AN INDUSTRIAL/AVIATION COMPLEX FOR THE FUTURE

John D. Kasarda

Commercial real estate development has always thrived on accessibility and taken advantage of changes in transportation technology. America's first great commercial centers grew up around seaports. Rivers and canals provided accessible locations for the cities that formed the backbone of America's industrial revolution.

Railroads sparked the third wave of commercial development, opening up the interior to manufacturing and trade. Major centers of goods processing and distribution emerged at rail hubs. Atlanta, for example, today the South's largest commercial center, started out as a railway hub known as Terminus.

The fourth wave of development in the United States was spawned by the shift to cars and trucks to move people and goods. Freeways, beltways, expressways, and interstate highways made possible a massive deconcentration of economic activity. Major commercial centers sprouted in suburban areas, and many rural communities located along the interstates received a shot of new economic life. On the other hand, communities that remained isolated stagnated.

The United States is now entering a fifth developmental era, in which foreign markets and foreign sourcing will play increasingly dominant roles, and the speed of production and distribution will become a critical competitive factor. In this era, aviation and airports will ultimately supplant seaports, rail hubs, and highway systems as the primary generators of jobs and wealth.

Ushering in this era are three irreversible and complementary business forces:

- the globalization of economic transactions,
- new manufacturing methods that allow customization and cut production and delivery times, and
- a growing need to ship products by air.

For U.S. regions, developmental success in the coming airport-centered decades will require vision today to put in place investment policies that recognize the pivotal role that aviation will play in commercial growth.

In North Carolina, an examination of ways these forces might affect the state's economy has led the University of North Carolina's Kenan Institute of Private Enterprise to formulate a concept for a global air cargo/industrial complex, which would provide a competitive edge in attracting new commercial development. The Federal Aviation Administration has awarded a $350,000 grant to assess the feasibility of such a complex, and the study by teams of aviation industry consultants now is underway.

The Aviation-Era Economy

Globalization. Huge volumes of raw materials, product components, and finished products flow across international borders every day. U.S. exports and imports more than doubled during the 1980s, and reached $1.3 trillion in 1990. Total world trade has surged to $4 trillion per year. Investment abroad by U.S. multinational corporations has likewise mushroomed, reaching $1.3 trillion in 1990.

The growing interdependence of world markets is reflected not only in the volume of international trade and multinational corporate activities, but also in international information flows and financial transactions. Between 1977 and 1987, telephone calls to and from the United States, the vast majority for business purposes, increased from 300 million minutes to nearly 5 billion minutes, a rise of well over 1,000 percent.

Japanese, German, and Dutch banks have become the chief underwriters of U.S. Treasury bonds and financiers of large commercial real estate projects in the United States and around the world. In 1990, the daily volume of foreign exchange trading exceeded $600 billion.

Perhaps nowhere is the new global economy more concretely manifested than in the dramatic rise of global component sourcing. Somewhat less than a decade ago, Ford introduced the world car: it was assembled in Detroit from parts produced on each of the inhabited continents. Today, global sourcing is commonplace.

Advanced telecommunications and transportation technologies allow a wide geographic dispersion of component manufacturing and product assembly in accordance with raw material availability, labor costs, and markets. A personal computer assembled at IBM's Research Triangle Park, North Carolina, facility is likely to contain integrated circuits imported from Japan, a power sup-

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ply unit from Singapore, microprocessors from Korea, disk drives from Malaysia, and a glass screen from Taiwan.

Just-in-Time Methods. A multitude of new foreign competitors puts pressure on U.S. manufacturing firms to reduce costs and increase productive efficiency. Global sourcing is one widespread cost-reduction mechanism. Another is "just-in-time" (JIT) production, distribution, and inventory control methods. Under a JIT system, all elements in the value chain, from raw material acquisition to the delivery of finished products, are synchronized to produce and deliver finished products precisely as needed, thus virtually eliminating the need for inventories.

Inventory carrying costs as a share of the total cost of production and distribution of many products have been growing. According to Business International Corporation, the proportion of total distribution costs for U.S. businesses that goes to maintaining inventory has doubled during the past decade. Early delivery raises warehousing and inventory expenses, while late delivery results in costly interruptions of production schedules or missed sales opportunities. The new economy will place a premium on manufacturers acquiring materials and producing and delivering finished products in a highly synchronized, timely fashion.

The cost-conscious transition to JIT systems is also necessitated by rapid changes in consumer tastes. Marketing research indicates that changes in demand for products are much more sudden than in previous decades, and will become more so in the decades ahead. Products that are "hot" one month may be obsolete the next. Manufacturers can no longer produce large batches of standardized goods for relatively stable markets. They need to

Legend

1. Just-in-Time Manufacturing Plants (JIT)
2. Air Freight Systems
3. Central Distribution Terminals (CDT)
4. Central Facilities with Unit Load Devices (ULD)
5. Container Storage Areas (SLOTS)
6. Electronic Transport Vehicle Corridors (ETV)
7. Critical Inventory Replacement Warehouse
8. Global Air Cargo Anchor Companies
9. High Speed Monorail/ People Mover
10. Aircraft Maintenance Hangars
11. Office/Support Complex
12. Commercial Aviation Service
13. Regional Transit Hub

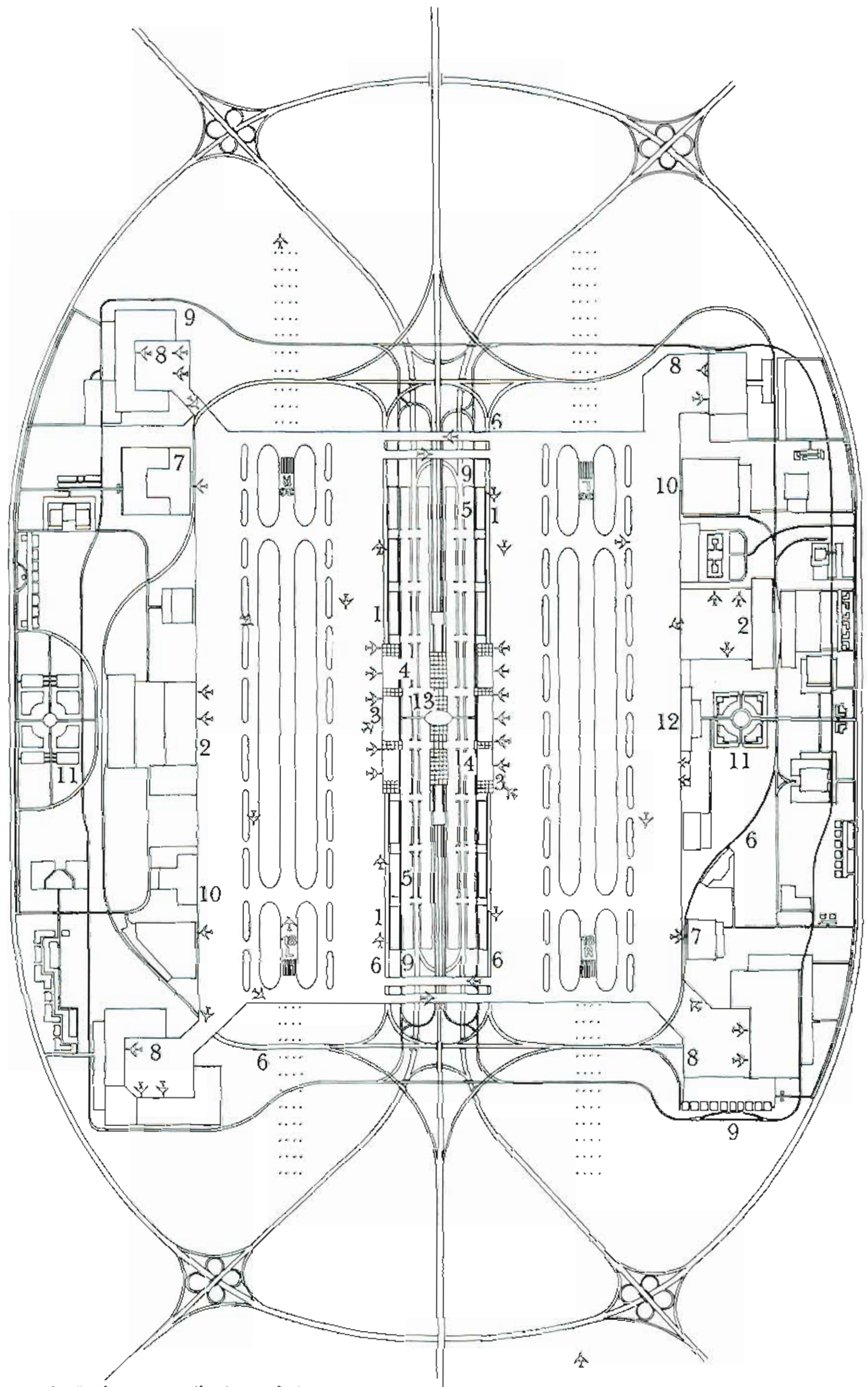

Illustration prepared by Envirotek, Inc.

A global air cargo/industrial complex.

customize production on short notice to respond quickly to sudden shifts in demand. JIT systems incorporating flexibility and speed will be imperative to compete successfully.

The Fast Century. With international transactions, production flexibility, and speed characterizing the new economy, air cargo will play an increasingly important role. No other means of transportation better satisfies globalized just-in-time logistics—logistics requiring that producers receive and ship smaller quantities more frequently, more quickly, over long distances.

Already air freight accounts for more than one-third of the value of U.S. products exported, a share that will surely rise in the years ahead. International air cargo shipments are projected to grow at least 7 percent annually during the 1990s, with the booming Pacific Rim routes generating double-digit annual growth rates throughout the decade.

Most of this cargo will continue to be shipped in the bellies of passenger planes, with some Boeing 747s carrying as much as 35 tons of cargo along with their passenger loads. So important has international aviation become that the Boeing Company alone has some 2,000 aircraft on back order, including over 300 of its 747s and 200 of its 767s. Yet, because air cargo is growing so much faster than passenger transit, hundreds of passenger planes are being converted to all-cargo carriers, including numerous 747s. New orders for all-cargo aircraft, known as freighters, are likewise rapidly rising, with Boeing expected to sell at least 125 of its 747-400 freighters—the largest U.S.-produced airplane with a cargo capacity of well over 100 tons—during the 1990s.

When speed of delivery and production flexibility were less crucial to competitive success, air freight was considered a luxury. It was limited primarily to small lightweight, compact products with high value compared with weight, or to emergency long-distance items.

Today, essentially anything that can be loaded onto a large aircraft is routinely shipped internationally by air—from automobiles and heavy machinery to high-tech equipment, textiles, furniture, pharmaceuticals, live cattle, bulk seafood, poultry, and agricultural products. Moreover, air freight is creating entirely new industries with its ability to deliver highly perishable goods, such as fresh-cut flowers, to distant markets within hours.

The next generation of freighters will be similar to the Soviet Antonov 225, the world's largest aircraft, which was the darling of the 1989 Paris Air Show. The size of an ocean liner, this cargo plane is 290 feet long, has a 100-yard wingspan and a 32-wheel landing gear, and can carry a payload of 250 tons thousands of miles. Hypersonic planes on the drawing boards will be able to carry products from the U.S. East Coast to Europe in less than two hours and to the Pacific Rim in less than three hours.

It is not unrealistic to suggest that within 20 years advances in aviation will place America's businesses within three hours' delivery time of virtually any part of the world, providing same-day access to nearly 8 billion potential customers.

American businesses face as well an immense global market growth potential in the more immediate future, the 1990s. Most of that growth will be in the Pacific Rim, a $4 trillion market expanding at $5 billion a week. Nearly two-thirds of the world's population lives in Asia, which contains the world's fastest-growing economies. Most Asian economies are expanding at real rates two to six times the growth rates in Europe and the United States. The number of Asian consumers with substantial purchasing power is increasing so rapidly that *Fortune* magazine's special fall 1990 issue on Asia dubbed the continent "Mega-Market of the 1990s." All forecasts project U.S. trade with Asia growing much faster than with any other region of the world.

As most of the exports and imports of East Coast businesses to and from Asia are currently shipped by truck or train across the United States, West Coast businesses have a four- to seven-day advantage in trade with Pacific Rim countries. But air cargo essentially levels the playing field by cutting the shipping time disadvantage to only three hours. Many East Coast companies wishing to do business in the Pacific Rim during the coming decades will have no choice but to use air freight to be competitive. The same may be said for states in the Midwest and West wishing to conduct business in Europe.

How valuable is an air route to the Pacific Rim? Houston officials, in their bid last fall to obtain nonstop service to Japan, commissioned a study that showed that the route would bring the area half a billion dollars a year in increased trade and tourism. Similar testimony is provided by other reports from around the United States and scholarly research that clearly document the growing importance of international airline accessibility for state and local economic development.

Air freight thus is becoming an integral part of a new economy based on global sourcing and sales, JIT production and inventory systems, and speed of delivery. These forces can be brought together in developmental form, which is what the global air cargo/industrial complex under study for North Carolina is all about. The region with such a complex would have a jump start into the fast century, where speed, speed, and more speed will separate global business winners from losers.

The Complex

It should be understood from the start that by "air cargo/ industrial complex" we mean something much more elaborate than simply a modern air cargo airport. We are talking about a computer age industrial complex in which aviation will play a pivotal role in distribution.

In its scale and use of integrated systems technologies, the proposed complex goes substantially beyond the successful Alliance Airport in Fort Worth, Texas, developed by H. Ross Perot, Jr. In the North Carolina complex, JIT manufacturing systems and global air freight systems would be spatially and operationally merged.

Instead of developing manufacturing facilities on land near the runways and air cargo terminals, the complex would place JIT plants along the taxiways, providing the plants access to air cargo freighters in the same way that railside spurs bring freight trains directly to factories to deliver raw materials and to ship finished products. All factories also would have rear access to roads for transferring products to and from trucks for distribution to regional customers and to commercial airports for domestic air freight.

The JIT factories would have computerized conveyor systems located along a central movement corridor, and feeder conveyor lines would connect to the freighters—a system that would move goods much as plane passengers are moved via concourses from ticket counters to gates and via connecting jetways into planes. While one feeder line unloads components and materials from the front of a freighter, another line could be loading finished products into the rear of the plane. (See intermodal interface drawing.)

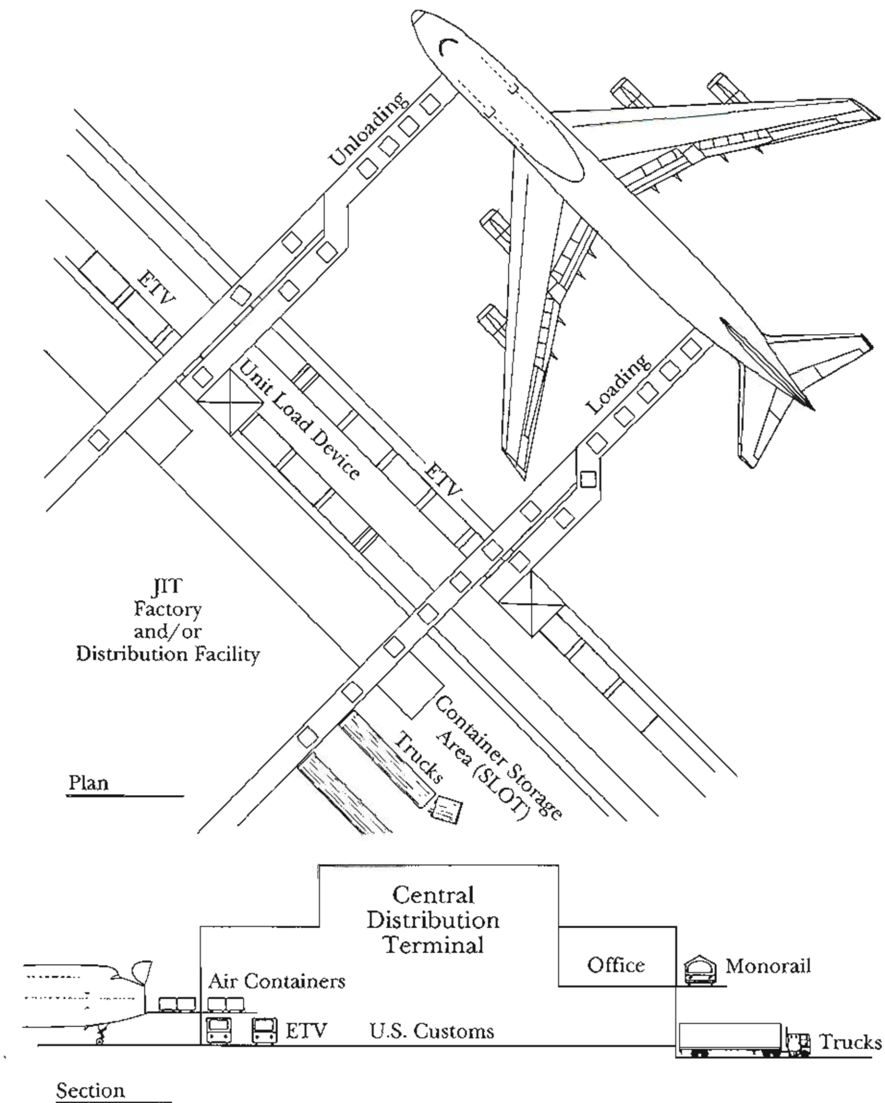

Illustration prepared by Envirotek, Inc.

Intermodal interface.

While some plants would have direct access to freighters, others would use central distribution terminals. Such central facilities likely would provide certain economies of scale: centralized U.S. customs clearance, security, sophisticated loading equipment, and the pickup and delivery of small loads.

All factories would be connected to the central distribution facilities via high-speed electronic transfer vehicles (ETVs). The distribution facilities would contain pallet and container loading devices and storage areas for a variety of types of shipping units, up to and including 20-foot containers.

Central distribution terminals would interface with nose- and side-loading aircraft via nose docks and feeder lines. The docks would be served by ETVs that would pick up and deliver cargo pallets and containers from and to designated storage slots, in a manner similar to modern computerized baggage handling at large airports.

Freight would be weighed automatically as it enters the terminal, its weight and balance recorded, and its destination checked for loading on a specific flight. Thus, when Cargolux Flight 276 pulls up to the nose dock for loading, the full load would be plucked from the stacks and slots in the proper loading sequence. The same procedure would work in reverse when ETVs arrive to pick up containers and pallets to be delivered to the JIT factories. Each centralized facility would be designed so that a number of freighters could be loaded and unloaded simultaneously. Freight packed in intermodal (20-foot) containers could be loaded directly from or offloaded to truck chassis, bypassing the terminal.

The air cargo/industrial complex also would house warehouses containing inventories of critical replacement parts for emergency shipment and equipped with round-the-world, round-the-clock communications capability. A request for an emergency replacement part for a machine in Bangkok or Brasilia thus could be acted upon expeditiously, with the part loaded on the next available flight to that destination.

The complex would have two 13,000-foot (2.5-mile) runways, which is the length needed for the giant cargo aircraft and hypersonic freighters of the future, and taxiways lining both sides of each runway. Anchoring the ends of the taxiways would be major global air cargo company facilities like Federal Express, Cargolux, United Parcel, or Burlington Air Express, each with its own aprons and terminal. The industrial plants lining the 10 miles of taxiways would generate enough business to attract the air cargo company anchors. A high-speed monorail people-mover connecting the buildings, parking, public transportation, and lodging facilities would tie the entire complex together.

Preliminary analysis by the University of North Carolina Business School's Center for Manufacturing Excellence indicates the manufacturing facilities would generate directly a minimum of 30,000 jobs. Operating at full capacity, the complex would contribute as much as $5 billion annually to a local economy, not counting its broader contribution to regional economic activity. This secondary contribution could be significant, as manufacturing facilities would be attracted to locations within a three-hour driving time radius from which they can conduct a full day's production, truck it to the air cargo complex, and have it delivered overnight to virtually anywhere in the world.

The basic infrastructure costs, excluding land acquisition and the construction of the manufacturing and warehousing facilities, are estimated to be in the range of $400 million, a small portion of the projected annual economic return of the complex.

At least 15,000 acres would be required. The complex should be located on or very near major interstate highways and within one hour's driving or rail-commuting time to at least one major metropolitan labor market. Flat topography would hold down construction costs. The complex should be served by a full complement of utilities and should obtain a free-trade-zone status.

Most of the flights would be by large freighters at night. Aircraft noise and night flight restrictions in metropolitan areas, as well as the massive land requirements, point to a semirural, low-density location, but with maximum highway accessibility. No tall objects should be within 10 miles of the complex, and all land within five miles should be appropriately zoned to minimize conflicting uses.

The complex should benefit substantially the existing airports that handle domestic cargo. Many of the large loads that arrive from abroad would be broken down and trucked to commercial airports to ship to domestic markets in the cargo holds of passenger planes.

Virtually all major U.S. airports will reach maximum capacity in the early 21st century. Overcrowding at some international airports already seriously limits cargo and passenger expansion prospects. Without major new airports, congestion will mount to crisis proportions. Increasing delays will weaken the competitiveness of U.S. businesses.

Thus, consideration should be given to developing a wayport (a passenger transfer airport) as a second phase of the global air cargo/industrial complex; and to developing business centers, hotels, and recreational facilities to serve wayport passengers as a third phase. A wayport hub would increase U.S. air capacity by diverting tens of millions of passengers away from the most congested airports and efficiently connecting them to their final destinations. And it would complement the air cargo/industrial complex by providing cargo space in the bellies of domestic passenger planes.

Obviously, a full range of engineering, environmental, regulatory, and logistical issues must be addressed to realize the concept of a global air cargo/industrial complex at any specific location. But implementation of the concept, rooted in changing economic realities and inevitable technological advances, is a step that government and business leaders should plan for now to enhance regional economic competitiveness and achieve development potential. ■

John D. Kasarda is director of the Frank Hawkins Kenan Institute of Private Enterprise at the University of North Carolina Business School at Chapel Hill. A longer version of this article appears in *Economic Development Quarterly,* August 1991, © Sage Publications, Inc., Newbury Park, California. Used by permission.