroit. The next international service improvement was acquisition of a nonstop route to London's Gatwick

airport. Northwest was able to add this route despite the economic difficulties faced by air carriers following the OPEC crisis in 1973-74.

Over time and among foreign negotiating partners, the restrictive nature of U.S. bilateral agreements has varied considerably. The second phase in these agreements was instigated by the UK in the 1970s. In trouble after the oil crisis, struggling to support two government-run international carriers (British Caledonian and British Airways), and concerned about the deregulatory mood in the U.S., the UK renounced the Bermuda I agreement negotiated thirty years earlier. The Bermuda II agreement was subsequently negotiated in 1976 and 1977. It increased the number of gateway cities in the U.S. for UK traffic from six to fourteen while restricting the number of carriers that could operate at each city. In addition, the agreement restricted fifth freedom rights for U.S. carrier service to points beyond the UK to elsewhere in Europe and beyond, and tightened capacity control clauses for scheduled service.

Bermuda II held nonscheduled (charter) operations on the lucrative North Atlantic market in check, slowing development of competition from alternative types of service. MSP's route to Gatwick was a direct result of the Bermuda II agreement. For traditional U.S. gateways, Bermuda II threatened monopoly service and pricing, and forced other cities to compete for single routes. In this way, international access levels from smaller urban centers increased, but fewer carriers provided service from each gateway.

Other major service partners did not follow the UK's tough negotiating lead. As Bermuda II was finalized, negotiations were already underway with other nations to liberalize international agreements, allowing airlines to develop new markets with as little government intervention as possible. This development constitutes the third phase in U.S. bilateral agreements since the Chicago Convention. In 1978, the U.S. concluded talks with Belgium that established a new "Open Skies" agreement. This agreement, in turn, became a template for similar pacts with other nations just as Bermuda I had been. The first Open Skies agreement was as liberal as the Bermuda II agreement was restrictive. The accord with Belgium and the Open Skies agreements that have followed seek:

1) Elimination of anticompetitive restrictions on charters and supplemental carriers;
2) Expanded opportunities for new low-priced scheduled service;
3) Maximum access to markets by expansion, not contraction, of nonstop U.S. gateways;
4) Adequate multiple-carrier designations (code sharing);
5) Avoidance of capacity or frequency restrictions; and
6) Maximum flexibility for air carriers to operate to points beyond, or on the way to, the country of the bilateral partner [9].

With their vastly different aims, Bermuda II and Open Skies certainly failed to make U.S. policies more consistent. The contradicting policies further intensified competition among gateway cities.

Congress attempted to standardize U.S. goals among bilateral partners and limit the anticompetitive measures allowed under Bermuda II by passing the International Air Transportation Competition Act in 1979. In conjunction with domestic deregulation in the U.S. industry, the act sought to uphold objectives similar to those of the Open Skies agreement. Thus, the government was able to establish Bermuda II as an exception among more liberal agreements.

In the same year, Northwest was able to capitalize on liberalizing international agreements. One-stop service began to Copenhagen, Glasgow, and Stockholm from Minneapolis via Detroit, with nonstop service added to Frankfurt and Oslo later [13]. Other U.S. carriers sought to begin international service from their domestic hubs as well.. The liberal nature of bilateral agreements has allowed airlines to come and go from gateways with ease as they attempt to establish the route network with maximum profit. Eventually, Minneapolis-St. Paul grew to be one of Northwest's major domestic hubs, but Detroit became the airline's primary international gateway.

Although Open Skies agreements such as the U.S.-Netherlands agreement signed in 1993 and the 1995 Canadian Open Skies agreement were initially promising for service at MSP, implementation of similar agreements has been difficult. Few nations welcome unrestricted entrance by U.S. carriers into their markets because such access threatens routes traditionally monopolized by foreign flag carriers (some of which are still state-supported). Likewise, the U.S. remains reluctant to allow through-service in its own market by foreign carriers (a process known

as cabotage) in order to protect the most profitable system in the world from foreign competition on internal routes. The geographic expanse and situation of the U.S. limits opportunities for lucrative service beyond the U.S. by foreign carriers (so-called sixth-freedom service), which directly affects the U.S. bargaining position in bilateral negotiations. Smaller nations, with correspondingly smaller markets, can choose to allow international flights originating in one country to continue beyond their airport to a third country. This is the case with TWA service to European cities other than Paris: the airline is able to serve Rome from the U.S. via Paris, for example, only because the French government has approved it. Air France, conversely, has no desire to serve points in Canada or Mexico beyond U.S. destinations because the large U.S. markets alone already fill its North America-bound planes.

On November 1, 1994, Secretary of Transportation Fredrico Peña issued a U.S. International Aviation Policy Statement for public comment. The policy reaffirms the U.S. commitment to further liberalize international air-service agreements wherever possible. Specifically, Secretary Peña promises to seek "...improve[d] access of cities, shippers, and travelers to the international air transportation system" [14]. The policy acknowledges the increasing concern of airlines wishing to operate global systems for traffic rights beyond and behind regional hubs. To this end, Peña emphasized the U.S. government's goal of promoting access to global markets by enabling airlines to gain the concentrated access necessary to efficiently operate hub and spoke systems on a global scale. Despite this commitment to liberalization, it is unlikely that U.S. airlines will wish to give up cabotage privileges within the U.S. market to foreign carriers, pointing to further concentrated alliances among U.S. and foreign carriers. Overseas routes linking U.S. domestic hubs to the regional hubs of foreign airlines will continue to be the most sought-after international routes; hub-to-hub traffic is the most profitable operation that a company can operate (See Appendix B for further explanation of hub and spoke routing). MSP's central position in Northwest's domestic network is its best hope for continued access to the global aviation system.

2.1.3 Bilateral Agreements of Special Interest to the Twin Cities

The nature of U.S. bilateral agreements with Japan, The Netherlands, and Canada are of particular interest to MSP. All airports in Japan are owned and operated by the national government, which allocates slots to control congestion. Northwest, with its history of service between the two countries, continues to hold slots at Tokyo. Japan is not eager to increase the number of U.S. airlines flying into its cities, so Northwest's position as the dominant U.S. carrier serving Japan is effectively protected by the foreign country. Minneapolis-St. Paul, with nonstop and direct service to Tokyo on Northwest, benefits from Northwest's slot holdings there.

Northwest and KLM's special relationship, discussed further below, would not be possible without the Open Skies agreement that went into effect in 1993. When KLM and Northwest combined their service networks, the Twin Cities gained over 80 new international destinations around the world. Passage of the Open Skies agreement made an alliance with a U.S. carrier more attractive to KLM because of the new freedom it had in selecting which U.S. cities to serve.

The Open Skies agreement with Canada reached early in 1995 produced prompt benefits for the Twin Cities. New nonstop Canadian destinations from MSP include Montreal, Regina, Saskatoon, and Vancouver. Previously, Northwest's service between MSP and Canadian destinations was largely direct rather than nonstop. Adoption of the latest round of talks with Canada provides for potentially improved access to be phased in over the next three years. These new privileges will enable MSP to serve as a major connection point for east-west service between Canada's major population centers.

2.2 INDUSTRY REGULATION: COOPERATION AMONG INTERNATIONAL AIRLINES

Bilateral agreement liberalization has allowed airlines of different countries to cooperate in new ways. Code and equity sharing are two types of cooperative arrangements that have changed the way global service is organized, operated, and marketed to the traveling public. The Northwest-KLM relationship exemplifies the maximum level of carrier integration allowed by the

USDOT. Since passage of the 1979 Air Transportation Competition Act, both the Department of Transportation and the Department of Justice have monitored code and equity sharing in an effort to maintain a competitive environment while continuing to expand opportunities for U.S. carriers abroad.

Northwest's integrated service provision with KLM quickly followed passage of the Open Skies agreement between the U.S. and The Netherlands. The airlines' close association is an exceptional example of cooperation between U.S. and foreign carriers. Not only do the two companies share operation of their transatlantic routes, ownership of their companies, and facilities, they have received special antitrust immunity from the USDOT to allow sharing of sensitive market information. For passengers, this cooperation means more frequent service across the Atlantic, and better connections on single tickets behind MSP on Northwest and beyond Amsterdam on KLM. In all, joint operations of KLM and Northwest provided a network of over 300 destinations in more than 100 countries on 6 continents in 1993 [13].

2.2.1 Code Sharing

"Code sharing" refers to several types of cooperative activities that involve the placing of one airline's identification code (such as NW for Northwest, AF for Air France) on another airline's flights [11]. (See Appendix C for a list of overseas code-shared routes and selected airline identification codes). Each airline flight has a designation that includes the operating carrier's two-letter code and a flight number. Flight designations are the means by which computer reservation systems (CRS) and timetables organize itinerary records. If one airline shares the code for one of its flights with another, the flight will be listed twice. For example, LH434 departs Munich daily at 11:30 a.m. for Chicago. It is the only nonstop flight between the two cities in that direction. However, flight UA3531 is also listed as service between Munich and Chicago [3]. United Airlines (United) uses Chicago as a major hub, and wants to have access to passengers coming off of as many nonstop overseas flights as possible to feed its domestic route network (its beyond-

gateway routes). Therefore, United has entered a code-sharing agreement with Lufthansa to gain access to as much Munich-originating traffic as possible.

Code-sharing arrangements can be organized in a number of ways. Operating carriers may incur all costs for the flight themselves, then split revenue with the code-sharing partner on a prorated basis. In other cases, the operating carrier sells a group of seats on its flight to the code-sharing partner, thereby also sharing the costs, inventory risks, pricing and marketing of seats, and profits or losses of the flight. The complexity of code-sharing agreements ranges considerably. The simplest agreements involve merely swapping codes on a single flight. More complex arrangements include joint operating and marketing agreements, and shared equity. Airlines use code-sharing arrangements like these to build corporate alliances, allowing them to circumvent restrictions so they can broaden the markets to which they have access [11].

Code sharing that enables two airlines to integrate their networks provides benefits similar to those associated with domestic hub and spoke route networks (Appendix B). Airlines enter code-sharing agreements to gain entry to new markets, increase market share, and/or reduce operating costs. The connection or alignment of route networks funnels traffic through gateways in each national market, allowing larger, more efficient aircraft to serve transoceanic routes. This was particularly important before the Boeing-767 was introduced, as larger aircraft were not able to fly transoceanic distances with very small passenger loads. Network alignments also allow carriers to share the considerable risks associated with expensive long-haul service. Additionally, more smaller destinations in foreign countries can be reached with just one stop from U.S. gateways.

2.2.2 Equity Sharing

Equity sharing refers to shared airline ownership. Joint investment among two or more airlines indicates commitment to a corporate alliance that goes beyond code-sharing activities that integrate route networks alone. Shared equity arrangements are a sign of commitment to making marketing and operating activities among two carriers as seamless as possible. Today, foreign

airlines are allowed to own no more than 25 percent of a U.S. carrier's voting rights. This legal restriction is due to the potential for the U.S. commercial air fleet to be involved in non-civilian activities in the event of war.

The strongest form of carrier alliance allowed between a U.S. and a foreign airline is an extension of equity sharing. When antitrust immunity is granted to two cooperating airlines, the companies are able to do more than market each other's routes and facilitate ground services for one another. Carriers enjoying this status are able to set fares together on all smaller city-pair markets using the same pricing formulas. Antitrust immunity permission circumvents restrictions on international joint ownership while giving two airlines many of the benefits of a full corporate merger. Although Northwest and KLM cannot market their combined services under a common brand name, they enjoy a partnership in almost every step of their route planning, pricing, and marketing operations [3].

The Northwest/KLM relationship directly benefits Minneapolis-St. Paul because its nature is unique among other international carrier partnerships. As mentioned above, the granting of antitrust immunity and subsequent expansion of service between MSP and Amsterdam gave Minneapolis-St. Paul one-stop access to 80 new international destinations. The full ownership requirement specified under the first Bermuda Accord has been relaxed in many cases during the past two decades, but none as completely as the antitrust immunity Northwest and KLM enjoy.

2.3 LOCAL LEVEL INITIATIVE

Despite the progress in liberalizing bilateral agreements and fostering cooperation between U.S. airlines and foreign carriers, the certification of new international routes to U.S. cities remains a time-consuming and cumbersome process. Two developments in the past six years have sought to improves upon these difficulties. The first was a resolution by the USDOT known as "The Cities Initiative." The goal was to encourage U.S. and foreign cities that desired new service between them to come to an agreement with an airline willing to serve their route. Cities and the airline were required to make sure the service would be feasible in terms of facilities at either

terms of facilities at either location, and in exchange the government was to provide faster navigation through the route certification process. While the initiative has encouraged U.S. cities to aggressively compete among themselves for international routes, it cannot be credited with the direct addition of any new routes.

The second development that has empowered U.S. cities is the formation of a new coalition: U.S. Airports for Better International Service (USA-BIAS). Working together, airports around the country have maintained a constant presence at bilateral negotiations in the past two years. Specifically, USA-BIAS representatives attending the U.S.-Canada Open Skies negotiations in 1994 were able make it clear to Canadian authorities that U.S. cities themselves were willing to cooperate with Canadian carriers.

This chapter has outlined route, industry, and local initiative regulatory issues that influence which cities have international routes and how service is allocated among them. Why are U.S. cities interested in promoting international service from their airports? Chapter 3 documents literature that helps explain the significance of transportation (and particularly international air transportation) to urban development processes historically. It then explores several interpretations of how airport activity supports the economies served. The final section of Chapter 3 comments on some of the more intangible impacts of international air service. All three sections help support the case for international air access's importance to Minneapolis and St. Paul.

CHAPTER 3
LOCAL CONSEQUENCES OF INTERNATIONAL SERVICE

This section investigates the significance of the international activity conducted at Minneapolis-St. Paul International Airport. MSP operations, both domestic and international, affect the local community in many ways. This chapter surveys literature on transportation networks and historical urban development, urban systems, and central place/gateway city functions; discusses several interpretations of modern economic impacts generated by international service, and briefly comments on some of the less tangible, often overlooked, connections between air service and activities across the region it serves.

3.1 LITERATURE RELATING TRANSPORTATION AND DEVELOPMENT

Transportation is widely recognized as a factor in the origin of urban centers, yet the vital link it continues to provide both among cities and between cities and their hinterlands is often taken for granted today. Throughout the past 150 years of concentrated European settlement at what is now St. Paul and Minneapolis, water, trail, rail, and highway access have successively influenced the Twin Cities' growth. Innovations in transportation and their timely implementation by local interests fostered the Twin Cities' evolution from a gateway city with access to the Northwest Territories to a modern regional central place. Air transportation is the latest in a series of transportation mode developments that have helped to link Minneapolis-St. Paul with the rest of the world.

3.1.1 Transportation and the Historical Development of the Twin Cities

Transportation geographers have explored the implicit relationship between transportation and the development of city-systems. Contributors to this area include J. Vance, E. Taaffe and M. Conzen [15-18]. Detailed discussion of the role played by rail development in the definition and

support of Chicago's hinterland is found in Chapter 2 of Cronon's Nature's Metropolis as well; although the technology and time periods examined predate aviation altogether, Cronon empirically verifies transportation's role in dictating the regional hierarchy [19].

It is difficult to characterize the history of a place without discussing its connectivity to other places by means of fixed transportation links. The earliest local example of transport-based interpretation of regional development is Mildred Hartsough's 1926 article in Minnesota History, "Transportation as a Factor in the Development of the Twin Cities" [20]. Her chronology of events clearly establishes transportation's pivotal role in the earliest European settlement at what became the Twin Cities.

The network of scheduled air service that links the Twin Cities with its immediate hinterland, other regional centers in the U.S., and global air hubs in Europe and Asia today reflects the historic role of MSP as an exchange center of people, goods, and ideas [21]. Specifically, it illustrates the status of the Twin Cities as a hub within a hierarchical system with links to a still more expansive national and global system. Air routes via MSP remain the most direct scheduled paths from many of the smaller urban areas in Montana, North and South Dakota, Minnesota, and parts of Michigan and Wisconsin. As when the passenger railroad system was at its peak, the Twin Cities remain an important connection point for links from the region's smaller cities to distant cities within the region, across the nation, and around the world. Thus, the airport activity at MSP fills a vital economic, social, and even cultural role for residents across the region seeking access to other places. The converse is equally true.

3.1.2 Urban Systems

The study of urban systems has its roots in a time long before rapid intercity travel was possible. Earliest specific acknowledgment of urban systems as a concept occurred in the nineteenth century and focused on the notion of transportation as the major force in city origin and distribution. Each city was deemed to have a major function--often categorized as defense, mining, agriculture, manufacturing, or administrative. Transportation and distribution are

noticeably absent in this list of exclusive functions; it is arguable, however, that both are integral parts of any urban center function [22]. A major inconsistency across urban system literature is the vague nature of the term "urban system."

The Chicago School of urban sociologists working in the first half of this century investigated the city as a biological system [23]. Others have taken a larger-scale approach by considering the urban system to be the system of linkages among major urban centers rather than of centers to their immediately contiguous hinterlands [24]. Both interpretations are related to the issue at hand; the Twin Cities' rich, dynamic hinterland (a system in its own right) supported the center's growth and allowed it to become competitive in a still more expansive system [25].

An invaluable resource on the literature of city systems is a collection of essays assembled by L.S. Bourne and J.W. Simmons [26]. Contributors included William Alonso, John Borchert, John Friedmann, Torsten Hägerstrand, Allan Pred, and Yi-Fu Tuan on issues from equity and symbolism to economic base studies and migration, all in relation to city system development. Again, transportation was not the explicit focus of any of these essays, but was discussed indirectly in many. The city-system literature places intercity transportation links in the context of the complex relationships between urban centers.

John Borchert and Allan Pred both relied heavily on transportation and its impacts to define their theories of urban systems. Borchert established the classification of metropolitan evolution into four epochs based on transportation technology innovation: (1) Sail-Wagon (1790-1830), (2) Iron Horse (1830-1870), (3) Steel Rail (1870-1920), and (4) Auto-Air-Amenity (1920-) [27]. Pred considered intercity linkages at great length, information flows, transportation and trade linkages, and migration [28]. Whereas Borchert considered the technological developments and the new capability they can potentially provide, Pred was much more concerned with the role of costs in determining the feasibility of new technology in influencing the urban system and the lives of people living within it.

Urban hierarchy has largely been associated with rank-size classifications [29]. As Lukermann [22] pointed out, the term "hierarchy" is seldom defined as anything other than

dominance on a particular quantitative scale. While population size and areal extent were the most common basis for urban hierarchy definition originally, the term is no longer applied as selectively. Studies define urban hierarchy based on employment composition, airline service levels, the number of foreign corporate headquarters, and other variables [17, 30, 31]. Because the structure of an urban hierarchy depends upon the relative dominance of cities in one form or another, it is logical that this concept would be closely associated with central place theory.

3.1.3 Gateway Cities and Central Places

Traditional central place theory is based upon hierarchy at a smaller scale than that which is discussed above. The point of best overall access defines the dominant central place over its hinterland; thus, transportation is an inherent requirement for realistic applications of the theory. Spatial patterning of central places can be expressed in "orders" of places, but this order differs considerably from one system to another [32].

Burghardt [33] provides the clearest, most specific discussion of the evolution of many "gateway" cities into "central" places. He defines "gateway" as a point of interface: a node that serves as a border between one system and another. Cities of the early U.S. often evolved from either frontier posts linking Native American and European traders, or endpoints on the most advanced contemporary system of transport. As the end of one place and the beginning of another, gateway cities serve as a funnel. An important characteristic is the spatial monopoly that gateway cities enjoy (at least for a time) as the single point of entry to a region. Transportation innovation, according to Burghardt, is at once the cause of a gateway city's rise and the major impetus in its demise when further innovation moves the transportation advantage to another point.

Also according to Burghardt, the embodiment of the transitional gateway city is the evolution of "twin" cities. With Dallas-Fort Worth, he uses the Twin Cities of Minneapolis-St. Paul to exemplify this phenomena. While those cities closer to the original dominating economic, population, and cultural center are the first to develop (Fort Worth and St. Paul), the second center grows to be the more dominant (Dallas, and Minneapolis). Transportation innovation is a major

role in this process, as the second center evolves to serve new and expanding markets while the original "twin" must compete with older centers in addition to the new markets continually redefined by the expanding frontier. This case is an excellent example of transportation's impact upon the Twin Cities' economic relations to other cities.

Burghardt points out that as transportation innovations took away the initial advantage held by earlier gateway cities, settlements were not always able to maintain their vitality. Although Burghardt's analysis focuses on the successive rise of fixed-route systems (water, steel rail, and highway), his observations are directly applicable to the growth of the international air transport system. Today's concept of an international air-service gateway is based on the same ideas Burghardt used to explain historical gateway cities.

3.2 MODERN ECONOMIC IMPACTS

Scholars and public officials alike have tried to characterize the economic impacts of air service in many ways. This section reviews connections that have been made between domestic and/or international air service and the local and regional economies served. Emphasis is on process rather than figures: consultants hired by the MAC have conducted multiplier-based analyses of the direct, indirect, and induced impacts in each of employment, business earnings, personal income, and tax revenue, and these results are available elsewhere [34].

3.2.1 Academic Research

One comprehensive study of the relationship between city dominance within the domestic airline service hierarchy and employment determines that job growth in both the producer-services and manufacturing sectors can be attributed to an increase in a city's centrality index within the network [35]. These results reflect a larger, ongoing debate as to whether transportation is an impetus for development, or development spawns growth in transportation systems. In this case, the authors found that reorganization of the domestic aviation network was a critical factor in employment growth and decline within U.S. metropolitan areas between 1950 and 1980.

Regression analyses and simple models generated using measures of airline service, highway, and communications network centrality, population density, infrastructure age, and workforce characteristics have led to the conclusion that the shifting structure of the airline system in the U.S. became a vital infrastructure element affecting job distribution during this period. These results are significant because the investigation examined a large number of U.S. cities (104), but must be carefully considered as the national network is treated as a closed system. No measure of centrality within the international system is included, although the authors assert that international access is a highly relevant issue to study in the current era of domestic deregulation.

John Kasarda, an author of the study outlined above and Professor of Business Administration at the University of North Carolina, is a strong advocate of air transportation's role in supporting regional economic health [36]. He recognizes the role air service plays in local economic vitality, and is particularly concerned with the potential for concentration of the international freight industry to serve as a tool for regional economic development and establish competitive advantage among cities. Massey has also taken up the issue, investigating the competition between cities for air service in the deregulated domestic environment [37].

Kasarda detailed cases for both the general potential for the air cargo-industrial complex initiative as a development tool and its particular applicability to North Carolina in his 1991 commentary in Economic Development Quarterly. He traced five phases of commercial development that have shaped America's urban centers, based loosely on Borchert's delineation of transportation epochs. Transportation innovations form the base for each urban development era according to Kasarda: ports, inland water terminals, railroad junctions, major highway nodes, and, most recently, air-service access each have played vital roles in urban morphology over time. According to Kasarda, we are moving into the newest era because of three major exogenous developments: widespread globalization of industrial production, movement to just-in-time production and delivery, and rapid advances in aviation technology.

The international nature of production today is exemplified by component sourcing, which allows assembly of specialized consumer-tailored products from component parts at a location

close to its destination market. Component parts originate at a variety of locations removed from the actual assembly point, enabling local economic resources to be used optimally by redistributing the transfer of raw materials and intermediate products during the total product cycle. This practice is part of modern "flexible production" which has replaced Fordism as the mainstay of manufacturing methods. Such a system requires reliable, efficient transportation and puts increased pressure on traditional distribution mechanisms to provide new competitive advantage. Cities depend on air transportation to compete in this new environment.

Similar pressure has emerged from the adoption of just-in-time production and delivery strategies. This system strives to maximize economies of scale early in the production process rather than in the final phase before delivery, thereby cutting down on inventory and transport costs. Reduced transport costs result from the ability to receive bulk shipments of intermediate parts, while faster delivery times allow for low inventory requirements.

The final impetus for a new era of transportation-based commercial development outlined specifically by Kasarda is a product of the aviation industry itself. Air freight has been the fastest sector of distribution growth in the past decade, and real costs have declined. Looking ahead to the future, aviation and aerospace technology seem to offer the greatest potential for improvements in geographic scope, speed, and efficiency of service. As larger planes make the shipment of larger goods possible, faster planes are opening up new industries to air freight as well--time-sensitive products such as fresh-cut flowers, for example.

While technological improvements will provide shorter delivery times and therefore the geometric increase in service scope, this increased access specifically makes the most rapidly expanding markets in Asia easier targets for American business. Globalization, just-in-time production and delivery, and aviation technology combine to make these areas more feasible destinations for American exports. Kasarda indicates that these markets will play an integral role in a global production and distribution economy, and accessing them swill be the driving force behind expansion of the current freight system.

3.2.2 Other Economic Impact Analyses

In a study of the San Francisco International Airport [38], officials used survey methodology to assess how local businesses are affected by activity at the airport. From traffic totals and samples from passenger and firm screenings, airport officials characterized the direct, indirect, and induced effects of both international and domestic service with a flowchart illustrating economic exchanges with areas of the economy not directly linked to the aviation industry (Figure 3-1). Using this framework, the San Francisco Airports Commission concluded that the airport does, in fact, have a significant influence on the regional economy. Ripple effects result throughout the national and global economies as well, spawned by activity at the airport. Business revenue was estimated at $6.3 billion annually from enterprises directly involved with the airport; the same sector was estimated to employ 30,185 individuals. Induced job creation resulted in an additional 13,000 positions. Total personal income generated through activities at SFO was estimated to be $2.1 billion [38].

Quantitative expressions of economic impacts may be illustrative, but they are estimates only. It is more important to understand the processes that result in employment and revenue development from airport activity. Quantitative impact analyses have been undertaken to assess MSP's economic impact as well, but the use of multipliers and models must be considered carefully [39, 40]. Economic impacts of airport activity are not mutually exclusive; it is impossible to capture the spatial, sectoral, or monetary extent of these impacts in a precise figure.

A case in point is the use of the IMPLAN model in a study of international trade impacts on the Hennepin County and Twin Cities Metropolitan Area economies [41]. The model estimates that a single additional international flight from MSP operating daily with a wide-body jet will generate $107 million in additional final demand, 3,700 jobs, and $162 million in value added. While these figures help to foster an appreciation for the vast impacts likely to be generated by additional international service, it is crucial to acknowledge that actual effects may be quite different, depending on potential problems with methods used to generate the estimates (double-counting, nature of data, etc.) and the more specific attributes of additional service (origin/

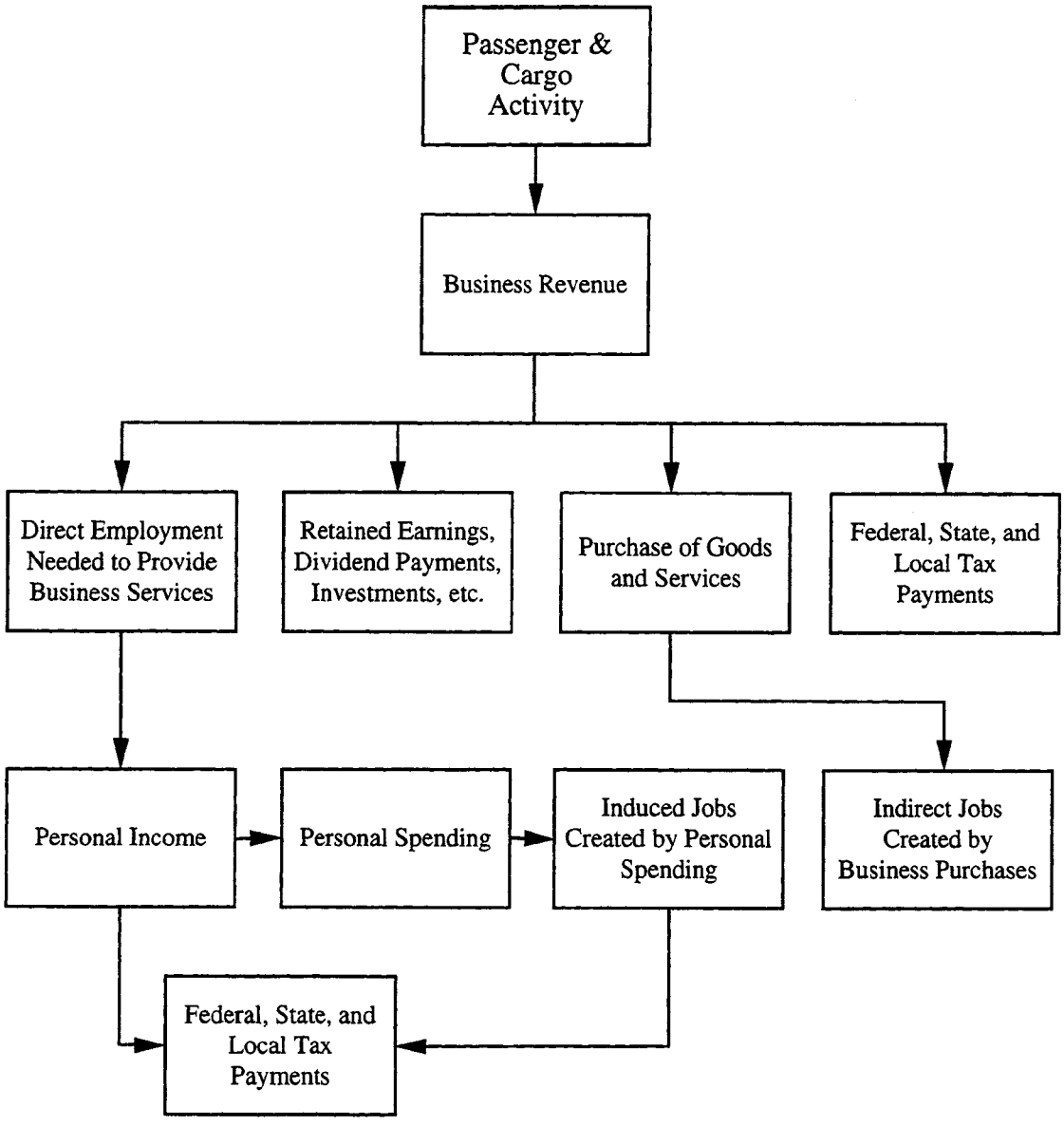

Figure 3-1. Economic Impacts of Airport Activity. Impacts of airport activity are not mutually exclusive. Revenue, earnings, and tax effects all have direct, indirect, and induced components that overlap. Adapted from [38] (San Francisco Airports Commission, 1993, p. 4.).

destination of the new service, composition of traffic as terminating or connecting at the Twin Cities, frequency, capacity, and routing).

3.3 OTHER IMPACTS

Airlines and cities alike seek to claim as many direct, if not nonstop, destinations as possible. The rise of code sharing to allow marketing arrangements to inflate the level of overseas service reported is an indication of the high value placed on these international links. In August, the MAC held Global Access '95, a symposium to educate local officials about international service at MSP and to promote to them current efforts to secure improved service. At that conference, MAC chair Sandy Grieve reported that international flights add between $100 and $300 million to the local economy each year, and total airport activity at MSP creates 113,000 jobs--25,000 of which are at the airport itself. He added that the airport does not take general tax revenue from the state, but actually adds tax income through economic activity on and off airport property.

Chairman Grieve made a claim that others echoed throughout the day: the more airlines, the more flights, and the more destinations served make the airport a stronger engine for the local and state economy. In recognition of this, airports around North America have taken aggressive actions to improve their international service--establishing new marketing departments, aligning with other airports in the USA-BIAS organization, and petitioning the government for new routes even before an airline has agreed to serve.

The presence of good national and international air access is often a consideration for firms seeking to start or expand service and operations in distant markets. Besides firms seeking new locations, existing firms benefit from superior connectivity to both domestic and overseas destinations. For example, it is a considerable benefit for Minnesota's global corporations like Cargill, Honeywell, and 3M to have so many direct flights from Minneapolis-St. Paul to places around the country and the world. Without guaranteed direct service provided by hub activity here, the metropolitan area would not garner the same level of service--a metro area of 2.6 million people does not have that kind of market potential relative to its larger competitors. Rather than ten

nonstop flights daily to Washington DC-area airports on Northwest alone, for example, passengers originating at MSP would have fewer direct and probably no nonstop options [42].

Local community benefits go beyond the increased convenience gained by direct service into feeder networks at other hubs for passengers originating at the Twin Cities. The 25,000 people employed at the airport itself alone outnumber Mall of America employees two to one--although the latter establishment is better know as an employment generator. Besides the people employed on-site at the airport, spin-off industries are significant job providers that simply would not exist in the Twin Cities in such a large number without high traffic volume. Freight forwarders, shipping companies, tour operators, and other transportation-related enterprises exist in large quantities because of the nature of service at MSP.

Cities evolve, in part, because of their function as a meeting place and a transportation node. They draw in people and services, filling a need for central places at which interaction can occur. Status in the urban hierarchy can be considered on many bases--a number of factors contribute to make an urban area into a "world class" city. There is competition between New York, Chicago, and Los Angeles to be the nation's largest city--while Washington DC continuously tries to prove itself a worthy rival to its dominant neighbor to the north. The competition is for status. Even in Minnesota, there is continual comparison between St. Paul and Minneapolis--while they may be "Twin" Cities in the metropolitan area, there is good-natured rivalry between the two centers. Urban area status measures may include:

1) geographic and population size;
2) presence of professional sports teams and major athletic facilities;
3) number of universities and colleges;
4) *Fortune* 500 companies headquartered or leading industries based in the area; and
5) reputations of cultural activities such as symphony orchestras and ballet companies.

Status created by these sorts of local resources contributes to the rest of the world's awareness of, and therefore interaction with, Minneapolis-St. Paul.

Demographic consequences of international access also exist. The tradition of service between Asia and MSP on Northwest probably is related in some way to the number of Asian refugees and immigrants in the local community. During the Korean War, Northwest contributed to the war effort by using its aircraft in evacuations; the Twin Cities was one of the destinations for displaced Koreans. Likewise, direct service from Asia to MSP during the Viet Nam War probably facilitated the journeys of many Vietnamese individuals and families. Descendants of these immigrants and refugees, as well as continuing new arrivals, help support today's direct routes between the Twin Cities and Asia .

This chapter has explored literature, impact studies, and other indications of historical and modern transportation's importance to the Twin Cities. The focus of Chapter 4 is quite different: local-level analysis is replaced by an examination of worldwide traffic centers. The chapter uses airport-level passenger and freight data to identify the busiest foreign airports worldwide. National-market data provide insights into which of these cities are most important to U.S. passengers.

CHAPTER 4
MAJOR FOREIGN AIR SERVICE MARKETS

The distribution of air passenger and cargo traffic around the world is changing. Just as many cities in the U.S. have gained nonstop international flights as the regulatory framework, industry organization, and technology improvements have allowed, smaller cities outside the U.S. have also become more significant international traffic centers. Likewise, traffic growth has slowed in some traditionally strong regions of the world at the same time that growth in other areas has dramatically expanded. This chapter briefly documents and analyzes the current distribution of passenger and cargo traffic around the world. Its goal is to identify markets to which service is likely to be particularly important in the future. The concentration and magnitude of both global airport activity and established markets for passengers to and from the U.S. form the basis for the analysis. An overview of industry traffic patterns and available data sources precedes sections devoted specifically to foreign airport passenger traffic, national- level passenger volumes, and cargo traffic respectively.

Size and scope of service provided by the global airline industry are sensitive to major world events affecting fuel prices, international discord, and company health. The stock market downfall of 1987, the Gulf War and its corresponding oil price rise, and the restructuring processes unleashed by international regulatory liberalization and trade expansion have contributed to periods of decline in what has historically been a protected, profitable, and constantly expanding industry. Service and traffic within the system have fluctuated according to the same factors, in addition to congestion and other locally-specific issues. For example, congestion has prompted new airport construction at Tokyo and Hong Kong, and forced the redistribution of traffic among several airports within metropolitan areas like London and Paris.

World air traffic increased over 50 percent in the 1980s in terms of total distance flown by passengers, and is expected to more than double by the year 2000 [43]. Growth trends slowed markedly or reversed completely in the U.S. and Europe during 1992 and 1993--North America

traffic grew by under 2 percent and Europe's declined by nearly the same proportion. Latin American traffic grew by over 2 percent in the same period, but Asia clearly dominated in terms of regional passenger traffic by continuing to average over 8 percent growth in total passenger airport activity annually [44]. These growth trends indicate a decline in the relative dominance of Europe and North America compared with other world regions.

Of the 50 busiest airports in terms of passenger and cargo activity from year to year, at least half have traditionally been in the U.S. and Canada [45]. European nations have followed in terms of their proportion of total airport activity worldwide. The strength of these countries has been a direct result of the traditional leadership of U.S. and European airlines in the development of air transport systems. Figure 4-1 indicates the uneven distribution of traffic among world regions. Traffic growth in Asia and the importance of service between the U.S. and other American markets suggest that foreign air service priorities for U.S. cities and carriers are changing.

International routes remain the most lucrative type of air passenger service for U.S. carriers. Industry analysts agree that growth in revenue passenger miles (RPMs) on international routes will continue to outpace that of domestic airlines. International traffic is expected to increase at an average annual rate of over 6 percent to 2005, although RPM growth within the U.S. may average only 3.6 percent through the same period [46]. Important characteristics of data used in these and other analyses of the air transportation system affect the reliability of their conclusions.

RPM data are aggregated by carrier or by geographic region, so that estimates based on these figures do not identify specific links between regions or cities themselves that are expected to grow in significance. Thus, RPM data are not very helpful in enabling geographically-specific analysis of continuing and potentially strong foreign air service markets for passengers and cargo to and from the U.S. Worldwide airport activity data and counts of passengers traveling between the U.S. and nations are more illustrative than RPM data aggregated by only region and carrier.

The first type of data employed in this chapter is based on activity levels at the busiest passenger and cargo airports in the world. The Airports Council International (ACI) identifies these facilities based on survey results from its member airports. Limitations of this source are:

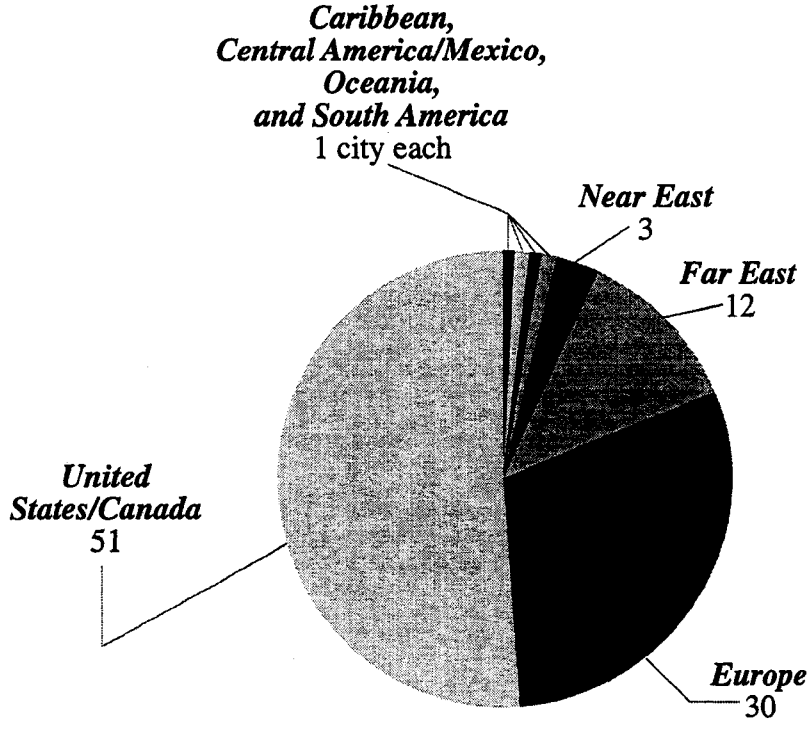

Figure 4-1. Regional Distribution of the World's Busiest Passenger Airports - 1994. The 100 airports reporting the highest passenger traffic levels are unevenly distributed among world regions. The U.S., Canada, and Europe dominate, with over 80 of these air travel centers. Data are total passengers boarding and deplaning at participating airports. Regional boundaries are based on Immigration and Naturalization Service definitions. Source: Airports Council International (1995). *Airports Council International 1994 Worldwide Traffic Report Preliminary Edition.* Geneva: Airports Council International. Calculations by the authors.

(1) incomplete series due to sporadic submissions by member airports and the exclusion of nonmember airports (often in less-developed countries), and (2) widespread publication of data for only a limited number of airports in a given year. Because cities in the U.S. dominate the data sets, the number of foreign cities represented is small. A complete airport report to ACI includes total passengers handled, total metric tons of cargo handled, and aircraft operations performed during the preceding calendar year. The most widely available figures from the organization's survey are aggregate counts; these totals do not differentiate between domestic or international, charter or scheduled travel. It is reasonable to assume, however, that high levels of passenger traffic reflect a propensity for international flights. This report uses preliminary 1994 figures collected by ACI headquarters in Geneva [47], with 1993 data considered for cities whose 1994 figures were not included in the 1994 preliminary report. Appendix D includes a complete listing of cities examined in this study and their corresponding traffic and growth levels.

The USDOT records the second type of information used in this chapter in conjunction with the Bureau of Immigration and Naturalization Services (INS). INS data are organized by country for all passengers traveling between the U.S. and foreign markets (except Canada). The overseas origin/destination is the recording category; national markets are in turn grouped into world regions. INS-specified regions are: Central America and Mexico, the Caribbean, South America, Europe, Africa, the Middle East, the Far East, and Oceania.

Each national market record includes total passengers arriving from or departing for the U.S., and the percentage of passengers who are U.S. citizens or are flying U.S. flag, charter (non-scheduled), national flag and flag carriers of other nations. Data are totaled by nation because INS has little interest in the specific location within a country from which a passenger's trip originated or is destined; customs regulations are still national rather than regional in jurisdiction. Larger and wealthier nations have more than one major international airport, and these separate city markets cannot be isolated within the INS data collection framework. This limitation is not a problem when considering small nations with only one international airport. Traffic between the

U.S. and Canada is not included in this data set because of the relatively free flow between the two nations.

A third U.S.-world traffic data set is available through the federal DOT. "T-100" data are based on required airline submissions of passenger loads on international flights originating or terminating here. Unlike INS, DOT monitors traffic flows to and from Canada; these data are the only T-100 figures included in this study. T-100 data are more location-specific than data from other sources, but other restrictions limit their utility here. As an attempt to preserve competition among airlines serving smaller markets, data are not made public for those foreign countries that are served by fewer than three carriers. Likewise, data availability at the city-pair level is limited for the same reason. T-100 data are therefore less complete in terms of smaller markets and not available as quickly, although the data set is more globally systematic than ACI data. Unfortunately, both T-100 and INS data publications are being redesigned, reorganized, and are in jeopardy of no longer being maintained due to escalating costs and diminishing budgets.

City market definitions for the purpose of this report are based on the regional metropolitan area served by an airport facility, rather than the facility's precise location itself. For example, the international airport serving Copenhagen is actually in Kastrup, a small fishing town on the periphery of the city. The majority of passengers and cargo that fly into the airport at Kastrup are bound for the greater Copenhagen metropolitan area, so it makes sense to identify this airport with the larger city it serves. Likewise, cities with multiple international airports are represented by single, aggregate markets based on the sum of activities at each airport serving it. Paris is an excellent example: total traffic for the city includes passenger and cargo figures for both Charles de Gualle and Orly. The existence of multiple international airports at cities like London, Paris, and Tokyo reflects the volume of traffic at each city.

The following three sections briefly examine empirical evidence of individual market strengths based on city and national-level information. Specific data are recorded in Appendices D and E. The following sections address worldwide passenger traffic centers, national passenger markets of particular significance to the U.S., and worldwide cargo activity points. The goal of

this analysis is to identify world regions, and specific markets within them, that are likely to be of significance to U.S. cities seeking to maintain or expand their international service.

4.1 LEADING PASSENGER TRAFFIC CENTERS

Figure 4-2 indicates the distribution of the world's largest markets for air passenger service outside the U.S. The world map reiterates the imbalance of traffic among regions, while the European and Asian insets show relative traffic levels within these two dominant areas. In all, the map shows thirty cities, comprising all foreign airports that reported enplaning and deplaning passenger traffic totaling at or above 10 million passengers in 1994 and/or 1993. European cities make up over one-half and Asian/Pacific Rim markets account for one-third of these markets. Only Mexico City, Toronto, and Vancouver represent the non-U.S. Americas.

As indicated above, Europe's dominance is not surprising, due in part to its early development of state-supported transportation systems. The rise of Asian and Pacific Rim cities, however, is more recent. The "Seven Tigers" that have enjoyed stupendous economic growth over the past decade were among the ten cities from this world region with over ten million passengers in 1993/1994. Many of the Asia/Pacific Rim centers outnumbered fifteen million passengers--placing them among the top fifteen passenger markets worldwide. Two of these cities have built new airports in the past five years (Hong Kong and Tokyo), and all except Sydney and Bombay are in the newly-industrialized countries (NICs) that have enjoyed remarkable economic growth in the past ten years [48]. Bombay and Mexico City are the only major passenger traffic centers identified here that are located in nations often identified as less-developed countries (LDCs).

Many factors dictate the levels of traffic among cities shown on Figure 4-2 in addition to historical technological prowess and recent economic success. Urban centers commonly thought of as "world cities" are present: London, Paris, Tokyo, and Toronto, among others. Mallorca, an island off the coast of Spain in the Mediterranean Sea, is certainly not a world population or economic center, yet it is a very popular tourist destination for Europeans with the money to afford such vacations. Its inclusion also demonstrates the significance of domestic traffic within total

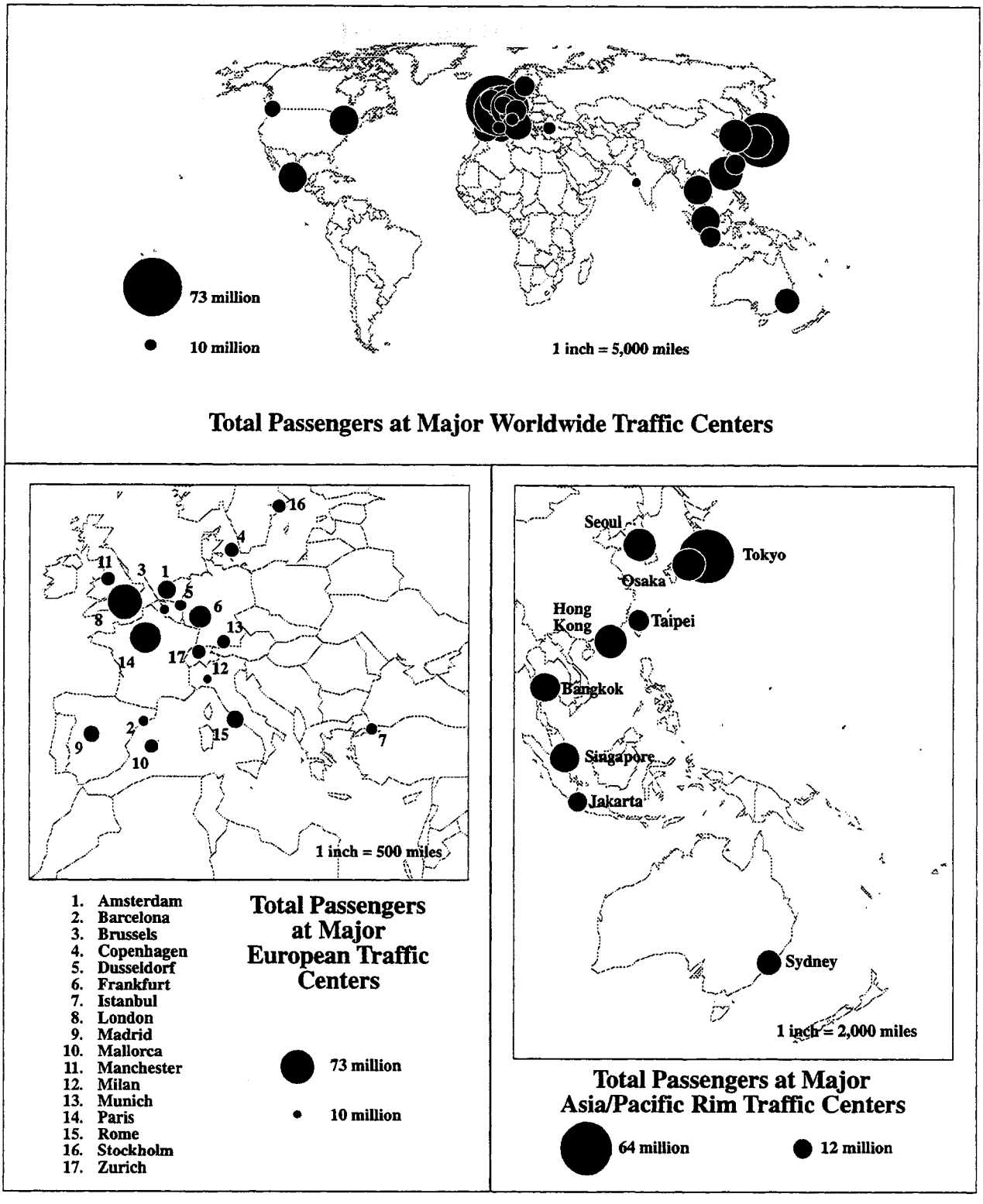

Figure 4-2. Total Passenger Activity at Major Worldwide Traffic Centers. International airports at the cities shown reported passenger enplanements and deplanements totaling at or above 10 million people during 1993 and/or 1994. Calculations by the authors. Source: Airports Council International (1995). *Airports Council International 1994 Worldwide Traffic Report Preliminary Edition.* Geneva: Airports Council International.

passenger traffic data. To a large extent, the distribution of heavily-traveled airports reflects the locations of worldwide private and corporate purchasing power. The concentration of major passenger traffic points in Scandinavia and Western Europe exemplifies this pattern. Many ofthese cities were also the headquarters of colonial empires, and built up service networks based at the European government centers to support their distant holdings. (Section 2.2 of this report refers to the U.K.'s efforts to promote air transportation technology to reinforce its colonial empire.) The major passenger traffic centers in today's LDCs are regional primate cities: their populations surpass those of surrounding cities by far.

The lack of major passenger centers in Africa, South America, the Caribbean, and Canada does not mean that passenger activity did not occur or was not important to the U.S. Table 4-1 indicates the busiest airports during 1994 in each world region outlined by INS plus Canada. Familiarity with past world airport traffic patterns makes the omission of Sydney (historically the dominant airport in Oceania) an obvious problem; this missing figure exemplifies concerns raised above about other cities that had not reported 1994 figures for inclusion in the ACI's 1995 report. It is therefore important to balance these figures with national market data. As Section 4.2 demonstrates, nations in the relatively less heavily trafficked regions are among the largest generators and recipients of U.S. passengers.

4.2 FOREIGN ORIGINS/DESTINATIONS FOR U.S. PASSENGER TRAFFIC

This section examines the important U.S. markets for foreign originating and destined traffic in light of the busiest foreign traffic centers identified above. Annual totals of passengers arriving from and departing to the U.S. from specific national markets illustrate the world regions that are of greatest significance to U.S. cities seeking to strengthen their international passenger service. Proximity and economic and cultural ties explain the dominance of top markets. All figures cited in this section are drawn from INS-based Department of Transportation data files except for Canadian market data (obtained from T-100 USDOT information). Appendix E includes complete lists of markets aggregated by world region.

Table 4-1. Total Passenger Traffic at Regional Traffic Centers - 1994.

REGION	HIGHEST PASSENGER TRAFFIC			
	Airport	World Rank	1994 Total Passengers	1993-1994 Percent Change
Africa	Algiers	138	3,207,800	-3.9
Central America & Mexico	Mexico City	35	18,889,620	24.6
South America	Sao Paulo	61	7,701,414	-2.1
Caribbean	St. Lucia	304	390,912	-0.81
Oceania*	Auckland	92	6,451,937	11.3
Middle East	Jeddah	65	9,344,868	3.4
Far East	Seoul	13	27,333,627	19.6
Europe	London (Heathrow)	4	51,727,893	8
Canada	Toronto	36	18,598,420	3.5

*In 1993, Sydney's Kingston Smith International Airport handled 16,580,110 passengers--an increase of 14 percent over its 1992 traffic level. 1994 data are not yet available for Sydney and other cities. As of April, 1995, the Airports Council International reported 1994 data on 401 airports worldwide. The list is incomplete, containing few African, Caribbean, and Oceanic airports. The high ranks of top cities in Europe and Asia indicate the strength of these regions.

Source: Airports Council International (1995). *Airports Council International 1994 Worldwide Traffic Report Preliminary Edition.* Geneva: Airports Council International.

To where do U.S.-based internationally-bound passengers travel? And from where do international passengers arrive at U.S. cities? Data for arriving and departing passengers comprise roughly equal proportions of total traffic at each market; the aggregate number of passengers traveling between the U.S. and each foreign nation are considered here. Figure 4-3 breaks total traffic to and from the U.S. into major world regions. As the only single-nation "region," Canada dominates other nations of the world, generating and receiving a total of over 12 million passengers alone. Sheer volume of traffic is heaviest with Europe, followed by the Far East (Asia), Canada, Central America and Mexico, and the Caribbean. Over 80 million individuals traveled between the U.S. and these regions in 1993, accounting for more than 90 percent of total international traffic at U.S. airports.

Geographic proximity directly affects the economic and cultural ties between the U.S. and foreign countries. Relative location is a strong determinant of leisure and business destinations chosen by travelers from the U.S. Just as Mallorca is a high-demand leisure market for Spanish and other European citizens, so also are the islands of the Caribbean and other points in Central America and Mexico popular destinations for American sun-seekers. Points in Canada are also attractive tourist destinations for mainland and Alaskan U.S. citizens, while Asia is a relatively close travel option for residents of Hawaii and Alaska. Business travel is also heavy to many of these markets and Europe simply due to the absence of intervening market opportunities between U.S. economic centers and foreign purchasing power.

Cultural ties also shape the distribution of international markets of significance to the U.S. Family connections between U.S. citizens and relatives in European, Asian, Central/South American, and Caribbean nations are strong, and generate considerable social traffic in and out of the U.S. At a smaller scale, specific international ties are evident: Chicago has the highest number of flights to Poland among U.S. cities; Houston and Miami have the greatest number of flights to Latin America and the Caribbean [3]. Also of note are the educational exchange programs that bring foreign students to the U.S. to study and allow college students from the U.S. to attend school in a foreign country.

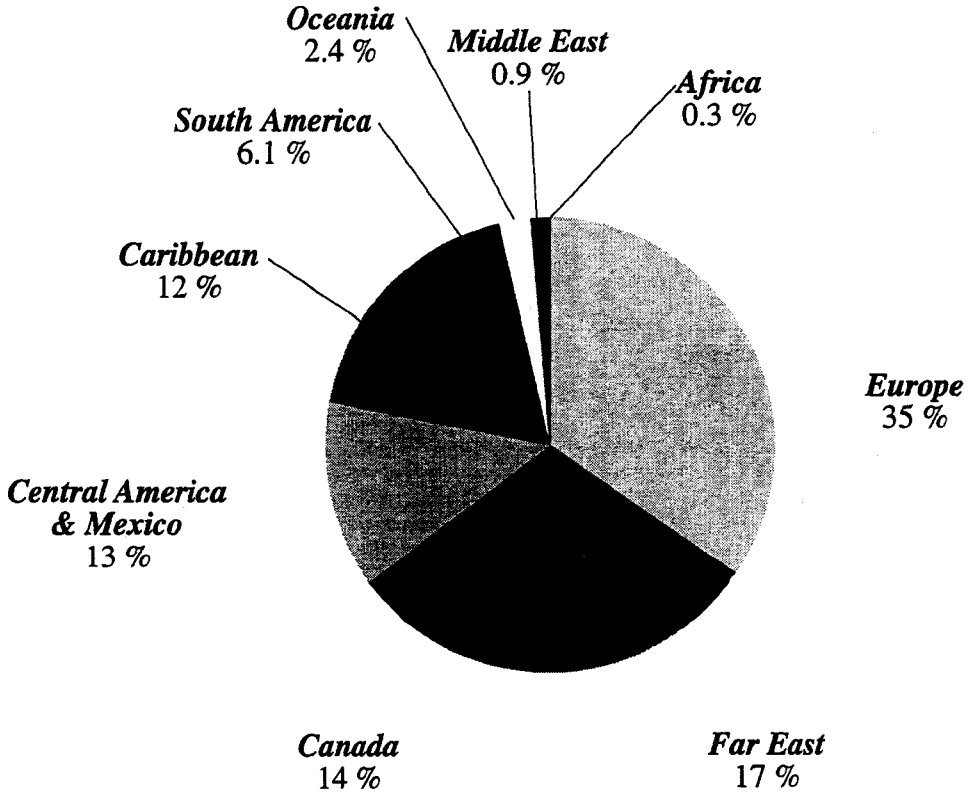

Figure 4-3. Proportion of International Passenger Traffic to/from the U.S. by World Region. The distribution among world regions of traffic to and from the U.S. differs from that of total non-U.S. passenger traffic shown in Figure 4-2. Geographic proximity as well as economic and cultural ties between the U.S. and foreign destinations shape the breakdown of international passenger traffic. Regional totals are based on INS-derived figures listed in Appendix E. Source: Office of International Aviation (1995). *Air Passenger Travel between U.S. and all Countries for Calendar Year 1993.* Washington: U.S. Department of Transportation. Calculations by the authors.

Table 4-2 presents the twenty largest foreign markets for international passenger traffic to and from the U.S. in 1993 [49]. The markets listed represent those nations that generated or received a total of at least one percent of the 92 million international passengers traveling through U.S. airports during the year. Canada, the U.K., Japan, and Mexico top the list; they surpassed all other markets by over three million passengers. As was the case with airport traffic discussed in Section 4.1, Europe and Asia dominated the strongest markets. Passenger levels between the U.S. and several nations in Central and South America accounted for nearly 20 percent of all international passengers (including Mexico); although most of these markets are relatively insignificant on the global scale, U.S. tourism and demographic connections make them more significant among U.S. travel partners. The importance of Australia is indicative of traditional Anglo economic and cultural ties.

The largest passenger markets did not experience the highest rates of growth between 1992 and 1993. The distribution of high-growth nations around the world is very different from the pattern of highest total passenger traffic. Small number of passengers in certain markets yield dramatic percentage changes that actually represent equally small amounts of new traffic (Table 4-3a). Twenty-seven nations each contributed less than 45,000 passengers to the international traffic total in 1993; the addition of a single weekly widebody flight during the year to one of these countries yields a percentage increase of at least one-third. Small markets in African, Caribbean, South American, and the Middle East regions have the most to traffic to gain, and often the most capacity with which to expand service. Table 4-3b presents the busiest markets ranked by percentage change in total international passengers between 1992 and 1993, taken from those markets that accounted for at least one-half of one percent of total U.S.-foreign market passengers in 1993. Tables 4-3a and 4-3b include Taiwan, the Cayman Islands, and Argentina because these markets increased by a considerable proportion and were fairly substantial in size. While both tables provide useful information about the fastest-growing markets for passenger traffic to and from the U.S., Table 4-3b provides a better summary of nations that are likely to be important to U.S. cities and carriers in the future.

Table 4-2. Largest Foreign Markets for Passenger Traffic to and from the U.S. - 1993.

Rank	Country	World Region	1993 Total Passengers	Percent Change	Percent of Total 1993 International Passengers
1	Canada	N. America	12,667,000	3.4	13.70
2	United Kingdom	Europe	11,688,000	7.3	12.64
3	Japan	Far East	9,756,536	-0.1	10.55
4	Mexico	C. Amer. & Mex.	9,149,023	2.4	9.89
5	Germany	Europe	5,710,614	5.3	6.18
6	France	Europe	3,636,022	-1.6	3.93
7	Netherlands	Europe	2,447,022	22.1	2.65
8	Bahamas	Caribbean	2,415,970	3.0	2.61
9	South Korea	Far East	2,031,285	9.3	2.20
10	Dominican Republic	Caribbean	1,975,921	7.8	2.14
11	Jamaica	Caribbean	1,869,620	11.0	2.02
12	Italy	Europe	1,780,764	1.3	1.93
13	Brazil	S. America	1,407,073	7.9	1.52
14	Venezuela	S. America	1,293,941	13.4	1.40
15	Taiwan	Far East	1,222,050	31.8	1.32
16	Switzerland	Europe	1,196,236	9.6	1.29
17	Australia	Oceania	1,179,615	-2.2	1.28
18	Spain	Europe	1,175,620	-9.3	1.27
19	Hong Kong	Far East	988,718	8.5	1.07
20	Ireland	Europe	905,734	2.4	0.98

INS defines world regions as Africa, Central America and Mexico, Europe, Far East, Middle East, Oceania, and South America. Canada data are based on USDOT T-100 market data. Passenger totals indicate all arriving and departing international traffic at all U.S. airports. Percentage change indicates difference between passenger traffic in 1992 and 1993.

Source: Office of International Aviation (1995). *Air Passenger Travel between U.S. and all Countries for Calendar Year 1993.* Washington: U.S. Department of Transportation. Calculations by the authors.

Table 4-3. Fastest-Growing National Air Passenger Markets - 1992-1993.

(a). Markets with the fastest growth worldwide among all nations that exchanged passengers with the U.S. during both years.

Rank	Country	World Region	1993 Total Passengers	Percent Change	Percent of Total 1993 International Passengers
1	Pakistan	Far East	266	1562.5	0.000
2	Kenya	Africa	592	443.1	0.001
3	Hungary	Europe	36,347	171.2	0.039
4	Bulgaria	Europe	29,384	123.1	0.032
5	South Africa	Africa	101,382	107.3	0.110
6	Kiribati	Oceania	2,287	50.0	0.002
7	China	Far East	146,062	38.3	0.158
8	Singapore	Far East	272,942	37.8	0.295
9	Turkey	Middle East	22,959	37.7	0.025
10	Romania	Europe	22,478	35.2	0.024
11	Ivory Coast	Africa	6,083	33.7	0.007
12	Turks/Caicos Islands	Caribbean	114,663	33.0	0.124
13	Taiwan	Far East	1,222,050	31.8	1.321
14	Russia	Europe	189,809	30.8	0.205
15	Haiti	Caribbean	380,153	29.9	0.411
16	Fiji	Oceania	177,684	28.3	0.192
17	Grenada	Caribbean	79,784	25.1	0.086
18	Chile	S. America	348,937	24.3	0.377
19	Cayman Islands	Caribbean	528,828	24.3	0.572
20	Argentina	S. America	675,187	24.0	0.730

(b). Fastest-growing markets among the nations that accounted for at lest 0.5 percent of all international traffic to and from the U.S. in 1993 and exchanged international traffic with the U.S. during both years.

Rank	Country	World Region	1993 Total Passengers	Percent Change	Percent of Total 1993 International Passengers
1	Taiwan	Far East	1,222,050	31.8	1.321
2	Cayman Islands	Caribbean	528,828	24.3	0.572
3	Argentina	S. America	675,187	24.0	0.730
4	Netherlands	Europe	2,447,022	22.1	2.646
5	Costa Rica	C. Amer. & Mex.	754,076	21.1	0.815
6	Neth. Antilles	Caribbean	706,523	18	0.764
7	Israel	Middle East	610,014	16.0	0.660
8	El Salvador	C. Amer. & Mex.	480,914	13.9	0.520
9	Venezuela	S. America	1,293,941	13.4	1.399
10	Colombia	S. America	741,532	11.2	0.802
11	Jamaica	Caribbean	1,869,620	11.0	2.022
12	Ecuador	S. America	457,577	11.0	0.495
13	Bermuda	Caribbean	682,530	9.9	0.738
14	Switzerland	Europe	1,196,236	9.6	1.294
15	Aruba	Caribbean	671,804	9.6	0.726
16	Belgium	Europe	780,275	9.5	0.844
17	Guatemala	C. Amer. & Mex.	759,303	9.4	0.821
18	South Korea	Far East	2,031,285	9.3	2.196
19	Hong Kong	Far East	988,718	8.5	1.069
20	Brazil	S. America	1,407,073	7.9	1.522
21	Dominican Republic	Caribbean	1,975,921	7.8	2.137
22	United Kingdom	Europe	11,688,000	7.3	12.639

Source: Office of International Aviation (1995). *Air Passenger Travel between U.S. and all Countries for Calendar Year 1993.* Washington: U.S. Department of Transportation. Calculations by the authors.

Proximity and economic and social ties are the most important factors determining the significance of foreign markets as origins/destinations for U.S. traffic, but certain data issues influence the way national market data represent traffic and are also important. National totals of traffic between the U.S. and foreign countries do not directly represent demand for travel between nations, but also reflect the service available for such travel. As is the case with all attempts to measure transportation demand from existing service, the totals presented here are constrained by the finite levels of service connecting the U.S. with foreign markets. For example, concentrated service across the North Atlantic is concomitant with the number of passengers flying between the U.S. and the U.K.; the large proportion of total passengers that traveled between the U.S. and European nations in 1993 reflects the well-developed service network between points in Europe and North America. In a perfectly free market, the service supplied could be equated with actual demand for travel between countries, but government, industry, and even technological constraints affect where planes fly.

Several categories of service comprise total traffic data figures, including scheduled and nonscheduled, domestic carrier and international flag carrier. (See Appendix A for clarification of terms.) All traffic figures included in this section account for total passengers traveling, regardless of the type of service used. What sort of service is available in different markets depends on whether it is primarily for leisure, business, or other travel, as well as the bilateral agreements governing the market. The profitability of service to and from a foreign destination, whatever the reason for travel on that route, will determine the existence and level of service offered as well.

Smaller markets often have more volatile traffic levels. Many nations with high rates of traffic change are largely served by non-U.S. carriers; the actual flight activity of these carriers can often vary considerably from their intended schedules. National flag airlines carry over 70 percent of the traffic between the U.S. and Africa, for example [49]. Carriers from many African countries operate with very small fleets and limited schedules. Fluctuations in passenger traffic of vast percentages from year to year are likely to be a result of one or two flights being altered within the schedule; a few flights may be a large proportion of the total service. Also, passengers

traveling between the U.S. and Africa are likely to fly via Europe, and if a layover of more than a few days is included, the market counted would be the European stopover point.

Charter (or nonscheduled) service is an important element of international passenger service, providing greater flexibility for serving markets in which stringent bilateral agreements apply. The same flexibility allows carriers to shift service depending on the travel season. The Caribbean, Central America, and Mexico are the biggest markets for international charter service with the U.S. for these reasons. Europe and Asian markets, comprised of more business than vacation travelers, have more scheduled than charter service.

The above examination of worldwide passenger traffic figures by both airport activity and U.S.-foreign travel markets identifies world regions and individual cities and nations that are significant on a global and U.S. scale today. Europe's continued dominance is clear from the data provided, as are the strength of several Asian markets. Mexico and Brazil (with Mexico City and Sâo Paulo as their leading markets) are important traffic centers in their own rights; they also represent regions with strong potential for expanded international service.

The data presented here suggest that the nations with the greatest potential for higher traffic volumes with the U.S. are not those markets that have traditionally led the world or been the most important markets for U.S. traffic, but are small yet strong markets with room for expansion. In Asia, these areas include points in Singapore, Malaysia, South Korea, Taiwan, and potentially China (due to resumption of Most Favored Nation status). European markets to be watched for growth are not the traditional powerhouses of Frankfurt, London, and even Paris, but smaller traffic centers in nations with which the U.S. has successfully negotiated Open Skies agreements (Amsterdam and Brussels). Caribbean and Central American countries are likely to remain popular tourist destinations for U.S. traffic; room for growth in service to and from these regions is especially strong in the scheduled sector.

Service between the U.S. and Canada and traffic volumes at Canadian airports received a boost from the Open Skies agreement negotiated between the two nations early in 1995. For Midwest cities like Minneapolis-St. Paul, the potential for service expansion is already being

realized. Chapter 5 looks at existing nonstop passenger connections between the largest cities in Canada as well as other major foreign traffic centers identified above and Midwest cities. First, however, Section 4.3 briefly examines the distribution of cargo traffic centers worldwide.

4.3 LEADING CARGO TRAFFIC CENTERS

Air freight, air mail, and air package express comprise what is commonly referred to as air cargo. Goods transported by air cargo are generally high-value, low-mass, and/or highly time-sensitive. Firms use air cargo as a part of their transportation operations to facilitate a variety of strategies that include accessing wider or more distant markets, saving as part of a cost cutting scheme applied to the entire production process, providing a service-oriented product to customers, or preventing assembly line stoppage through timely delivery of a necessary machine component [50]. Passenger airplanes carry the majority of cargo traffic, so dimensions are constrained to fit in the bellies of aircraft. Airplanes are relatively more expensive to operate than all other transport modes, but provide safer and more secure passage. The value added to the total product by the temporal and service benefits of air cargo must outweigh the cost relative to other modes.

To some extent, the location and magnitude of air cargo activity centers shadow those of passenger traffic markets. Figure 4-4 indicates the distribution of the world's busiest air cargo centers outside the U.S. during 1993 and 1994. As was the case for passenger traffic, the map demonstrates a cargo traffic imbalance among world regions. Europe and Asia were the most dominant areas of the world for cargo as well as passenger traffic, comprising 96 percent of the nearly fifteen million metric tons of cargo handled by the 24 cities that reported airport traffic exceeding 200 thousand metric tons in either 1993 or 1994 [45, 47].

A few of the busiest foreign air cargo centers represented regions that did not have a major passenger point. Tel Aviv, shown in the Europe inset in Figure 4-4, generally is considered part of the Middle East, but is not likely to be a gateway for cargo traffic into other countries in that region for political reasons. On the other hand, Sao Paul (ranked thirteenth) is likely to be a major

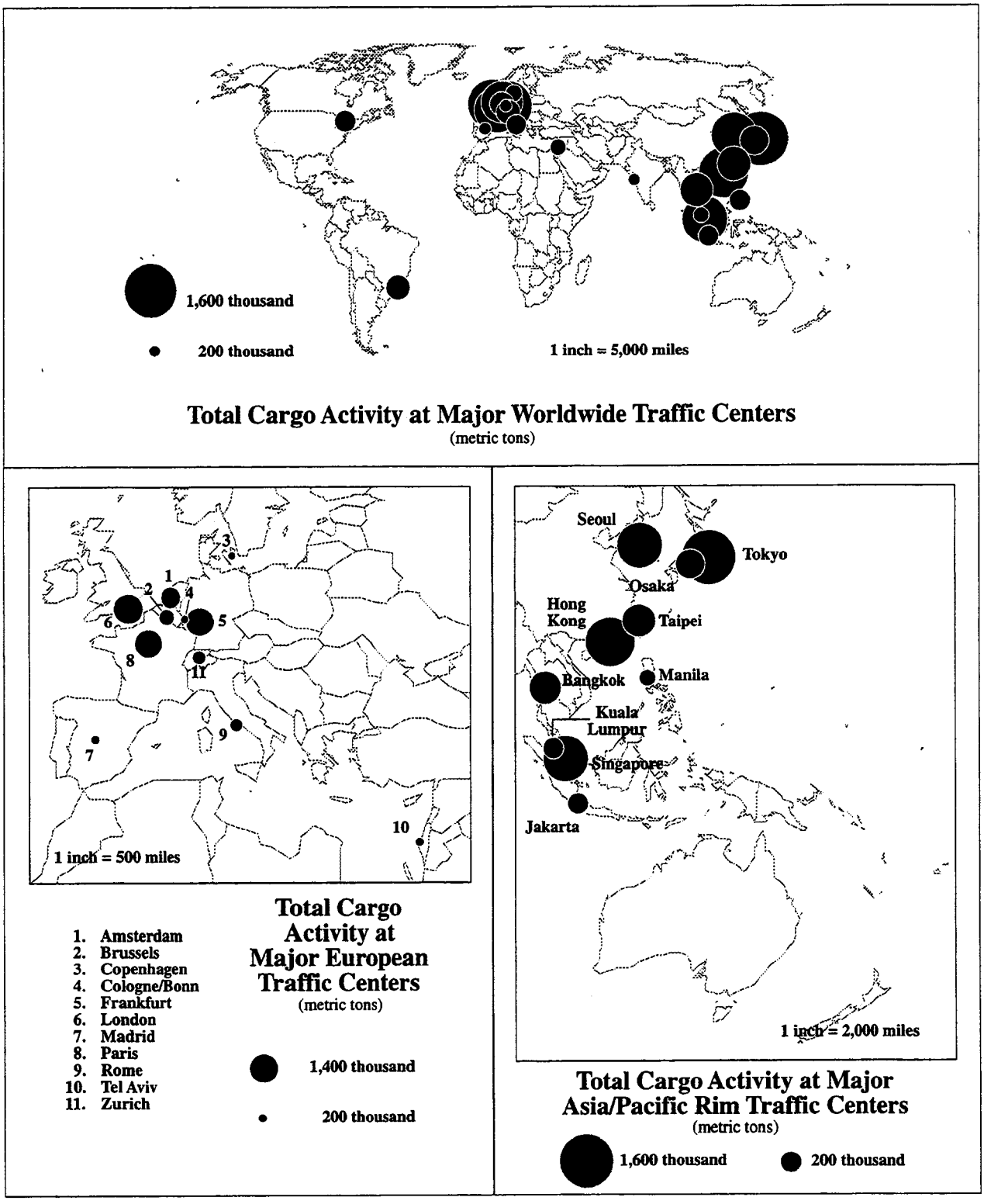

Figure 4-4. Total Cargo Activity at Major Worldwide Traffic Centers. International airports at the cities shown reported cargo handled totaling at or above 200 thousand metric tons during 1993 and/or 1994. Calculations by the authors. Source: Airports Council International (1995). *Airports Council International 1994 Worldwide Traffic Report Preliminary Edition.* Geneva: Airports Council International..

node through which intercontinental air cargo traffic flows to other points in South America. Mexico City and Vancouver are absent from the cargo activity map although both appeared as major passenger traffic centers; cargo data for Mexico City were not available for 1994 and did not exceed 200 thousand metric tons in 1993, and Vancouver fell short of the threshold (118 thousand metric tons handled during 1994).

European passenger activity continued to dominate over that of Asia in 1993-94, but Asia outpaced Europe in cargo traffic during the same period. Although both regions had eleven major cargo centers (including Tel Aviv and Bombay in Europe and Asia respectively), Asian cities handled nearly one million more metric tons of cargo than their European counterparts. The top eight centers worldwide surpassed their competitors by over 250 thousand metric tons; four were located in Asian and four in Europe. The growth of high-technology industries in Asia and the Pacific Rim account for the importance of air cargo in these areas; goods associated with such industries are small, light, and expensive enough to make shipping by air economically feasible.

This chapter has surveyed the cities and regions of the world outside of the U.S. that were characterized by high passenger and cargo traffic levels during the early 1990s. The next section documents the level and scope of nonstop service between Midwest cities and those points in Asia, Europe, Africa, and South America identified in this chapter as the most significant traffic centers.

CHAPTER 5
LINKING THE MIDWEST TO THE WORLD: SERVICE TO MAJOR FOREIGN MARKETS

Foreign air service to and from cities in the Midwest varies in quantity, geographic scope, and diversity of service providers. These characteristics form service profiles that reflect links between the region and the global air service network. Chicago dominates the region as an international traffic center, but smaller metropolitan areas enjoy niches associated with their major home-based carriers. This chapter considers in turn international service and other market characteristics of eleven Midwest cities, with particular attention paid to all-cargo and nonstop passenger service to and from the busiest foreign traffic centers identified in Chapter 4.

The Midwest is defined according to the FAA's Great Lakes and Central air traffic regions for the purpose of this report (Figure 5-1) [51]. Cities located within the Midwest but not specifically examined here include Omaha, Des Moines, and other regional centers that did not have nonstop service to any of the international traffic centers identified above in September, 1995. A few cities, including Minneapolis-St. Paul, have nonstop passenger service to several Canadian cities that are not major traffic centers on a worldwide scale: examples include Winnipeg, Edmonton, and Thunder Bay. Dayton is the smallest Midwest city that has nonstop service to a major foreign traffic center (11 flights per week to Toronto [52]), with a 1990 city population of under 85,000 [53]. Chicago is the largest urban area included, dominating the region in service as well as population size.

Overall passenger traffic at the cities examined varies as widely as local populations do. Figure 5-1 illustrates the eleven centers included in this report. Five cities are consistently among the busiest airports in the country based on total passenger traffic: Chicago, Cincinnati, Detroit, Minneapolis-St. Paul, and St. Louis. These are designated as "Large" air traffic centers by the FAA because each city handles over 1.0 percent of all passenger enplanements nationwide annually. Cleveland, Columbus, Indianapolis, Kansas City, and Milwaukee fall into the

(a). Midwest regions (shaded) among the eight FAA-designated air traffic regions in the continental U.S.

(b). The eleven Midwest cities with nonstop service to at least one major foreign passenger or cargo traffic center.

Figure 5-1. Study Area Reference Maps. The Central and Great Lakes regions defined by the Federal Aviation Administration form the study area of this report. The eleven cities shown in (b) have nonstop service to Toronto and/or other major international traffic centers. Sources: Federal Aviation Administration (1994). *Airport Activity Statistics of Certificated Route Air Carriers - 1992.* Washington: Government Printing Office; Official Airline Guides (1995, September). *Worldwide Edition Desktop Flight Guide.* Oak Brook, IL: Reed Travel Group. Compiled by the authors.

"Medium" traffic category, and Dayton fits the "Small" definition of between 0.25 and 0.49 percent of total annual enplanements nationally [51]. The FAA hub designations are based solely on passenger traffic, without regard for cargo traffic, local carrier dominance, or specifically international traffic.

The Office of International Aviation at the U.S. Department of Transportation compiles gateway rankings based on nonstop international cargo traffic. In 1994, Chicago and Detroit were the only Midwest cities represented among the top 15 U.S. gateways for nonstop traffic, with 6.1 and 2.2 million international passengers handled at each respectively [54]. Minneapolis-St. Paul ranked twentieth with a total of just over one million nonstop international passengers handled during 1994. These figures reflect the availability of nonstop service among Midwest cities examined below. In terms of total international freight, Chicago was the only Midwest gateway among the top fifteen nationwide behind Miami, Anchorage, New York, and Los Angeles.

The scope of specific service examined in this chapter is limited to nonstop passenger and direct all-cargo flights from Midwest cities to 35 major foreign traffic centers (See Appendix D for complete lists of major foreign passenger and cargo nodes). Route data reflect service operated during September, 1995. Only scheduled service recorded in the Official Airline Guides (OAG) worldwide passenger and cargo directories is included [52, 5]. Charter service by operators such as Minneapolis-based Sun Country Airlines and Indianapolis-based American TransAir is not considered due to lack of specific flight data availability.

Although only all-cargo international flights are documented in detail here, cargo space is generally available on all wide-body international routes. International routes for passenger traffic therefore reflect cargo service between cities. This report tracks all single-plane direct, dedicated freighter (all-cargo) service between the Midwest and the 35 traffic centers identified above, regardless of the number of stops required en route. Other flights and destinations are discussed on an anecdotal basis. Cargo flights are free from the constraints of passenger comfort and convenience in route planning and ground-handling time, therefore the number of stops is less of an issue. At the same time, cargo requires attention to facilitate equipment changes, so direct

service involving multiple aircraft is less desirable than single-plane direct service. A low number of all-cargo flights between two cities does not mean that cargo traffic does not move between the pair; all-cargo service must be considered in conjunction with wide-body passenger service and the proximity and convenience of alternative transportation options.

The types of aircraft used on individual routes are an important indication of both the relative location of the origin and destination, and the volume of traffic handled on the route. Distance flown continues to dictate the types of aircraft that are feasible for each route; on transoceanic or otherwise long-haul service requiring high cruising altitudes and therefore long take-off profiles, wide-body aircraft such as Boeing 747s and 767s, MD-11/DC-10s, Lockheed L-1011s, or Airbus 300s are appropriate. Even when configured to carry passengers only on the upper deck and cargo only on the lower deck, these wide-body aircraft have far greater capacity than all-cargo narrow-bodied aircraft in terms of both weight and volume [55]. Additional constraints on aircraft cargo capacity include door locations and dimensions, cabin (and therefore container) dimensions, and volume per unit of floor space; each of these requirements is less restrictive on wide- ~~rather~~ than narrow-body aircraft. These considerations are significant because the volume of cargo carried on routes between Midwest cities and points in Canada and Mexico (serviced largely with narrow-bodied aircraft) is much lower on a per-flight basis than cargo traffic on longer-haul service to other countries due to the aircraft types used.

Capacity differences are equally significant in terms of passenger traffic volume. The highest-capacity aircraft configurations are DC-10/MD-11 and 747-300 and -400 series aircraft constructed for all-coach travel to hold between 550 and 600 passengers [52]. Boeing-767 aircraft, the smallest wide-body aircraft, hold at least 200 passengers, depending on their configuration. In contrast, narrow-bodied aircraft configured for maximum passenger capacity generally have fewer than 200 seats, and often seat under 100 individuals. Non-jet equipment used for short-haul, commuter service (including service to Thunder Bay from Minneapolis and some service between Toronto and Cleveland or Detroit), hold under 50 passengers.

Local market characteristics such as population size, congestion, and distance to competing airports all act as determinants of the level of service available at specific sites. Only 40 percent of the international accessibility of U.S. "Large" and "Medium" hubs can be accounted for by city size alone, however [56]. It is therefore important to examine the local determinants and service on a case by case basis. Tables 5-1 and 5-2 summarize the nonstop passenger service and single-plane direct all-cargo service between Midwest cities and major traffic centers. Italicized figures indicate routes operated with at least some narrow-body aircraft service. The following three sections discuss the service profile of each Midwest city in detail, relating the geographic scope and quantity of different service types to local market characteristics.

5.1 MAJOR MIDWEST SERVICE CENTERS

5.1.1 Chicago

In terms of both aircraft operations and total passengers handled, Chicago's O'Hare International was the busiest airport in the world in 1994. Over 880,000 aircraft took off and landed at O'Hare, a figure over twice as high as London's Heathrow, the highest-ranking foreign airport in terms of aircraft operations. (Aircraft operations figures include every plane, whether private, charter, or scheduled, that arrived or departed the airport facility during the year; the inclusion of private planes explains the high rankings of otherwise uncongested airports such as Orange County and Long Beach ahead of Detroit, St. Louis, and other domestic airline hubs as well as all foreign airports.) The over 60 million passengers that traveled through O'Hare in 1994 represent over six times the volume of traffic at the five smallest international passenger traffic centers identified in Chapter 4. Totals include O'Hare traffic alone, rather than Chicago's Midway, Meigs Field, and Pal-Waukee airports. Although these facilities handle little, if any, international traffic, their operations indicate the sheer volume of the traveling public in the metropolitan region.

Metropolitan Chicago, with a 1990 population of over eight million, is nearly twice the size of the Detroit area, Chicago's most significant regional competitor [53]. All these characteristics indicate Chicago's regional dominance; international service characteristics further support this

Table 5-1. Weekly Nonstop Passenger Flights from Major Foreign Traffic Centers to Midwest Cities - September, 1995.

	U.S. DESTINATIONS											
FOREIGN TRAFFIC CENTERS (ORIGINS)	Chicago	Cincinnati	Cleveland	Columbus	Dayton	Detroit	Indianapolis	Kansas City	Milwaukee	Minneapolis-St. Paul	St. Louis	TOTAL
Amsterdam	10					14				14		38
Bangkok												
Barcelona												
Bombay												
Brussels	13											13
Cologne/Bonn												
Copenhagen	6											6
Dusseldorf	7											7
Frankfurt	18	7				14				1		40
Hong Kong												
Istanbul												
Jakarta												
Kuala Lumpur												
London	42	7				7				7	7	70
Madrid												
Mallorca												
Manchester	14											14
Manila												
Mexico City	***24***					***7***						***31***
Milan	7											7
Munich	7											7
Osaka						7						7
Paris	28					7					3	38
Rome	7											7
Sao Paulo												
Seoul	3					3						6
Singapore												
Stockholm	7											7
Sydney												
Taipei												
Tel Aviv												
Tokyo	20					14				1		35
Toronto	***138***	***53***	***57***	***19***	***11***	***35***	***24***		***12***	***21***		***370***
Vancouver	***35***									***14***		***49***
Zurich	13	5										18
Total Flights/Week	**399**	**72**	**57**	**19**	**11**	**108**	**24**		**12**	**58**	**10**	**770**
Total Origins	**18**	**4**	**1**	**1**	**1**	**9**	**1**		**1**	**6**	**2**	**19**

Italicized, bold numbers within the table indicate flight frequencies on routes operated with at least some narrow-bodied equipment; all other routes are served by wide-bodied aircraft only. Flight frequencies include flights originating at foreign traffic centers bound for Midwest cities; reciprocal service from Midwest origins to foreign destinations is not reflected in frequency totals. Table does not include nonstop service from other (smaller) foreign markets.

Source: Official Airline Guides (1995, September). *Worldwide Edition Desktop Flight Guide.* Oak Brook, IL: Reed Travel Group. Calculations by the authors.

Table 5-2. Weekly All-Cargo Flights from Major Foreign Traffic Centers to Midwest Cities - September, 1995.

FOREIGN TRAFFIC CENTERS (ORIGINS)	U.S. DESTINATIONS: Chicago	Cincinnati	Cleveland	Columbus	Dayton	Detroit	Indianapolis	Kansas City	Milwaukee	Minneapolis-St. Paul	St. Louis
Amsterdam				1(0)							
Bangkok	1(3)									1(4)	
Barcelona											
Bombay											
Brussels											
Cologne/Bonn											
Copenhagen											
Dusseldorf											
Frankfurt	6(0)										
Hong Kong	4(1-3)			4(2-3)							
Istanbul											
Jakarta											
Kuala Lumpur							4(3)				
London											
Madrid											
Mallorca											
Manchester											
Manila											
Mexico City	***4(0)***	***5(1)***									
Milan	4(0-1)										
Munich											
Osaka	6(1)										
Paris	5(0-1)										
Rome											
Sao Paulo											
Seoul	9(1-2)			1(3)						1(3)	
Singapore	1(4)									1(5)	
Stockholm											
Sydney											
Taipei	6(1-2)			1(2)							
Tel Aviv											
Tokyo	12(1-2)			1(1)			5(1)			2(2-3)	
Toronto	***37(0)***	***16(0)***	***6(0)***	***6(0)***	***6(0)***	***18(0)***	***12(0-1)***	***6(0)***	***29(0)***	***6(0)***	***1(0)***
Vancouver											
Zurich											
Total Origins	**12**	**2**	**1**	**6**	**1**	**1**	**3**	**1**	**1**	**5**	**1**

Italicized, bold numbers within the table indicate flight frequencies on routes operated with at least some narrow-bodied equipment; all other routes are served by wide-bodied aircraft only. Flight frequencies include flights originating at foreign traffic centers bound for Midwest cities; reciprocal service from Midwest origins to foreign destinations is not reflected in frequency totals. Table does not include air cargo service from other (smaller) foreign markets. The first number in each cell indicates the weekly flight frequency; numbers in parentheses () indicate the number of stops made between the foreign origin and the Midwest destination

Source: Official Airline Guides (1995, September). *Worldwide Edition Air Cargo Guide.* Oak Brook, IL: Reed Travel Group. Calculations by the authors.

conclusion. Nonstop service is available between Chicago and 16 major foreign passenger and cargo traffic centers, as well as Birmingham (UK), Glasgow, Moscow, Prague, Shannon (Ireland), and Warsaw. Within the Americas and the Caribbean, nonstop narrow-body service is available to Calgary, Guadalajara, Montreal, Nassau, Ottawa, and Winnipeg, among other cities. Likewise, direct single-plane service (with cargo capacity on the lower deck) exists between Chicago and Beijing, Amman (Jordan), Bucharest, Lvov (Ukraine), Manila, and Shanghai. All the major U.S. carriers operate equipment-changing direct flights from Chicago via their major international gateways; major worldwide passenger traffic centers served by this type of flight are Hong Kong, Madrid, Osaka, and Sydney. Athens, Auckland, Buenos Aires, Caracas, Cozumel, Jamaica, Melbourne, and Tel Aviv, also served with equipment-changing direct flights operated by U.S. carriers, further extend the geographic scope of Chicago's international passenger access. In addition to the combined passenger-cargo aircraft service indicated above and in Table 5-2, dedicated cargo service is available between Chicago and Dublin/Shannon (wide-body) and Calgary (narrow-body).

With such an extensive international route network operating in and out of Chicago, the diversity of air carriers serving these routes is also extensive. United and American have domestic as well as international service hubs in Chicago, and all other major U.S. carriers except USAir operate at least one direct international flight from O'Hare. The outstanding dimension of Chicago's international service, however, is the large number of foreign carriers that serve the city: among these are Aer Lingus, Aeroflot, Air France, Air Ukraine, Alitalia, British Airways, China Eastern Airlines, Japan Air Lines, KLM-Royal Dutch Airlines, Korean Air Lines, LOT-Polish Airways, Lufthansa, Royal Jordanian, SAS, and TARON Romanian Air Transport. While many of these carriers operate service in and out of Chicago only 1-4 times each week, each has made Chicago one of its U.S. gateways--a choice that is especially significant for small airlines with limited transoceanic capabilities.

Chicago has traditionally been a nationwide transportation hub since the completion of several transcontinental railroad links via Chicago in the nineteenth century. It is also a major node

on the interstate highway system. The city's relative situation in the center of the country, well-connected to the national transportation systems of truck, rail, and air, enhance its role as an international gateway. Its place as a major air cargo point is supported by industry organization and infrastructure; motor carriers advertise scheduled truck service taking no longer than overnight between O'Hare and each of the ten Midwest cities with significant international air service, as well as Omaha, Des Moines, and other regional centers.

Chicago is truly an international traffic center in addition to a regional and national node. It is in a class with New York, Miami, Seattle, and Los Angles--the traditional U.S. gateways for foreign traffic. However, high demand for takeoff and landing spots at O'Hare has led to serious congestion both on-site and in transportation arteries around the airport. The potential for diseconomies of scale--when the sheer volume of operations becomes cost-contributing rather than a cost-saving--offers the greatest hope for other Midwest air traffic centers wishing to compete for a larger share of international cargo and passenger traffic into and out of the Midwest. As the air service available today indicates, there are vast differences between Chicago's connection to the international air service network and those of other cities in the region.

5.1.2 Detroit

The Detroit metropolitan area (population 4.7 million in 1990) is Northwest Airlines' North American hub for international traffic. The airline dominates international and domestic routes at Detroit's Wayne County International Airport, with nonstop service to Amsterdam, Frankfurt, London, Mexico City, Osaka, Paris, Seoul, Tokyo, and Toronto as well as the United States' major population centers on the East Coast. Northwest also serves Taipei with a direct flight via Tokyo, and offered similar service to Hong Kong until the middle of September, 1995. Passage of the Open Skies bilateral agreement with Canada allowed expansion of nonstop service between smaller cities in Canada and Detroit: Northwest serves Halifax, Montreal, and Ottawa, each with at least 14 nonstop round trips daily. Besides service to Mexico City, Northwest also has a Saturday nonstop round trip to Cancun that largely serves vacation travelers.

Carriers other than Northwest have limited service on international routes in and out of Detroit. KLM and Asiana Airlines operate joint service with Northwest to Amsterdam and Seoul respectively, and British Airways offers single-plane direct service to London via Montreal. The British Airways route is in competition with both Northwest's seven weekly nonstop flights to London as well as Continental's equipment-changing direct service via Newark. Although airlines other than Northwest advertise direct service to Frankfurt, London, and Madrid, each trip requires an equipment change in Pittsburgh (USAir) or Newark (Continental). Continental serves Mexico City from Detroit via Houston with a single aircraft, but again competes with nonstop service operated by Northwest. In all, over one hundred nonstop flights connect Detroit to nine of the world's busiest traffic centers, but over one-third of the flights are on narrow-bodied aircraft bound for Toronto--just 207 miles away.

As Northwest has a virtual monopoly on seat space found on international flights in and out of Detroit, the same pattern is reflected in cargo space handled in wide-body aircraft. Two other options exist in all-cargo service, however. Cargolux, a major international cargo carrier based in Luxembourg, operates daily service to Luxembourg via Glasgow, and three carriers offer a total of 18 nonstop flights on the short hop from Detroit to Toronto. The heavy industries that dominate Detroit's economy, the presence of a monopolistic carrier with transoceanic wide-body belly space for cargo, Detroit's proximity to Chicago, and the city's situation on the national border rather than in the interior of the region all contribute to the lack of diversity in cargo service at Detroit. As is the case with all Midwest cities examined in this report other than Chicago, the presence or absence of most international service at Detroit depends upon the actions of one company.

5.2 INTERMEDIATE CENTERS

5.2.1 Cincinnati

Cincinnati's international passenger service, like Detroit's, is dominated by a single carrier: Delta. Delta does not use Cincinnati as a major international hub within its service network, though. Nearly all of Delta's wide-body international routes operating in to and out of Cincinnati

travel via Portland (OR) to Asia or New York's Kennedy airport to Europe. The only exceptions are daily nonstop service to and from London and Frankfurt, and five round trips each week to Zurich operated jointly with Swissair. The other nonstop international service available at Cincinnati uses narrow-body aircraft: one flight per week to the Cayman Islands, 21 flights each week from Montreal, and 53 round trips between Cincinnati and Toronto weekly. The only direct international passenger service without a change of equipment operates to and from Winnipeg via Minneapolis on Northwest--Delta's sole international competitor for passengers at Cincinnati.

The majority of direct international service at Cincinnati is Delta's service beyond its coastal gateways. With equipment changes in Portland, the Atlanta-based airline serves routes between Cincinnati and Bangkok, Nagoya (Japan), Seoul, Taipei, and Tokyo. European origins/destinations with equipment changes at Kennedy are Athens, Berlin, Madrid, Moscow, Munich, and Paris. While the total of 73 nonstop flights into Cincinnati weekly from four major foreign traffic centers at first appears unprecedented for a city of under two million people, Toronto service actually accounts for the majority of the flights. The combination of Delta's dominance, small market size, and competition both in the Midwest and at major population centers on the East Coast effectively limits both the activities of competing carriers and the magnitude of Delta's own service at Cincinnati.

Delta does not operate any of the limited international all-cargo service available at Cincinnati. DHL serves Cincinnati to and from Mexico City with direct flights. Airmax and DHL both serve Toronto with a total of 16 nonstop flights each way weekly. Cargo space is available on Delta's nonstop flights to and from Europe, but no single-plane direct service connects Cincinnati with Asia. As with passenger traffic at Cincinnati, relatively small market size and the wide availability of alternative transportation options to and from foreign destinations influence the low levels of all-cargo service from Ohio's second-largest city.

5.2.2 Minneapolis-St. Paul

Chapter 1 provides a profile of Minneapolis-St. Paul's international service , but it is useful to consider MSP's service in the context of other Midwest cities. In many ways, Minneapolis-St. Paul serves the same role for Northwest that Cincinnati serves for Delta. A significant difference is the historical location of Northwest's headquarters at the Twin Cities rather than Detroit, but in an age of diminishing long-term corporate commitment to local communities in the interest of short-term profits, historical ties and local loyalty do not carry the value they once did. Also, Minneapolis-St. Paul is removed from the tight clustering of competing service centers southeast of Chicago, and is truly the regional center for the Upper Midwest. This creates a lack of physically close competition, but also reflects a small, dispersed market for cargo and passengers alike.

Northwest's route structure provides the beyond and behind gateway traffic at Minneapolis-St. Paul that is largely responsible for the high number of major passenger traffic centers with nonstop service to and from MSP. Canada's two largest cities account for 35 of these routes, some of which are operated by Air Canada. Amsterdam enjoys the same number of round trips each week as Vancouver, illustrating the importance of the Northwest-KLM cooperation in bringing major world markets within as easy reach as regional centers. The single Tokyo round trip each week is MSP's only nonstop passenger service to Asia; the Twin Cities' connections to Canada, Europe, and Asia reflect both Northwest's route structure and the region's traditional foreign orientation.

Although on the edge of the Midwest, Minneapolis-St. Paul is still an overnight drive away from Chicago and the substantial cargo service available from O'Hare. Europe-bound cargo flown out of the Twin Cities either occupies belly space on one of the 22 weekly nonstop flights or on single-plane direct service via Detroit or Boston. Options are greater for shipping via air to Asia: in addition to the single nonstop passenger flight weekly to Tokyo, Northwest has other single-plane direct service to Asia and two all-cargo flights each week to Tokyo via Anchorage, one of which goes on to Seoul, Bangkok, and Singapore. These flights indicate the unique benefit among Midwest cities that Northwest's Asian foothold provides to the Twin Cities: Besides Chicago,

Columbus is the only Midwest city that comes close to the direct cargo access to Asia available at the Twin Cities.

Clearly, Northwest is the major player in international cargo and passenger service availability at MSP. Like all other Midwest cities besides Chicago, the city relies on one carrier with a virtual monopoly on international, if not also domestic, service. That creates an unfriendly environment for other carriers that must try to work around the local "bully" carrier, but it also allows the dominant carrier to capitalize on economies of scope and scale. These economies, in turn, make wider service options available to customers at the hub city. Minneapolis-St. Paul enjoys the benefits of wider service than would otherwise be available at a market of its size (2.4 million), but also faces the consequences of a monopolistic service structure. The Open Skies agreements with The Netherlands and Canada have broadened available service options and expanded the number of international service providers at Minneapolis-St. Paul relative to many of its Midwest competitors, making the Twin Cities a unique service center within the region.

5.2.3 St. Louis

St. Louis's international connectivity is tied to its struggling home-based carrier, TWA. The city remained one of the twenty busiest airports in the world during 1994 in terms of aircraft operations (480,000, slightly behind Detroit), but its relatively high rank does not reflect a corresponding level of international service or total passenger traffic. The population of the St. Louis area in 1990 was just under 1.5 million; it is logical to conclude that both passengers to support TWA's ten nonstop flights each week to Europe and the high number of annual aircraft operations are the results of St. Louis' role as TWA's major mid-continental hub for domestic traffic.

Single-plane direct service connects St. Louis and several other international destinations, but these cities are all relatively small markets in Canada and Mexico (Calgary [service that was discontinued at the end of September, 1995], Guadalajara, and Montreal), with the exception of Toronto. These services are offered by TWA as well as Continental, Northwest, and United. All

other direct international service from St. Louis is handled by TWA through its international hub at JFK, and is limited to a few destinations in Europe.

St. Louis's only international all-cargo service is operated once a week to and from Toronto in a narrow-bodied aircraft. Transoceanic freight traffic can be handled on the limited TWA service to Europe and via air or motor carrier to a cargo carrier center. Emery, DHL, UPS, and Federal Express offer several short daily flights between St. Louis and their respective hubs at Dayton, Cincinnati, Louisville and Memphis. St. Louis, like Chicago, is a major node in the interstate highway system; Indianapolis (Burlington Air Express), Dayton, and Columbus (home of international service operated by a variety of carriers) are within direct access via I-70, Chicago and Memphis are directly north and south on I-55, and Cincinnati can be reached on U.S. Route 50 The paucity of international cargo flights at St. Louis is logical considering the presence of a dominant carrier at the city's main airport (Lambert Field), and St. Louis's proximity among other cargo service facilities.

5.3 SMALLER PLACES AND SPECIAL CASES

The remaining six Midwest cities listed in Tables 5-1 and 5-2 all have very tenuous links to the international air service system. Toronto is the only major traffic center to and from which these cities have nonstop passenger or direct all-cargo service. All of this service is on narrow-bodied aircraft, making its volume relatively insignificant compared to the transoceanic capacity at other cities in the region. Generally, these cities are served better in terms of direct all-cargo service than they are with nonstop passenger routes. Market size, proximity to other traffic gateways, and specialized cargo service niches shape the profiles of service at these cities. The cities lack the behind and beyond gateway service and/or the large population base necessary to make major international service efforts feasible.

Cleveland is the largest limited-service city in the region, with a metropolitan area population greater than Cincinnati, Minneapolis-St. Paul, and St. Louis (2.8 million). Although the city is an important enough market to warrant direct passenger service to Europe, all such

service is equipment-changing and travels through gateways at Newark, Kennedy, or Pittsburgh. The diversity of carriers handling this international traffic is strong; Continental, USAir, Delta, and Northwest all use Cleveland as an origin for routes to major traffic centers in Canada or Europe. Although Continental has used Cleveland as a domestic hub in the past, Newark has become a preferred service center. The single nonstop passenger route at Cleveland operates to and from Toronto; Air Canada and USAir compete on the route with a total of 57 round trips each week. Toronto is also the only direct international destination for all-cargo service from Cleveland. The city's proximity to Detroit, Pittsburgh, and East Coast gateways with both larger population bases and markets for behind/beyond gateway traffic make Cleveland an unlikely location for significant international all-cargo and passenger routes of its own.

Milwaukee and Kansas City are similar in size (each with a population of 1.6 million in 1990), and have correspondingly limited international service. Milwaukee is less than 100 miles from Chicago, and is an easy flight to Northwest's Detroit and Minneapolis-St. Paul hubs. It has 12 nonstop round trips each week to Toronto for passengers, and nearly 30 all-cargo flights. Alternatively, Kansas City only has six all-cargo flights to Toronto, and no nonstop passenger service. Kansas City's Mid-Continental International Airport was previously the home base of Braniff, but today is a spoke rather than a hub for domestic service.

Columbus, Dayton, and Indianapolis all have nonstop passenger service to Toronto, but the scope of cargo activity varies considerably at each. Columbus is the largest of the cities, with 1.4 million people living in the metropolitan area in 1990. It is a major cargo center, but is not the specific hub for any carrier. A total of four international carriers operate direct all-cargo service with stops to the Asian destinations of Hong Kong, Khabarovsk, Seoul, Taipei, and Tokyo; nonstop all-cargo routes serve both Toronto and Amsterdam. Dayton, just west of Columbus, is a smaller metropolitan area, but is Emery Worldwide's major North America hub. Like Columbus, it has nonstop passenger and all-cargo service to Toronto. Indianapolis also has service to Toronto, but has the additional benefit of a Federal Express route serving Subic Bay (Philippines), Tokyo, Kuala Lumpur, and Penang (Malaysia) via Anchorage. Columbus, Dayton, and

Indianapolis are strung along the I-70 corridor through central Ohio and Indiana; each has easy access via air or truck to other airports with all-cargo service in the country's interior.

This chapter has summarized international passenger and cargo characteristics at eleven cities in the Midwest. While it is useful to examine the aggregate service presented in Tables 5-1 and 5-2, local market and international airline route network features that define the service available at each city provide valuable insights into each city's unique case. The sheer size of some metropolitan areas like Chicago generates traffic to support international service, but the location of domestic hub activity for a U.S. carrier is a valuable ingredient for service at mid-sized cities. The Midwest has eight metropolitan areas with populations of between one and three million, yet these cities enjoy a wide variety of service profile based on the orientation of their economies and the presence or absence of domestic airline hub activity. The distribution of international routes among Midwest Cities reflects both of these issues, and offers insights into what characteristics make international passenger and cargo routes viable.

CHAPTER 6
CONCLUSIONS

Today's international air service system is more complex than ever before. Technological barriers to long-distance international travel that existed just two decades ago have greatly diminished. Liberal agreements among nations now enable routes to be established or eliminated and service on them to be altered easily. Intricate marketing and other collaborative arrangements between U.S. and foreign airlines have made numerous types of service available and prompted global industry restructuring.

International air transportation systems and the distribution of cities that they serve are the products four distinct sectors' conflicting agendas. First, profit-maximizing carriers seek to operate combinations of routes that provide the greatest return for their investment, regardless of the effects on places served. Airport operators, local governments, and their boosters seek to improve the well-being of the local community through increased air service and the tangible and intangible economic benefits it provides. Consumers of cargo and passenger service want the best service possible at the lowest cost, regardless of the routes or modes that doing so requires. Finally, federal policy-makers seek to balance the wishes of all three of these interests as well as foreign governments and their airlines to ensure a safe, strong international air service system that preserves U.S. interests.

The varying goals of these four sectors make the global airline service network dynamic and the links between mid-sized cities in the U.S. and the international air service system itself volatile. Most air carriers and many consumers of international passenger and cargo service are not irrevocably tied to their operating locations. With the exception of prohibitive relocation and fixed capital costs, airlines can fly their aircraft from anywhere to anywhere; many firms that are major consumers of air service are equally flexible in their location possibilities. Carriers and consumers generally have stronger loyalties to their own bottom lines in the short term than to the long-term

health of the places where they operate or are located. A route must not only be profitable, but must be more profitable than any other alternative route on which a carrier could use its aircraft.

For example, Northwest Airlines owns a fixed number of aircraft that are capable of operating on transoceanic routes. The airline must decide which cities to serve with its limited equipment. Northwest has access to Tokyo, a major foreign destination, through rights granted under provisions of the U.S.-Japan bilateral agreements. Which U.S. cities will generate the greatest number of passengers paying the highest fares? Minneapolis-St. Paul may be a strong market for Tokyo traffic, but is it stronger than Detroit with that city's frequent, direct service to the major population centers on the East coast? Will Seattle or Los Angeles, both shorter flights, allow the airline to fly the aircraft in and out of Tokyo more often? It is not enough to be a profitable market alone; a city must be more profitable than any other markets that the airline can serve. Until an air carrier is convinced that serving Minneapolis-St. Paul with an international flight will yield more profits than using the plane elsewhere, it will not offer such service.

Cities cannot expect profit-maximizing airlines to look out for the best interests of their communities, but must work with air carriers to encourage and support service that improves the well-being of the metropolitan region. Airport operators, local governments, and their boosters seek to facilitate such levels and types of service with complementary concerns for the negative aspects of air service (noise, other environmental concerns, inappropriate corporate subsidies using taxpayer money, etc.). International airline service is a vital ingredient for regional and local economic activity; links to the international air service network through regularly scheduled service support a metropolitan area's global economic orientation.

The number and variety of foreign markets to and from which a city has direct service are a mark of status and a source of pride for international air carriers and U.S. cities alike. The Metropolitan Airports Commission (MAC) which operates the Minneapolis-St. Paul International Airport started a new interest group in 1994 in an attempt to harness local and regional support for enhanced international passenger and cargo service to the Twin Cities among local industries, individuals, and organizations. The Global Access Task Force (GATF) held symposia in the

summers of 1994 and 1995 to publicize its mission. Governor Arne Carlson and MAC Executive Director Jeff Hamiel have spoken in favor of the group's efforts. The Task Force's initial active membership included local economic leaders such as 3M and Pillsbury. The Minnesota Department of Transportation, the Canadian Consulate, and the University of Minnesota have represented the public sector, and several freight forwarders, air carriers, and other service providers have been involved. Individuals from the local Convention and Visitors Bureau, chambers of commerce, and county governments have also participated in organizational meetings.

Late in 1995, GATF members voted to transfer leadership from the MAC to a new private-sector director; Irv Stern of Stern International, Inc. took over in November, and is working to formally incorporate the Task Force. The new, independent organization is dedicated to the improvement and expansion of quality passenger and cargo air service at Minneapolis-St. Paul International Airport to strengthen the regional economy of the Upper Midwest. Specifically, the task force will work with the Metropolitan Airports Commission to:

- Improve awareness of the Minneapolis-St. Paul International Airport's value to the region among the traveling public, the corporate community, and other local airport consumers as well as elected officials through positive publicity for the services the airport enables and the indirect benefits it provides;
- Encourage expansion of carrier and shipper activities at Minneapolis-St. Paul International Airport that will be sensitive to environmental issues;
- Promote the Minneapolis-St. Paul International Airport as a low-cost, low-congestion gateway for passengers and cargo to the Upper Midwest and the nation; and
- Work to enhance on-site international passenger and cargo facilities and ground access to and from the airport.

Collectively, the individuals involved in the Task Force hope to act as a major booster for the airport and the surrounding region to any and all carriers that can improve and expand the international service at MSP. It is similar to organizations that have formed to support efforts to attract professional sports teams, major entertainment complex developments, and other enterprises

to the Twin Cities that would serve the entire metropolitan region for many years to come. International air service provides the same kind of status that these other investments do, in addition to supporting more immediately tangible improvements like jobs and tax/business revenue. The GATF encourages examination of the region's own bottom line over the long term, rather than simply considering next year's profits or election results.

Local consumers of international cargo and passenger service for whom relocation to other, better-served metropolitan areas is not practical, want the best service possible at the lowest cost, regardless of the routes or modes that doing so requires. For example, a company that wishes to ship five cargo pallets to Paris does not care whether they go by truck to either Chicago or New York to be loaded onto a nonstop flight if it means the same amount of time. Air service of any kind competes with two things: time, and alternative transportation modes. Shippers who use air do so for speed, safety, security, and/or other service characteristics specifically of concern to their cargo. Whatever combination of modes meets these service needs while also minimizing costs will be used, regardless of consideration for which airport facility gets the flight. Passengers deciding on routes face similar trade-offs: time and convenience versus cost. Nonstop international service will be used, and even fought for, if it is the option that maximizes service and simultaneously minimizes cost.

Finally, federal policy-makers seek to balance the wishes of service providers, local governments, and service consumers as well as foreign governments and their airlines to ensure a safe, strong international air service system that preserves U.S. interests. The federal government cannot specifically favor one airline or one city over another, but must negotiate on behalf of all U.S. air carriers and all cities unilaterally. Pursuing these goals has resulted in liberal agreements that increase the flexibility of service.

In such a volatile environment, the amount and type of international service a city enjoys cannot be taken for granted. Today, airlines' route networks are determined less by regulatory issues and more on the basis of profit. A single airline often has control over a city's markets, further increasing the tenuity of that city's ability to attract other carriers and establish additional

links to the international air service system. Minneapolis-St. Paul and other cities, especially mid-sized cities with a single dominant carrier, must motivate individuals, industries, and other local interests to remain aware of and work to expand, or at least maintain, the international service currently available at their airports.

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APPENDIX A

GLOSSARY

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GLOSSARY

AIR CARGO. Any property (freight, mail, express) carried or to be carried in an aircraft, except passenger baggage (OAG 1995d).

AIR FREIGHT. A service provided for the transport of goods in any volume. Air freight accounts for over 80% of all air cargo movement worldwide, but does not include mail, small package express, or passenger baggage (OAG 1995d).

AIR TRAFFIC HUB. Air traffic hubs are not airports, they are the cities and Standard Metropolitan Statistical Areas requiring aviation services. Communities fall into four classes (Large, Medium, Small, and Non-hub) based on the community's enplaned passenger level as a proportion of the total passengers enplaned at US airports by domestic airlines (FAA 1994). For example, the Chicago air traffic hub includes O'Hare and Midway; the New York City air traffic hub includes JFK, LaGuardia, and the World Trade Center Heliport.

AIRCRAFT DEPARTURE. An aircraft takeoff made at an airport.

AIRCRAFT OPERATIONS. Takeoffs and landings at a specified airport or by a specified air carrier.

ALL-CARGO AIRCRAFT. An aircraft for the carriage of cargo only, rather than the combination of passengers and cargo. The all-cargo aircraft will carry traffic in bulk or container in the main deck as well as in the lower deck of the aircraft. It may include a scheduled and nonscheduled service (OAG 1995d).

CARRIER GROUPS. The FAA defines carrier groups as Majors, Nationals, Large Regionals, and Medium Regionals based on operating revenue. In practice, carriers are usually described as either "major" or "regional." As of September, 1994, America West, American Airlines, Continental, Delta, KLM, Markair, Northwest, TWA, United, USAir, and Express One were the major carriers operating at MSP. Regional careers were Bearskin, Express Air II, Great Lakes, Mesaba, Canadian Regional, Airvantage, and Comair.

CERTIFICATED ROUTE AIR CARRIER. An air carrier holding a Certificate of Public Convenience and Necessity issued by the US Department of Transportation to conduct scheduled service. Nonscheduled or charter operations may also be conducted by these carriers (FAA 1994). For example, Northwest can use its equipment to operate a single flight on behalf of MLT Vacations or another tour company in the same manner that Sun Country Airlines, a non-certificated carrier, also operates its planes on behalf of tour operators.

CHARTER SERVICE. The temporary hiring of an aircraft, usually on a trip basis, for the movement of cargo or passengers (OAG 1995d). Sun Country Airlines is the major charter carrier serving the Twin Cities at MSP's Hubert H. Humphrey Terminal. Seats on Sun Country Minneapolis-St. Paul flights are sold through MLT Vacations, Trans Global Tours, and Trilogy Tours. Destinations for the winter 1995-96 season include ten vacation spots in Mexico and the Caribbean, as well as 22 mainland US cities. Because charter service is provided on an irregular basis and sold entirely through tour operators distinct from the airline itself, routes are not listed in the Official Airline Guides. Airport traffic or market aggregate data may or may not include charter data, depending on the information source.

COMBI AIRCRAFT. Aircraft specially designed to carry unitized cargo loads on the upper deck of the aircraft forward of the passenger compartment (OAG 1995d).

DIRECT SERVICE. Service between two cities, under a single flight number, and with intermediate stops at one or points. One or all of the intermediate stops may require an "equipment change"--a change of plane for the passenger despite a single flight number on the route. These equipment changes are guaranteed connections for the passengers, and are timed to minimize time on the ground. For example, 32 US cities advertise direct service to Paris--one of the most popular overseas destinations from the US (OAG 1994). However, service from fifteen of these cities requires at least one plane change. Demand at Minneapolis-St. Paul, Kansas City, and Cleveland, among others, justifies published direct service, but not single-plane routing.

DOMESTIC CARRIER. Generally, a domestic carrier is any airline that flies only within its own country. However, U.S. Department of Transportation data tables refer to domestic carriers as and U.S. carrier flying on the international routes described. All of the major U.S. carriers except for Southwest fly international routes.

ENPLANED PASSENGERS. The total number of revenue passengers boarding aircraft.

ENPLANED REVENUE TONS OF CARGO. The number of revenue tons of freight, express, US and foreign mail loaded on an aircraft including originating and transfer tons.

HUB AND SPOKE ROUTING. A method of aircraft routing that feeds traffic from many cities into a central hub designated to connect with other flights to final destinations. See Appendix B for further explanation.

HUB. Common term for airports or cities dominated by a single air carrier.

INTERLINE (cargo). The movement of a shipment via two or more carriers (OAG 1995d). Interlining can refer to coordination of intermodal transportation.

INTERLINING (passenger). The routing of a trip on two or more carriers. Interlining passenger traffic virtually disappeared in US domestic markets after domestic deregulation, as airlines sought to compete with one another through their own hubs to serve "spoke" markets with smaller aircraft rather than cooperating with one another to fill larger aircraft to these smaller markets. When a foreign carrier gains access to a new US market it wishes to serve, the lowest level of cooperation with a US carrier it will seek is an interline agreement, easing passenger connections.

INTERNATIONAL FLAG CARRIER. An air carrier that operates international routes on behalf of its home country, to the exclusion of all other carriers from that country. For example, AlItalia is the flag carrier of Italy; it is the only Italian carrier that operates international routes. Flag carriers are often financially supported, if not owned and operated entirely, by their home governments. The U.S. does not have a single flag carrier, although Pan Am served as the U.S.' designated international carrier through the 1930s.

MAJOR CARRIERS. See **CARRIER GROUPS**.

NONSCHEDULED SERVICE. Revenue flights that are not operated in regularly scheduled service such as charter flights (FAA 1994).

NONSTOP SERVICE. Service between two cities with no intermediate stops between origin and destination.

ON-LINE CONNECTIONS. Changing of aircraft between flights operated by a single carrier that are part of a single ticket purchase, allowing amenities for passengers such as the elimination of baggage handling and check-in requirements to meet the connecting flights. Code sharing agreements seek to emulate the passenger benefits of on-line connections despite service provision by two or more air carriers.

REGIONAL CARRIERS. See **CARRIER GROUPS**.

SCHEDULED SERVICE. Transport service operated over an air carrier's certificated routes, based on published flight schedules.

SINGLE-PLANE DIRECT SERVICE. Direct service between two cities that requires at least one intermediate stop, but does not require the passenger to deplane and board another aircraft. See also **DIRECT SERVICE**.

APPENDIX B

HUB AND SPOKE ROUTE STRUCTURES

APPENDIX B
HUB AND SPOKE ROUTE STRUCTURES

After deregulation of the domestic airline industry in 1978, US airlines sought to utilize their new freedom to serve whatever city they desired (as feasibility allowed) to maximize their profits. Hubbing emerged as a way to harness economies of scale and scope, while strengthening market share at a few key cities. The system maximizes operating flexibility by connecting many markets through a central hub with fewer flights than would be required to connect each pair of cities in an extensive system. By the early 1990s, each major US airline was reorganizing its route network structure around two or three cities. All Northwest flights served either Minneapolis-St. Paul, Detroit, or Memphis. TWA had continued to strengthen its operations at St. Louis, site also of its cooperate headquarters, and New York, its major European gateway. American, Continental, Delta, and United concentrated at Chicago and Dallas, Newark and Houston, Atlanta and Cincinnati, and Chicago and Denver respectively.

For airlines, advantages include economies of scale in baggage handling and other terminal operations, economies of density (or scope) from the ability to use larger aircraft on spoke routes rather than on point-to-point routes, and the creation of "fortress" hubs giving the dominant carrier market power at each city. For passengers originating in the hub city, the number of nonstop destinations served by larger aircraft exceeds what the local market might otherwise be able to support, although ticket prices in and out of their home hub airport may be higher due to the same increased demand. For passengers originating at spoke points in the network, the menu of destinations available with only one stop grew, although flight frequency the use of larger aircraft at their cities declined.

Airlines are attempting to use hub and spoke route structures at an international scale to reap the same benefits. Serving international destinations from their domestic hubs is the most straightforward way for an airline to expand the economic benefits described above. An example is TWA's origination of a London flight at Cincinnati to capture the domestic traffic that is

"behind" its gateway for that flight. Code-sharing allows extension of consolidated traffic benefits: by code-sharing with Lufthansa on the Chicago-Frankfurt route, United receives passengers on its US routes "beyond" Chicago who originated behind Frankfurt. Figure B-1 demonstrates the behind and beyond hub concepts.

In the case of KLM/Northwest cooperation, KLM passengers have access to all markets beyond Minneapolis-St. Paul, Detroit, and Memphis, while Northwest passengers have access to all destinations in KLM's route network. Minneapolis-St. Paul and the other hub cities in the US provide concentrated markets for any foreign airline that can gain access to them. Once allowed to serve US cities by federal authorities, foreign carriers must next acquire access to passengers originating behind the hub city on other airlines. Dominant carriers control these markets jealously, however; they control their market share through their willingness to cooperate with the foreign carrier through code-sharing or simply interlining agreements.

A case helps to illustrate this point. In the summer of 1995, Icelandair sought to add an additional US city to its route system. Because of Iceland's Open Skies agreement with the US, the carrier has access to any US market which can accommodate it in terms of facilities and, where necessary, landing and take-off slots (Chicago's O'Hare International and LAX in Los Angeles have capacity controls due to congestion at their facilities). The airline had the regulatory access it needed to provide service between Reykjavik and either Boston or Minneapolis-St. Paul, the two cities between which it wanted to choose. Market characteristics at these cities, however, are very different. Home-based Northwest is the dominant carrier in the Twin Cities, controlling over 75% of the market share at MSP (MAC 1992). The Boston market, conversely, is spread more evenly among major carriers. Without being able to tap into Northwest's behind gateway traffic for service to Europe via Reykjavik through attractive interlining or code-sharing agreements, Boston proved to be a better choice. In August, Icelandair announced its intention to begin nonstop service between Boston and Reykjavik next spring.

Hub and spoke route networks have gained popularity at the national and international scale. The consequences are mixed for both hub and spoke cities. The airlines seek to reduce

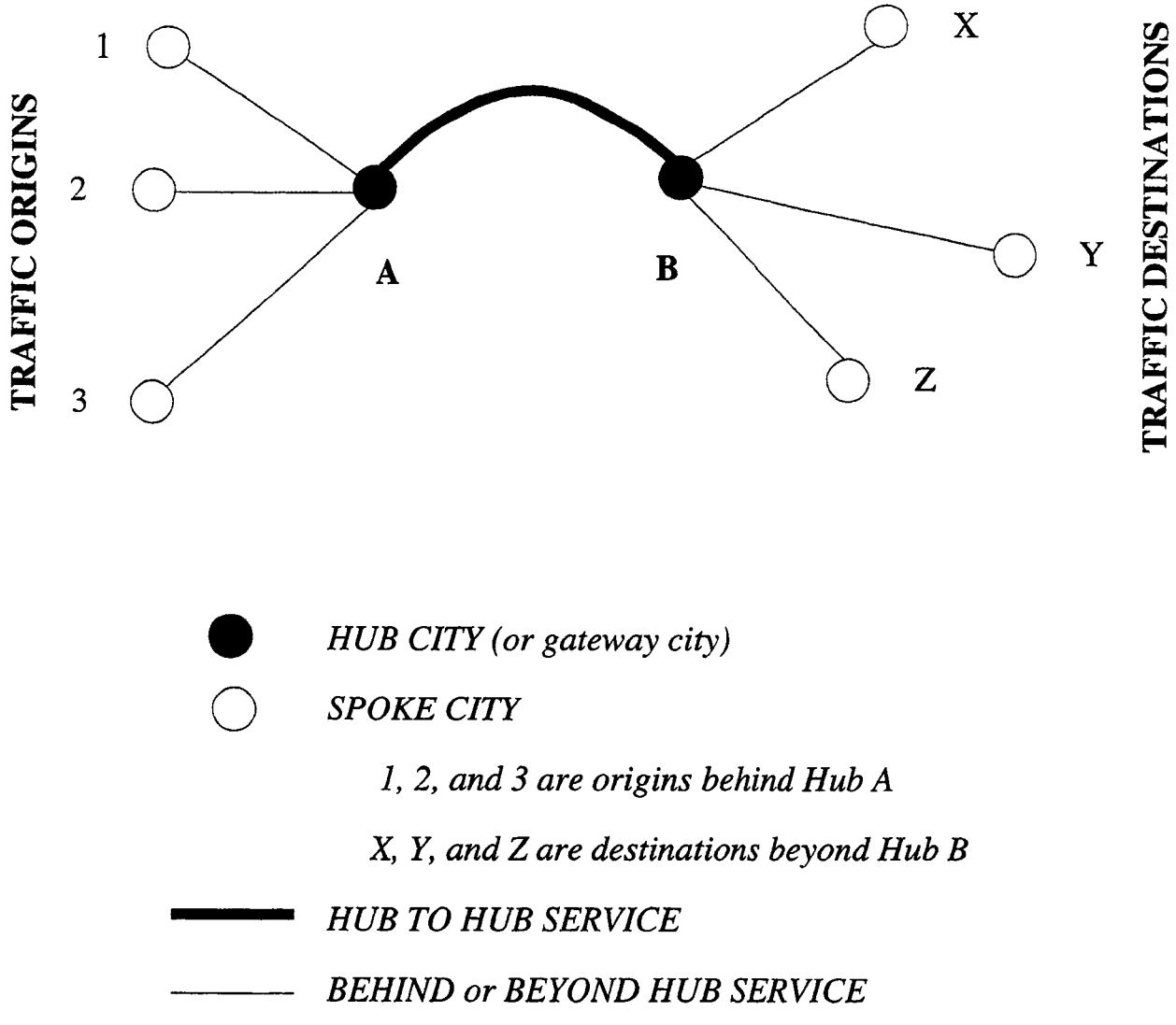

Figure B-1. Simplified Hub-and-Spoke Diagram. If spoke points 1, 2, and 3 are passenger origins, and X, Y, and Z are passenger destinations, passengers will travel via hub points A and B. The route between A and B is a larger market because of traffic generated at 1, 2, and 3 and bound for X, Y, and Z. The dominant airline at Hub A consolidates traffic arriving in smaller aircraft from points 1, 2, and 3 into a single, larger plane (more appropriate for long distances). At Hub B, the process is reversed. (Source: Adapted from GRA, Inc. (1994). *A Study in International Code Sharing*, p. 10.)

costs across their service networks as a whole; the liberalized regulatory system of today allows them to adjust which cities they serve and at what frequency according to the highest profit margin. Cities, on the other hand, have a different set of goals: they seek to enhance the service available to their businesses and citizens. Understanding why hub and spoke systems have arisen and how they benefit airlines helps explain the service profiles and negotiating leverage of Midwestern cities.

APPENDIX C

OVERSEAS CODE-SHARING ROUTES FROM MIDWEST CITIES

APPENDIX C
OVERSEAS CODE-SHARING ROUTES FROM MIDWEST CITIES

Airlines use code sharing to improve the geographic scope of their service, increase market share, and/or reduce operating costs through economies of scale and density. Table C-1 lists the nonstop routes between Midwest and overseas cities on which designation is shared by two airlines on at least one scheduled flight. Table C-2 provides a key to decoding US and foreign airlines that serve cities in the Midwest.

As one of the three busiest airports in the US, Chicago is an attractive destination for overseas carriers seeking access to the largest markets. Markets as large as New York, Chicago, and Los Angeles provide guarunteed "one-stop shopping" for guaranteed plane loads of passengers. Foreign airlines use code sharing with US carriers to allow them to advertise direct service to markets they may not have the regulatory approval or equipment to serve independently. Conversely, US carriers use code sharing to gain access to heavily controlled, congested, or simply smaller foreign markets. On the Chicago-Zurich flight, code sharing arrangements are actually between SwissAir and Austrian Airlines on the flight segment beyond Zurich to Vienna.

Table C-1. Nonstop Routes with Airline Code Sharing

US CITY	FOREIGN CITY	US CARRIER	FOREIGN CARRIER
Chicago	Amsterdam	NW	KL
" "	Frankfurt	UA	LH
" "	Munich	UA	LH
" "	Zurich	--	SR, OS
Detroit	Amsterdam	NW	KL
" "	Seoul	NW	OZ
Minneapolis-St. Paul	Amsterdam	NW	KL

Source: Compiled by the authors from [3] (Official Airline Guides. (1995, August). *Worldwide Edition Desktop Flight Guide*. Oak Brook, IL: Reed Travel Group.).

Table C-2. Air Carrier Abbreviations

AA	American Airlines, Inc.
AC	Air Canada
AF	Air France
AZ	Alitalia
BA	British Airways
CP	Canadian Airlines International
DL	Delta Airlines, Inc.
JL	Japan Airlines
KE	Korean Air
KL	KLM-Royal Dutch Airlines
LH	Lufthansa German Airlines
MX	Mexicana de Aviacion
NW	Northwest Airlines, Inc.
OS	Austrian Airlines
OZ	Asiana Airlines
SK	SAS-Scandinavian Airline
SR	SwissAir
TW	Trans World Airlines, Inc.
UA	United Airlines
US	USAir

Source: Compiled by the authors from [3] (Official Airline Guides. (1995, August). *Worldwide Edition Desktop Flight Guide*. Oak Brook, IL: Reed Travel Group.).

APPENDIX D

FOREIGN AIRPORT TRAFFIC DATA

APPENDIX D
FOREIGN AIRPORT TRAFFIC DATA

The following tables summarize total passenger and cargo traffic at major air service centers outside the United States (Tables D-1 and D-2). Airport-level data are aggregated by city to provide the best representation of service available and traffic generated at major metropolitan areas around the world.

Figures for 35 cities reflect the busiest airports outside the U.S. Thresholds of 10 million passengers and 200,000 metric tons of traffic allow identification of the 20 to 30 strongest foreign air service markets for the respective service type. Airports have differing relative strengths: the busiest passenger facilities are not necessarily the most active cargo points.

The worldwide distribution of passenger and cargo air traffic is heavily weighted towards the U.S. because of its well-developed domestic air transportation system. Of the 50 busiest passenger and cargo airports in the world in 1993, 27 of each were found in the U.S. Likewise, seven of the ten busiest facilities according to passenger or cargo traffic volumes were U.S. airports. In order to highlight the relative importance among non-U.S. service centers, only foreign airports are included in this study.

Non-U.S. air traffic is unevenly distributed among other world regions. Shading in Tables D-1 and D-2 reflect the dominance of European cities relative to Asia and North and South America. No African or Central Asian cities were identified at all, and only one South American and one Middle Eastern city surpassed the traffic thresholds in 1993 or 1994.

Table D-3 summarizes the passenger and cargo markets that exhibited the greatest growth rates between 1993 and 1994. European cities dominate the list of passenger growth points, although Mexico City and Seoul grew the most both proportionately and in sheer traffic volume. On the cargo side, Brussels' traffic volume had the highest growth rate at 23 percent, but Singapore, Jakarta, Bombay, Seoul, Bangkok, and Hong Kong all grew at least 15 percent as

well. Mallorca and Vancouver showed growth rates of close to 20 percent, although each city's cargo traffic volume was lower than 200,000 metric tons in 1994.

The aggregate airport activity figures provided by the Airports Council International and used in this study do not distinguish between international and domestic traffic. However, it is logical to assume that the busiest traffic centers around the world are of the greatest significance to U.S. cities. Although the compatibility of U.S.-foreign city pairs depends on many other factors than sheer traffic volume, busier airports are likely to hold greater potential for multiple connections to diverse destinations beyond.

Table D-1. 1994 Passenger Traffic at Major Worldwide Traffic Centers*

City	Country	Total Passengers**
London	United Kingdom	72,940,010
Tokyo	Japan	*63,700,412*
Paris	France	55,297,779
Frankfurt	Germany	35,122,528
Seoul	Korea	27,333,627
Hong Kong	Hong Kong	25,948,788
Amsterdam	Netherlands	23,559,316
Osaka	Japan	*23,360,638*
Singapore	Singapore	21,644,677
Bangkok	Thailand	21,012,259
Rome	Italy	20,316,702
Mexico City	Mexico	18,889,620
Toronto	Canada	18,598,420
Madrid	Spain	18,427,332
Sydney	Australia	*16,580,110*
Manchester	United Kingdom	14,814,299
Zurich	Switzerland	14,538,695
Mallorca	Spain	14,142,035
Dusseldorf	Germany	13,995,344
Munich	Germany	13,497,041
Stockholm	Sweden	13,420,232
Taipei	Taiwan	13,349,468
Copenhagen	Denmark	13,329,327
Jakarta	Indonesia	12,664,575
Brussels	Belgium	11,342,172
Vancouver	Canada	11,065,751
Barcelona	Spain	10,642,663
Istanbul	Turkey	10,225,864
Milan	Italy	10,134,307
Bombay	India	9,955,867

Shading refers to the world region in which each city is located.

The Americas
Asia and the Pacific Rim
Europe and the Middle East

*1994 data not completely available at time of report preparation. *Italicized figures reflect 1993 passenger traffic.*

**"Total Passengers" refers to enplaned, deplaned, and transfer passengers at all international airports serving each city. For example, London, Paris, and Tokyo figures reflect passenger activity at multiple airports.

Foreign air service markets included in this table reported annual passenger traffic volume at or above 10 million passengers during 1993 and/or 1994. Sources: Airports Council International (1995 and 1994). *Worldwide Airport Traffic Report.*. Geneva: ACI. Compiled by the authors.

Table D-2. 1994 Cargo Traffic at Major Worldwide Traffic Centers*

City	Country	Total Cargo**
Tokyo	Japan	1,604
Frankfurt	Germany	1,402
Hong Kong	Hong Kong	1,309
London	United Kingdom	1,285
Paris	France	1,216
Seoul	Korea	1,029
Singapore	Singapore	1,027
Amsterdam	Netherlands	874
Bangkok	Thailand	590
Taipei	Taiwan	533
Osaka	Japan	*492*
Brussels	Belgium	395
Sao Paulo	Brazil	343
Zurich	Switzerland	337
Toronto	Canada	320
Rome	Italy	294
Manila	Phillipines	*289*
Cologne/Bon	Germany	265
Jakarta	Indonesia	256
Tel Aviv	Israel	243
Copenhagen	Denmark	234
Kuala Lumpur	Malaysia	*221*
Bombay	India	214
Madrid	Spain	211

Shading refers to the world region in which each city is located.

The Americas
Asia and the Pacific Rim
Europe and the Middle East

*1994 data not completely available at time of report preparation. *Italicized figures reflect 1993 cargo traffic.*

**"Total Cargo" refers to enplaned, deplaned, and transfer air freight, small package, and air mail traffic in thousands of metric tons at all international airports serving each city. For example, London, Paris, and Tokyo figures reflect cargo activity at multiple airports.

Foreign air service markets included in this table reported annual cargo traffic volume at or above 200,000 metric tons during 1993 and/or 1994. Sources: Airports Council International (1995 and 1994). *Worldwide Airport Traffic Report.*. Geneva: ACI. Compiled by the authors.

Table D-3. Growth Rates of Busiest Foreign Passenger and Cargo Markets - 1993-94

Rank	City	Percent Change in Total Passenger Traffic	1994 Total Passengers
1	Mexico City	24.6	18,889,620
2	Seoul	19.6	27,333,627
3	Tel Aviv	16.9	5,917,885
4	Jakarta	16.6	12,664,575
5	Mallorca	13.0	14,142,035
6	Bombay	11.5	9,955,867
7	Brussels	11.3	11,342,172
8	Manchester	10.7	14,814,299
9	Amsterdam	10.7	23,559,316
10	Bangkok	9.8	21,012,259

Rank	City	Percent Change in Total Cargo Traffic	1994 Total Cargo (1,000 metric tons)
1	Brussels	23.3	395
2	Singapore	21.7	1,027
3	Mallorca	21.0	17
4	Vancouver	19.2	182
5	Jakarta	18.4	256
6	Bombay	17.5	214
7	Seoul	17.4	1,029
8	Bangkok	16.6	590
9	Hong Kong	15.1	1,309
10	Paris	12.1	1,216

Shading refers to the world region in which each city is located.

The Americas
Asia and the Pacific Rim
Europe and the Middle East

Foreign air service markets included in this table reported annual passenger traffic volume at or above 10 million passengers and/or cargo traffic volume at or above 200,000 metric tons during 1993 and/or 1994. Sources: Airports Council International (1995 and 1994). *Worldwide Airport Traffic Report.*. Geneva: ACI. Compiled by the authors.

APPENDIX E

PASSENGER TRAFFIC BETWEEN THE U.S. AND FOREIGN COUNTRIES

Table E-1. Air Passenger Travel between the U.S. and Foreign Countries - 1992-1993.

World Region	Country	Total Passengers 1992	Total Passengers 1993	Percent Change
Europe	United Kingdom	10,895,731	11,688,000	7.3
	Germany	5,423,875	5,710,614	5.3
	France	3,695,345	3,636,022	-1.6
	Netherlands	2,003,990	2,447,022	22.1
	Italy	1,757,798	1,780,764	1.3
	Switzerland	1,091,557	1,196,236	9.6
	Spain	1,295,903	1,175,620	-9.3
	Ireland	884,593	905,734	2.4
	Belgium	712,471	780,275	9.5
	Denmark	561,148	556,362	-0.9
	Portugal	327,667	329,300	0.5
	Greece	296,038	314,544	6.3
	Sweden	343,291	292,487	-14.8
	Finland	219,171	251,394	14.7
	Iceland	173,203	201,969	16.6
	Poland	166,728	198,739	19.2
	Russia	145,114	189,809	30.8
	Austria	151,407	122,775	-18.8
	Czechoslovakia	50,231	53,785	7.1
	Hungary	13,404	36,347	171.2
	Bulgaria	13,171	29,384	123.1
	Romania	16,631	22,478	35.2
	Luxembourg	11,046	- 3,617	-67.3
	Norway	12,095	1,164	-90.4
Total		*30,280,760*	*31,924,441*	*5.4*
Far East	Japan	9,767,260	9,756,536	-0.1
	South Korea	1,857,976	2,031,285	9.3
	Taiwan	927,326	1,222,050	31.8
	Hong Kong	911,070	988,718	8.5
	Philippines	556,216	566,915	1.9
	Singapore	198,143	272,942	37.8
	China	105,581	146,062	38.3
	Thailand	147,066	116,621	-20.7
	Indonesia	109,783	111,130	1.2
	India	104,237	92,682	-11.1
	Malaysia	68,748	85,079	23.8
	Pakistan	16	266	1562.5
Total		*14,754,147*	*15,390,286*	*4.3*

World Region	Country	Total Passengers 1992	Total Passengers 1993	Percent Change
North America	*Canada*	*12,254,000*	*12,667,000*	*3.4*
Central America & Mexico	Mexico	8,932,753	9,149,023	2.4
	Guatemala	693,955	759,303	9.4
	Costa Rica	622,536	754,076	21.1
	El Salvador	422,053	480,914	13.9
	Panama	363,178	394,822	8.7
	Honduras	323,574	344,807	6.6
	Belize	180,644	190,021	5.2
	Nicaragua	156,677	172,205	9.9
Total		*11,695,370*	*12,245,171*	*4.7*
Caribbean	Bahamas	2,346,562	2,415,970	3.0
	Dominican Republi	1,832,232	1,975,921	7.8
	Jamaica	1,684,127	1,869,620	11.0
	Neth. Antilles	598,894	706,523	18
	Bermuda	621,301	682,530	9.9
	Aruba	613,230	671,804	9.6
	Cayman Islands	425,539	528,828	24.3
	Barbados	375,876	414,370	10.2
	Haiti	292,648	380,153	29.9
	Trinidad	296,511	354,171	19.4
	Antigua	328,013	336,195	2.5
	Br. Virgin Islands	188,692	208,444	10.5
	St. Lucia	124,365	147,595	18.7
	Turks/Caicos Island	86,244	114,663	33.0
	St. Kitts-Nevis	82,476	97,785	18.6
	Cuba	78,936	96,442	22.2
	Grenada	63,784	79,784	25.1
	Guadeloupe	58,206	64,349	10.6
	Anguilla	45,394	52,844	16.4
	Martinique	38,910	45,850	17.8
	Dominica	3,133	3,757	19.9
	Montserrat	1,626	860	-47.0
	St. Vincent	2,892	234	-91.8
Total		*10,189,591*	*11,248,692*	*10.4*

Source: Office of International Aviation (1995). *Air Passenger Travel between U.S. and all Countries for Calendar Year 1993.* Washington: U.S. Department of Transportation. Calculations by the authors.

Table E-1. Air Passenger Travel between the U.S. and Foreign Countries - 1992-1993 (continued).

World Region	Country	Total Passengers 1992	Total Passengers 1993	Percent Change
South America	Brazil	1,303,988	1,407,073	7.9
	Venezuela	1,140,636	1,293,941	13.4
	Colombia	666,891	741,532	11.2
	Argentina	544,356	675,187	24.0
	Ecuador	412,198	457,577	11.0
	Peru	382,804	444,455	16.1
	Chile	280,672	348,937	24.3
	Bolivia	122,899	127,920	4.1
	Guyana	71,057	82,494	16.1
	Paraguay	64,127	78,019	21.7
	Suriname	23,633	7,646	-67.6
	Uruguay	8,064	6,359	-21.0
	French Guiana	667	429	-35.7
Total		*5,021,992*	*5,671,569*	*12.9*
Oceania	Australia	1,206,554	1,179,615	-2.2
	New Zealand	553,752	529,893	-4.3
	French Polynesia	169,767	184,884	8.9
	Fiji	138,482	177,684	28.3
	Micronesia	88,699	101,019	13.9
	Cook Islands	24,223	22,293	-8.0
	Marshall Islands	19,623	20,158	2.7
	Tonga	10,566	2,321	-78.0
	Kiribati	1,523	2,287	50.0
	Nauru	952	1,096	15.1
	Papua/New Guinea	2,954	220	-92.5
Total		*2,217,095*	*2,221,473*	*0.2*

World Region	Country	Total Passengers 1992	Total Passengers 1993	Percent Change
Middle East	Israel	525,719	610,014	16.0
	Saudi Arabia	102,097	107,650	5.4
	Jordan	41,912	40,800	-2.7
	Kuwait	23,277	22,554	-3.1
	Turkey	16,672	22,959	37.7
Total		*709,782*	*803,977*	*13.3*
Africa	South Africa	48,908	101,382	107.3
	Egypt	74,522	71,866	-3.6
	Morocco	37,906	41,669	9.9
	Senegal	33,535	35,929	7.1
	Cape Verde	34,536	25,107	-27.2
	Nigeria	33,323	20,404	-38.8
	Ivory Coast	4,551	6,083	33.7
	Sao Tome	2,258	2,489	10.2
	Kenya	109	592	443.1
Total		*269,961*	*306,540*	*13.5*

	Total Passengers 1992	Total Passengers 1993	Percent Change
All Markets	***87,392,698***	***92,479,149***	***5.8***

Source: Office of International Aviation (1995). *Air Passenger Travel between U.S. and all Countries for Calendar Year 1993.* Washington: U.S. Department of Transportation. Calculations by the authors.