
LOGISTICS & THE RISE OF AEROTROPOLIS

by John D. Kasarda, CRE

More than a decade ago, futurist Alvin Toffler predicted that by the beginning of the 21st century one indisputable law would determine competitive success: *survival of the fastest*.¹ In Toffler's view, producing high-quality goods at competitive prices would still be necessary but no longer sufficient for commercial success. Speed and agility would take center stage, as industry increasingly emphasized accelerated development cycles; international sourcing and sales; flexible, customized production, and rapid delivery.

How right he was. During the 1990s, the most successful companies used advanced information technology and high-speed transportation to source parts globally, minimize their inventories, and provide fast and flexible responses to unique customers' needs, nationally and worldwide. They sought international partners, just-in-time suppliers, and sophisticated distributors and logistics providers. By combining flexible production systems with information systems that connected companies simultaneously to their suppliers and customers, firms reduced cycle times and customized their products to create additional value. They also offered the same speed and flexibility in the delivery process from the time the finished goods left the factory until they arrived at the customer's doorstep.

The rise of the Internet and e-commerce further heightened time-based competition. As late as 1995, sales through the Internet were essentially zero. By 1999, U.S. Internet-based business-to-consumer (B2C) sales had grown to nearly \$7 billion. According to Forrester Research, 166 million packages were shipped in 1999 by Internet retailers (e-tailers), with approximately 70 percent going by express delivery.²

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By 2003, e-tailers are expected to ship 1.1 billion packages annually, with overall global e-commerce approaching \$7 trillion in transactions in 2004.³

Most of this explosive growth is expected to be business-to-business (B2B), supply-chain transactions where materials and components will be ordered through the Internet and shipped to next-stage producers. Air cargo and air express have become the preferred modes of shipping and receiving of high value to weight B2B transactions such as microelectronics, automobile electronic components, mobile telephones, fashion clothing, pharmaceuticals, optics, and small precision manufacturing equipment as well as perishables such as seafood and fresh-cut flowers. The introduction of e-marketplaces (auctions, aggregators, bid systems, and exchanges) will greatly expand B2B e-commerce: Forrester Research predicts that e-marketplaces will account for up to three-quarters of B2B supply chain transactions by 2004.⁴

However, as many e-tailers discovered during the 1999 Christmas season, as valuable as the Internet is in generating sales, the Web cannot move a box. Order fulfillment frequently broke down, and the WWW—*worldwide wait*—cost e-tailers plenty.

To meet the imperative of speed in order fulfillment, e-commerce distribution centers are being built near airports that have extensive flight networks, a location trend that's sure to accelerate in the decades ahead. This will especially be the case at the nation's two air express mega hubs: Memphis International (FedEx) and Louisville (UPS). These gateway express airports actually extend the business day for e-commerce fulfillment by allowing shippers to take orders for next day delivery as late as midnight. Dozens of e-tailers have thus already located their fulfillment centers near Memphis International Airport including barnesandnoble.com, PlanetRx.com, Toysrus.com, and williams-sonoma.com. The same story holds for Louisville International Airport where such companies as Nike.com, Drug Emporium.com, and Guess? have sited e-commerce fulfillment centers.

Complementing these aviation-linked distribution centers are flow-through facilities for perishables (either in the physical or economic sense), just-in-time supply chain and emergency parts provision centers, and reverse logistics facilities for the repair and upgrade of high tech products such as computers and cell phones. The clustering of such time-sensitive goods facilities around airports is

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stimulating further expansion of air cargo, air express, less-than-load (LTL) trucking, freight forwarders, and third-party logistics providers along major arteries leading into and out of gateway airports. All of these functions and facilities are leveraging off of each other.

Speed and agility have become so critical to the new economy that air commerce is quickly becoming its logistical backbone. Forty percent of the value of world trade already goes by air, and the percentage is steadily rising.⁵ Further evidence that we have entered "the fast century" is offered by data showing that nearly two-thirds of all U.S. air cargo is transported via 24- to 48-hour door-to-door express shipments, with the FedEx hub at Memphis becoming the world's leading air cargo airport.⁶

Not only time-sensitive goods-processing and distribution facilities are being drawn to gateway airports. As our service economy also shifts into fast-forward, these airports are becoming magnets for corporate headquarters, regional offices, and professional associations that require officers and staff to undertake considerable long-distance travel. Airport access is likewise a powerful attraction to service-sector industries such as consulting, advertising, legal, data processing, accounting and auditing, and public relations, which often send out professionals to distant customers' sites or bring in their clients by air. Business travelers, overall, benefit considerably from access to major airports, which offer greater choice of flights and destinations, more frequent service, more flexibility in rescheduling, and generally lower travel-related

costs, (for example, hub airports make it easier to avoid the time and expense of overnight stays).⁷

With intellectual capital supplanting physical capital as the primary factor in wealth creation, time has taken on heightened importance for today's knowledge workers. So has the mobility of these workers over long distances. Research has shown that technology workers travel by air between 60 percent and 400 percent more frequently than those in the general workforce.⁸

Some observers have suggested that advances in Internet access, videoconferencing, and other distributed communications technologies will diminish the need for air travel. The evidence indicates that telecommunications advances often promote additional air travel by substantially expanding long-distance business and personal networking. Indeed, innovations in telecommunications technology have generated spatial mobility at least since the days of Alexander Graham Bell—whose first words over his newly invented telephone were “Watson, come here, I need you.”

URBAN ECONOMIC AND LAND USE IMPACTS

In an economy increasingly geared to speed, mobility, and global access, frequent and extensive air service has become essential to attracting major conventions, trade shows, and merchandise marts. Two facilities—Infomart and Market Center, both of which are located on the I-35 corridor between Dallas' Love Field Airport and the Dallas-Ft. Worth International Airport—offer examples of this attraction. Infomart is a huge, ultra-contemporary merchandise display building for telecommunications and information technology companies. Market Center—a cluster of six large buildings that contain nearly seven million square feet of display space for fashion clothing and home merchandise—is the world's largest wholesale merchandise mart. Hundreds of thousands of buyers and vendors fly into Dallas annually to conduct business at Infomart and Market Center. In 1999, the Market Center alone attracted buyers and vendors from all 50 states and 84 countries, who purchased 300,000 airline seats and filled 720,000 hotel rooms while conducting an estimated \$7.5 billion in wholesale transactions.

Clusters of high-tech facilities and information technology companies are likewise locating along major airport corridors, such as those along the Dulles International Airport access corridor in Northern

Virginia and the expressways leading into and out of Chicago's O'Hare International Airport. The experiences of Dulles and O'Hare are being replicated across the country, with airport scale becoming a primary predictor of an area's high-tech job growth.

Kenneth Button and Roger Stough conducted a comprehensive study of the impact of hub airports on employment growth in high-tech fields.⁹ Their multiple-regression analysis (which controlled for other factors that may affect high-tech job growth) covered all 321 U.S. metropolitan statistical areas (MSAs) and generated convincing results. Button and Stough showed that the presence of a hub airport in a MSA increases the number of high-technology jobs in the area by over 12,000, and their multiple-regression model explained over 64 percent of the variation among metropolitan areas in high-technology employment growth. Additional analysis revealed that the causal link between job growth and the level of airport services flowed from air transportation to the creation of high-tech employment, and not vice versa. This finding has been corroborated by research that the author and Michael D. Irwin conducted, demonstrating that airports have pervasive effects on overall metropolitan employment growth and that the causal relationship flows from extensiveness of air connections to employment growth.¹⁰

Across the U.S. and around the world, gateway airports are having dramatic effects on urban economies and land use. For example, Los Angeles International Airport (LAX) is responsible for over 400,000 jobs in the five-county Los Angeles region; 80 percent of which were in L.A. County, where one in 20 jobs was found to be tied to LAX. The airport currently generates \$61 billion in regional economic activity, which translates to \$7 million per hour.

Dallas-Ft. Worth International Airport has become the primary driver of Metroplex's fast-growing economy. The number of companies located within the dynamic Las Colinas area, just to the east of the airport, has expanded to more than 2,000 and includes Abbot Laboratories, AT&T, Exxon, GTE, Hewlett-Packard, and Microsoft.

In the 26-mile commercial corridor linking Washington, DC's two major airports—Reagan National and Dulles International—employment grew from 50,000 in 1970 to over 600,000 by 1996.¹¹ This represents a 1,100 percent increase: in contrast, overall U.S. employment growth during this period was 59 percent. Among the companies located along the

airport corridor are America Online, Computer Associates, Nextel Communications, Cisco Systems, and EDS.

In the Philippines, Subic Bay Freeport is rapidly expanding around a former U.S. naval air base that was converted to commercial use in 1993. Since FedEx located its Asia/Pacific hub at Subic Bay in 1994, over 150 firms—employing 40,000 workers—have located there, generating almost \$2.5 billion in investment. Between 1994 and 1999, the annual value of exports from Subic Bay jumped from \$24 million in to \$559 million. In late 1998, Acer opened its largest personal computer assembly facility in the world at Subic Bay; the facility relies heavily on air freight for its supply-chain management.

By 1997, nearly 50,000 people (the traditional city size threshold for U.S. metropolitan status) were employed on the airport grounds at Amsterdam's Schiphol Airport, a 7.2 percent increase over the previous year. In 1998, nearly half of the 547 companies linked to Schiphol grew—compared with 31 percent in 1995. Schiphol alone accounts for 10 percent of the European air cargo market and 1.9 percent of Netherlands' GNP; the airport forecasts that by 2015, it will generate 2.8 percent—approximately \$14 billion.

The impact of airport-induced job growth on land use in the vicinity of airports is substantial. An analysis of employment growth in the suburban rings of U.S. metropolitan areas showed that areas within four miles of airports added jobs two to five times faster than the overall job-growth rate of the suburban ring within which the airport was located. Most of the employment was concentrated around the airport or along a major access corridor within 15 minutes of the airport.¹²

THE RISE OF THE AEROTROPOLIS

Emerging corridors, clusters, and spines of airport-induced businesses are giving rise to new urban forms as much as 15 miles from major airports. These represent the beginnings of the aerotropolis. In response to the new economy's demands for speed and reliability, the aerotropolis is based on low density, wide lanes, and fast movements. In other words, form is following function.

Although aerotropolises have so far evolved largely spontaneously—with previous development creating arterial bottlenecks—in the future they will be improved through strategic infrastructure planning. For instance, dedicated expressway links (aerolanes)

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and high-speed rail (aerotrains) will efficiently connect airports to nearby and more distant business and residential centers. Special truck-only lanes will likely be added to airport expressways, as well. Seamlessly connected multi-modal infrastructure will accelerate intermodal transfers of goods and people, improving logistic system effectiveness and further influencing business location and resulting urban form.

The metric for determining commercial real estate value (and corresponding urban structure) will be time-cost access to the airport. Firms of various types will bid against each other for accessibility predicated on the utility each gives to the related combination of time and cost of moving people and products to and from the airport. Land value will no longer be measured by traditional bid-rent functions that decline linearly with spatial distance from the primary mode (here, the airport), but by speed to the airport from alternative sites via connecting highways and rail arteries.

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Air-commerce clusters and spines are already taking on distinct spatial form around gateway airports such as Miami International, New York's Kennedy, LAX, London's Heathrow, Paris's Charles

de Gaulle, and Amsterdam's Schiphol. In the United States, even smaller, specialized air-cargo airports—such as Alliance Airport, near Ft. Worth, Texas, and Rickenbacker Airport, in Columbus, Ohio—are generating mini-aerotropoli in the form of low density cluster and spine development. Commercial real estate development surrounding Southern California's Ontario Airport—which cornerstones the Inland Empire logistics complex 40 miles east of Los Angeles—offers an excellent contemporary illustration of an aerotropolis in evolution. Over 12 million square feet of distribution space was added in 1999 adjacent to the airport and along I-10 and I-15 radiating from it. As of mid-2000, another 10 million square feet was on the way. Moreover, the size of Inland Empire distribution facilities has dramatically increased from an average of 200,000 square feet in 1985 to over 500,000 square feet in the late 1990s, with some facilities in the 800,000 to 1 million square feet range.¹³

In Brazil, one can observe an emerging aerotropolis centered around Viracopos International Airport in Campinas, located 60 miles east of Sao Paulo, where high-tech manufacturing, distribution, and logistics industries are clustering. Viracopos will likely become the air cargo and e-commerce fulfillment center of South America over the coming decade with aviation-driven urban form resulting from these logistic and high-tech clusters radiating outward from the airport.

Aerotropoli are also emerging in distinct patterns around new international airports in Asia. One example is Lantau Island, where the newly opened Hong Kong International Airport is spawning highly visible business and residential clusters directly linked to the airport. In late 1999, the Walt Disney Company announced that it would locate its third international theme park (Hong Kong Disneyland) on Lantau Island to take advantage of the international airport and its high-speed rail and expressway links to Hong Kong. This siting decision is not unlike those Disney made earlier for Tokyo Disneyland, near Narita International Airport, and EuroDisney, near Paris's Charles de Gaulle Airport.

A major planned aerotropolis is under development at Incheon, Korea, where the government is creating a 24-hour aviation city on Yongjong Island, about 40 miles west of downtown Seoul. The new international airport (scheduled to open in 2001) will anchor an expansive urban agglomeration composed of commercial, industrial, residential, and tourism sectors. Its centerpiece will be Media

Valley, Korea's version of Silicon Valley. Designed as a center for global high-tech industries, Media Valley is being constructed adjacent to the airport on a 3.6-million-square-meter site that will include a large techno-park and a university research center.

As of mid-1999, 625 companies—including 49 companies from Canada, Israel, Japan, The Netherlands, Taiwan, and the United States, among others—had submitted letters of intent to move into Media Valley. Arthur D. Little predicts that by 2003, a total of 1,300 companies will be located in Media Valley's campus-like setting, and by 2005 slightly over 2,000.¹⁴

A new town is being developed to serve as a residential base for those employed at Media Valley and in other sectors of this emerging aerotropolis. Dedicated expressways will give both Media Valley employees and the new town residents high-speed access to Incheon Airport.

By 2004, the airport, (currently over 90 percent complete), will be complemented by a seaport and a teleport now under construction. The plan is to form a consolidated "triport" for 21st-century transportation, distribution, and information processing.

An even more ambitiously planned aerotropolis radiates northward from the Kuala Lumpur International Airport in Malaysia. This massive new airport will provide the aviation foundation for Malaysia's Multimedia Super Corridor (MSC), a high-tech government, commercial, education, and residential zone about the size of the city of Chicago. Promoted internationally as the future information technology center of Asia, MSC will contain two new cities (Putrajaya, the relocated government capital, and Cyberjaya, or Cyber-city, each of which will house about a quarter of a million residents), along with a multi-media university to train IT workers. MSC's advanced infrastructure will be complemented by laws and policies designed to create the ideal commercial environment for developing and merging 21st-century audio, video, and data transmission technologies.

REAL ESTATE COMMUNITY RESPONSES

Hong Kong's Lantau Island, Korea's Incheon-Aviation City, and Malaysia's Multi-media Super Corridor demonstrate that gateway airports will be the cornerstones of dynamic new forms of 21st-century urban development. The commercial real estate

community has already begun to take serious notice and respond. For example, both the Trammell Crow Company and Hines have established airport property divisions as new units in their corporate structures. The Perot Group spun off Hillwood Development to focus on maximizing real estate returns on the 16,000 acres linked to its successful Alliance Industrial Airport and associated Hillwood Strategic Services to replicate the Alliance model elsewhere.

Real estate investment trusts such as Prologis and AMB are likewise giving primary emphasis to airport-linked logistics and distribution properties. In fact, AMB is disposing of much of its traditional warehousing and retail properties to focus its investments on high velocity flow-through distribution facilities near America's largest airports. At the same time, specialized commercial real estate companies including International Airport Centers, headquartered in Birmingham, Michigan, are concentrating on building business and distribution parks around the nation's top airports while firms such as DAMG of New York are introducing innovative public/private financing instruments to develop air cargo airports (e.g., San Diego Air Commerce Center) and commercialized cargo complexes of existing airports (e.g., Denver International). Finally, even multi-national engineering and construction enterprises such as Bechtel are establishing subsidiaries (Alterra Partners, headquartered in London) to purchase privatizing airports around the globe and develop adjoining real estate. These firms and others understand the powerful role that logistics, in general, and air commerce, in particular, will play in business strategy and location in the 21st century. They are placing their commercial real estate bets accordingly.

CONCLUSION

Gateway airports will be as important to business location and urban development in the 21st century as automobiles and trucks were in the 20th century, railroads in the 19th century, and waterborne transport in the 18th century. While multiple transportation modes will continue to shape metropolitan growth, substantial evidence is accumulating that major airports are generating concentrations of commercial activities that are leading to a new aviation-linked urban form—the aerotropolis. Real estate professionals who recognize this megatrend can select strategic sites near gateway airports and position investment to be leveraged by air commerce. Planners and developers who design and build infrastructure and facilities that are consistent with

the new form and function of the aerotropolis can contribute substantially to the economic competitiveness of urban areas and to the emerging needs of business. ^{REI25}

NOTES

This article is adapted from "Aerotropolis," an article which appeared in the Urban Land Institute's publication, *ULI on the Future: Cities in the 21st Century*, (Washington, DC: September, 2000).

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