

Aerotropolis

John D. Kasarda

The University of North Carolina at Chapel Hill

John_Kasarda@unc.edu

Abstract

The aerotropolis is a new urban form that relies on an airport and its integrated surface transportation infrastructure to speedily connect high-value, time-sensitive firms to their distant suppliers, customers, and enterprise partners. It consists of a multimodal airport-based commercial core (Airport City) and outlying corridors and clusters of aviation-linked businesses and associated mixed-use commercial/residential developments that feed off of each other and their accessibility to the airport. The competitive advantages of the aerotropolis along with its key components, planning principles, critiques, and counterpoints are discussed.

Keywords

Aerotropolis, airport city, competitiveness, globalization, sprawl, urban planning

An aerotropolis is a metropolitan subregion whose infrastructure, land-use, and economy are centered on an airport. Similar in shape to the traditional metropolis made up of a central city commercial core and its outlying commuter-linked suburbs, the aerotropolis consists of a multimodal airport-based commercial core (Airport City) and outlying corridors and clusters of aviation-linked businesses and associated residential developments that feed off each other and their accessibility to the airport.

The airport city portion of the aerotropolis is often viewed as confined to airport property. This gives a clean definitional break to the aerotropolis's two main geographic components. But, just as central cities did not stop growing at their political boundaries, airport cities frequently spill over airport boundaries. Thus, the airport city is also designated in terms of commercial development on the airport and its contiguous areas, similar to the U.S. Bureau of Census definition of urbanized area meant to capture the more-complete metropolitan core unit.

Likewise, the outer boundaries of the aerotropolis are not set by jurisdictional borders or even distance, but by the connectivity time of aviation-linked businesses and businesspeople to the airport. No concrete, agreed-upon connecting time measure has been established, although a 20- or 30-minute radius has been used to set outer boundaries in some aerotropolis master plan studies.

The aerotropolis can be further designated in terms of three analytically separable, but interdependent elements that make up its functional form, spatial form, and connections and linkages. Aerotropolis functional form is largely non-spatially defined and often unobservable. It consists of firms and frequent air travelers who may be widely dispersed throughout a metropolitan region or clustered at a substantial distance from the airport – think of the Canary Wharf financial district in London and

Heathrow Airport or New York’s Lower Manhattan and JFK Airport – but rely heavily on the airport for business purposes.

Aerotropolis spatial form consists of physically observable development on and around the airport and along its connecting surface transportation corridors. Corridors of development can stretch up to 20 miles or more from the largest hub airports with the main aerotropolis corridor typically between the airport and the central city.

Connections and linkages afforded by the aerotropolis’s internal and externally oriented transportation infrastructure integrate its spatial and functional forms, shaping land use and operational efficiencies. Highways, rail arteries, surface connections to ports, and air routes provide the skeleton for aerotropolis mobility and connectivity, upon which its business muscle is attached.

In the aerotropolis model, time and cost of connectivity supersede space and distance as the primary planning metrics. It is not how far, but how fast aerotropolis firms can connect to their suppliers, customers, and enterprise partners locally, nationally, and globally. A well-designed aerotropolis functions as an “urban pipe” reducing the time-cost frictions of space and distance, increasing both firm and regional operational efficiency.

The impact of this urban pipe on metropolitan region trade in time-critical goods and business services is accelerated and broadened through expanding airline routes. Domestic and international air routes coalesce into aviation’s World Wide Web, operating as a “physical Internet” to move products and people quickly over long distances, analogous to the way the digital Internet moves data and information (See Figure 1). The routers of this physical Internet are hub airports that anchor and sort growing airborne flows of high-value products and high-value people. These include everything and everybody from sushi-grade tuna, biomed, and smartphones to investment bankers, international corporate lawyers, and foreign tourists.

Figure 1: Analogous Components of the Digital and Physical Internets

The Digital Internet		The Physical Internet
Electronic Networks	↔	Aviation Networks
Routers	↔	Hub Airports
Computers and Workstations	↔	Firms and Workers
Rapid Data and Information Transfer over Long Distances	↔	Rapid Product and People Transfer over Long Distances

Hub airports and their surrounding areas serve as the concrete interfaces where the global meets the local in international people and product flows. Their dual roles as airline network routers and global-local interfaces are making these airports and their environs business magnets and urban economic catalysts as they attract, sustain, and grow aviation-dependent firms.

Firms in the high-tech and advanced manufacturing sectors, for example, are often more dependent on suppliers and customers halfway around the world than those in their own metropolitan region. By providing these firms with proximity to speedy long-distance connectivity, the aerotropolis

helps them raise product quality while cutting costs (via timely access to the widest variety of inputs at the lowest price) and expand market reach, thereby improving their competitiveness and performance in the international division of labor.

Global e-commerce, spurred by the fusion of the net age with the jet age, particularly benefits from aerotropolis location. Good airport access offers e-commerce firms “economies of speed”, which have become as important as economies of scale or economies of scope for many in this and other business sectors where time is not just cost, but currency as well.

The aerotropolis also contains the full set of logistics and commercial facilities that support aviation-dependent businesses, cargo, and millions of air travelers who pass through the airport annually. Included here, among others, are freight-forwarding and third-party logistics (3PL) providers; distribution facilities for pharmaceuticals, perishables, and other time-sensitive products; hotels, medical, convention, and exhibition complexes; and office buildings along with shopping, dining, and leisure venues.

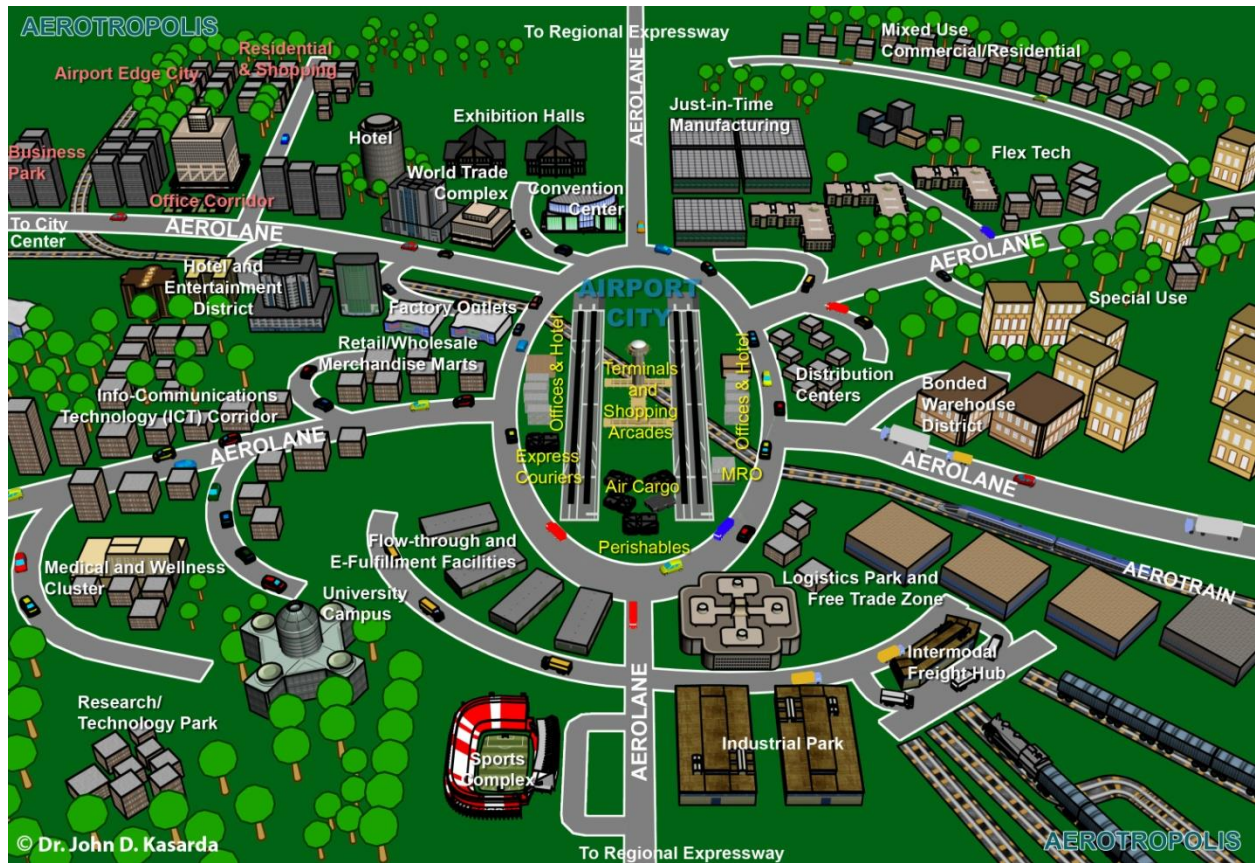
In addition, the aerotropolis attracts and sustains a range of advanced business service firms whose executives and professionals frequently travel to distant sites or who bring in their clients by air for short-term meetings. These firms, referred to as producer service firms, include such sectors as auditing, architecture and engineering, consulting, corporate law, international finance, and marketing.

Corporate headquarter functions are likewise gravitating to airport areas, either in their own office complexes or by using airport area hotels as virtual corporate headquarters where widely dispersed executives fly in for sales meetings, client contacts, board meetings, and high-level decision-making. This optimizes dispersed executives’ long-distance connectivity while minimizing their local ground transport times and costs.

As increasing numbers of aviation-oriented businesses and their associated residential developments cluster in the vicinity of airports, they are creating new urban growth poles. Some of the largest aerotropolis clusters – such as Amsterdam Zuidas, 7 minutes from Schiphol Airport; Las Colinas, Texas, just east of DFW; Songdo International Business District near South Korea’s Incheon International Airport; and the Zhengzhou (China) Airport Economic Zone – have become globally significant. Amsterdam Zuidas, for instance, houses the headquarters of international banking giants ABN AMRO and ING. Las Colinas hosts the world headquarters of nine of the Fortune 1000 corporations, while Songdo International Business District is the home of the United Nations Green Climate Fund. The Zhengzhou Airport Economic Zone is currently the world’s largest single site for smartphone production. Foxconn (Apple’s original equipment manufacturer) assembled over 100 million iPhones there in 2016, representing 70% of all iPhones sold globally. More than a dozen other smartphone manufacturers produced another 150 million handsets in the airport economic zone that year.

A compressed schematic of the Aerotropolis with its airport city core is shown in Figure 2. No aerotropolis will look exactly like this rendering, but many will eventually take on similar features, led by newer “greenfield” airports on metropolitan peripheries, much less constrained by prior decades of surrounding development. But even around major airports where old industrial development still predominates, transition to more modern aerotropolis economic functions is slowly occurring.

Figure 2: Compressed Aerotropolis Schematic with Airport City Core



The aerotropolis is thus much more a dynamic, forward-looking concept than a static, cross-sectional model where present form often primarily reflects historic nearby development, well before aviation and airports took on their current business attraction and support functions. Globalization, along with the need for speed, will continue to attract modern aviation-oriented business investment to airport areas. This will challenge cities and metropolitan regions to effectively plan their aerotropolises in order to bring about the greatest positive returns to the airport, its users, businesses, surrounding communities, and the larger region the airport serves.

Optimal outcomes are not likely to occur under most current airport-area planning approaches, which are fragmented into various planning domains and local jurisdictions, and face conflicting stakeholder interests. Many also face significant social challenges posed by endogenous settlements and their residents. Getting the aerotropolis right is a formidable, complex task that requires aligning a broad range of stakeholders and integrating business site planning, airport planning, and urban planning so that they are reconciled to one another and reinforcing.

More specifically, aerotropolis integrated planning requires reconciling and synergizing the business site and profitability objectives of individual firms making capital investments; airport and surface transportation planning objectives of ensuring maximal access to the airport and business sites at minimal time and cost; and the urban planning objectives of economic efficiency, livability, and environmental sustainability (Kasarda and Appold 2014). Regarding transportation planning, aerotropolis planning also includes designing systems for efficient, secure cargo logistics and for efficient, safe personal mobility.

Figure 3 illustrates the ring of aerotropolis integrated planning, which encompasses airport, urban, and business site planning domains. Aerotropolis planning is unique in that business, urban, airport, and surface transport objectives are addressed together to foster personal and logistics mobility along with economically and socially desirable development. Such integrated planning is necessary if the full set of benefits for aerotropolis firms and places are to accrue. Aerotropolis integrated planning can also serve as an antidote to the congestion, sprawl, and unsightliness that frequently results from organic, haphazard development around airports, detracting from the airport area's operational efficiency and image while generating community conflicts.

Figure 3: The Ring of Aerotropolis Integrated Planning



Aerotropolis Critiques and Counterpoints

The aerotropolis model and its development processes have not been without critics, who raise a number of environmental, social, and technological issues, which they contend undermine the model's longer-term viability. Environmental critiques focus on "peak oil" (when oil production is surpassed by demand) that will constrain the future of aviation upon which the aerotropolis model relies; aviation's carbon emissions and its impact on climate change; and the loss of farmlands, forests, and green space, resulting from aerotropolis-induced urban sprawl.

Social critiques mirror many of those directed at suburbanization in decades past. In addition to the human consequences of sprawl, critics point to a lack of neighborhood vibrancy, architectural character, and urban ambience in aerotropolitan communities, which they characterize as boring, soulless places with limited walkability and street life. Aircraft noise, detracting from livability, is frequently mentioned as well.

Technological critiques contend that improvements in video conferencing and other telecommunications advances will diminish future business travel and possibly even leisure air travel. Aerotropolis critics further note the emergence of 3D printing technologies that could reduce the need for air cargo shipments of time-critical parts, components, and finished products, thereby eliminating the value of airport proximity. They also point to the prospects of high-speed rail substituting for air travel as a desired and likely future outcome.

All these critiques have intuitive appeal and should be considered in assessments of the aerotropolis model. Yet, each has counterpoints that should be considered as well. Regarding peak oil, there is no consensus on when it will be reached with models pushing it further and further out as additional sources of oil and other fossil fuels are discovered and new techniques for energy resource extraction and energy generation emerge (Institute of Mechanical Engineers 2012). In the meantime, aircraft continue to improve with lighter composite materials, more fuel-efficient, lower-carbon-emitting engines, and the introduction of alternative propellants, such as biofuels. According to the World Resources Institute, air transport was responsible for about 2% of global greenhouse gas emissions in 2005 (Herzog 2009). Biofuels and other aeronautical advances may bring this percent down in future decades, even with anticipated strong growth in air transport.

Reducing sprawl via cluster development with green space between is an aerotropolis planning objective (see www.aerotropolis.com). Clustering around outlying airports represents suburban re-densification, a long-sought objective of urban planners. And loss of farmland appears less of an issue with agricultural productivity gains so great that some governments pay huge annual subsidies to keep existing farmland out of production to shore up commodity prices. In fact, there may be a surplus of farmland and green space in many countries. In the United States, for example, less than 5% of the nearly 2.3-billion-acre U.S. land mass was developed in 2007, including 89 million acres of urban and built-up areas and 22 million acres devoted to highways, railways, and airports in rural America. This compares to 671 million acres (30%) in forestland; 614 million acres (27%) in grassland pasture and rangeland; 408 million acres (18%) in cropland; and 313 million acres (14%) primarily in preserved rural parks and wildlife areas (Nickerson et al. 2011).

Social critiques of aerotropolis mixed-use residential/commercial clusters for their lack of architectural character, neighborhood vibrancy, walkability, livability, and urban ambience are more community design issues than inherent shortcomings of the aerotropolis model, which its prescribed integrative planning approach is meant to address. The aerotropolis typically covers an expansive subregion, offering planners and architects opportunities to lay out and design future mixed-use aerotropolis clusters outside high-aircraft-noise contours that are physically and socially appealing (and more sustainable), utilizing new urbanism concepts and smart growth principles. Aerotropolis development and smart urban growth that is environmentally, resident-, visitor-, and worker-friendly are not necessarily inconsistent; they can and should go hand in hand. The same can be said for fostering improved matches between the new aerotropolis economy and endogenous airport-area workforces and economies through upgrading local labor skills and community projects that generate their own social and/or economic appeal to air travelers. This is not meant to understate the challenges of integrating such objectives into a comprehensive aerotropolis development strategy.

As to advances in telecommunications substituting for air travel, some of this will no doubt occur. Throughout modern history, though, every significant advance in telecommunications technology has been accompanied by, or has even stimulated, greater human mobility over longer distances. Today's social networking technologies are leading to mushrooming digital connections worldwide among people with common interests, many of whom are separated by hundreds, if not

thousands, of miles. Should only a miniscule fraction of these distant digital friends text “let’s get together”, air travel will receive a considerable boost.

3D printing is an emerging technology that holds excellent promise to eliminate the need for shipping certain types of products. This technology is in its early stage, however. By the time it matures to significantly reduce such shipments, heretofore unrecognized economic sectors that heavily rely on air transport will likely appear, as did global e-commerce in our most recent past decade.

Finally, it has been found that high-speed rail can partially substitute for air travel between urban concentrations up to 500 miles. It appears to have little substitution effect for longer distances and is not a realistic means of intercontinental (global) connectivity, a key component of the aerotropolis model. The world’s leader in high-speed rail development, China, is also the world’s leader in aviation growth and aerotropolis development. High-speed rail is expanding major airport passenger catchment areas, further stimulating their air traffic, while airport-linked rail stations are reinforcing airport city and aerotropolis development.

The bottom line is that reasoned critiques of aerotropolis development and their counterpoints can contribute to healthy debate in urban and regional studies. Central to debate and further study is addressing the extent to which 21st-century globalization is manifested and accelerated by aviation-linked urban forms and functions, along with the challenges and opportunities such aerotropolis development presents to people, firms, communities, regions, and nations.

References

Kasarda, John D., and Stephen J. Appold. 2014. “Planning a Competitive Aerotropolis.” In *Volume 4: The Economics of International Airline Transport*, edited by James H. Peoples, Jr., 281-308. Bingley, England: Emerald Group Publishing Limited.

Herzog, Tim. “World Greenhouse Gas Emissions in 2005.” Working Paper, World Resource Institute, 2009. http://www.wri.org/sites/default/files/world_greenhouse_gas_emissions_2005.pdf (accessed January 24, 2016).

Institute of Mechanical Engineers (2012). ‘When will oil run out?’ Available at: <http://www.imeche.org/news/features/all/less-cause-to-panic-about-oil-running-out>

Nickerson, Cynthia, Robert Ebel, Allison Borchers, and Fernando Carriazo. *Major Uses of Land in the United States, 2007*, EIB-89, U.S. Department of Agriculture, Economic Research Service, December 2011.

Suggested Readings

Charles, Michael B., Paul Barnes, Neal Ryan, and Julia Clayton. “Airport futures: Towards a critique of the aerotropolis model.” *Futures* 39, no. 9 (2007): 1009-1028, doi:[10.1016/j.futures.2007.03.017](https://doi.org/10.1016/j.futures.2007.03.017).

Freestone, Robert, and Douglas Baker. “Spatial planning models of airport-driven urban development.” *Journal of Planning Literature* 26, no. 3 (2011): 263-279, doi:[10.1177/0885412211401341](https://doi.org/10.1177/0885412211401341).

Kasarda, John D., and Lindsay, Greg. 2011. *Aerotropolis: The Way We’ll Live Next*. New York: Farrar, Straus and Giroux.

Kasarda, John D. McGraw Hill Financial Global Institute. *Gateway Airports: Commercial Magnets and Critical Business Infrastructure*. 2014. <https://media.mhfi.com/documents/MHFIGI-Gateway-Airports-Updated.pdf> (accessed January 24, 2016).

Peneda, Mauro, Vasco Reis, and Maria Macário. "Critical factors for development of airport cities." *Transportation Research Record: Journal of the Transportation Research Board* 2214 (2011): 1-9, doi:[10.3141/2214-01](https://doi.org/10.3141/2214-01).

United States Government Accountability Office. *National Airspace System: Airport-Centric Development*. GAO-13-261. Washington, D.C.: US Government Printing Office, 2013. <http://www.gao.gov/assets/660/653427.pdf> (accessed January 24, 2016).

Author Mini-Biography

John D. Kasarda, PhD, directs the Center for Air Commerce at the University of North Carolina's Kenan-Flagler Business School and is President of the Aerotropolis Institute China. He has published more than 100 articles and 10 books on airport cities, urban economic development, and competitiveness. Amongst his more recent books is *Aerotropolis: The Way We'll Live Next* (co-authored with Greg Lindsay), which *Time* magazine highlighted in 2011 as one of "10 Ideas that Will Change the World".