IN-TRANSIT URBANISM:
The Landscape of Logistics and the Time Present

by

Anthony P. Vanky

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Signature of Author: _____

Anthony P. Vanky
Department of Architecture
May 20, 2011

Certified By: _____

Arindam Dutta
Associate Professor of the History of Architecture
Thesis Supervisor

Certified By: _____

Dennis Frenchman
Norman B. & Muriel Leventhal Professor of Urban Design
Thesis Supervisor

Accepted By: _____

Takehiko Nagakura
Associate Professor of Design and Computation
Chair of the Department Committee on Graduate Students

Thesis Supervisor

Arindam Dutta
Associate Professor of the
History of Architecture

Thesis Supervisor

Dennis Frenchman
Norman B. & Muriel Leventhal
Professor of Urban Design

Thesis Reader

Alexander D'Hooghe
Associate Professor of
Architecture and Urbanism

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Anthony P. Vanky

Submitted to the Department of Architecture of May 20, 2011 in Partial Fulfillment of the Requirements for the Degree of Master of Science in Architectural Studies.

ABSTRACT

Upon arrival in Memphis by air, a sign welcomes passengers to "Memphis - America's Distribution Center", a reflection of one's place in the city, and the country. Rather than a romantic reflection of the cultural heritage of the city with Elvis Presley and B.B. King, the statement places passengers not at the destination of their travels, vis a vis a "welcome to", but en route somewhere else. Memphis International Airport, identified via its aviation code "MEM", is not a place of arrival—a terminal, from "terminus", the end—but a location to be passed through—a state of being in transit or colloquially "passing through". Few passengers and goods conclude their travel here; MEM's raison d'etre is as a layover, as travelers are being distributed elsewhere as a result of the efficiency of the hub-and-spoke model of aviation.

As a result, MEM is the world's busiest cargo airport. At its peak, an upwards of six flights arriving a minute carrying Apple computers, Mickey Mouse plush toys, cooking items from William-Sonoma, and the variety of other goods to and from all corners of the world destined for FedEx's so-called SuperHub. Because of the presence of such a facility, MEM has arisen as an economic capital in an improbably location within the interior of the United States replete with its own sprawling developments. MEM, as an airport city, challenges the social and cultural norms of what one considers a traditional city, as its reasons for being is the economy of moving goods and founded on the way we do business and not the way we live.

This thesis proposes an urban form for MEM's surrounding city that serves as a means of regeneration of the surrounding, decaying area as well as accepts the condition of being in transit for goods and people as a primary condition of existence. In Brophy's character's words, it is an urbanism that "[perpetually remains] in the present moment, in at least semi-sempiternal transit between departure from the past and arrival in the future" and is more appropriate than the status quo within the context of MEM with regard to the transitory nature of goods, passengers and employees. The urban logic is thus a metaphor of FedEx in the transposition of technological logics, such as the flow of bodies and the interface of machine, the parcel, and the human occupant.

Thesis Supervisor

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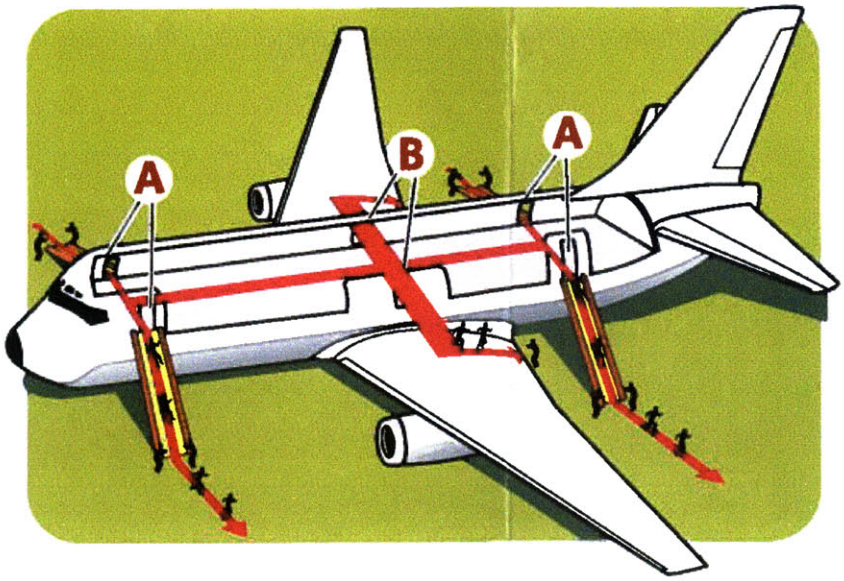

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ANTHONY P. VANKY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
2011

TYPESET IN WHITNEY

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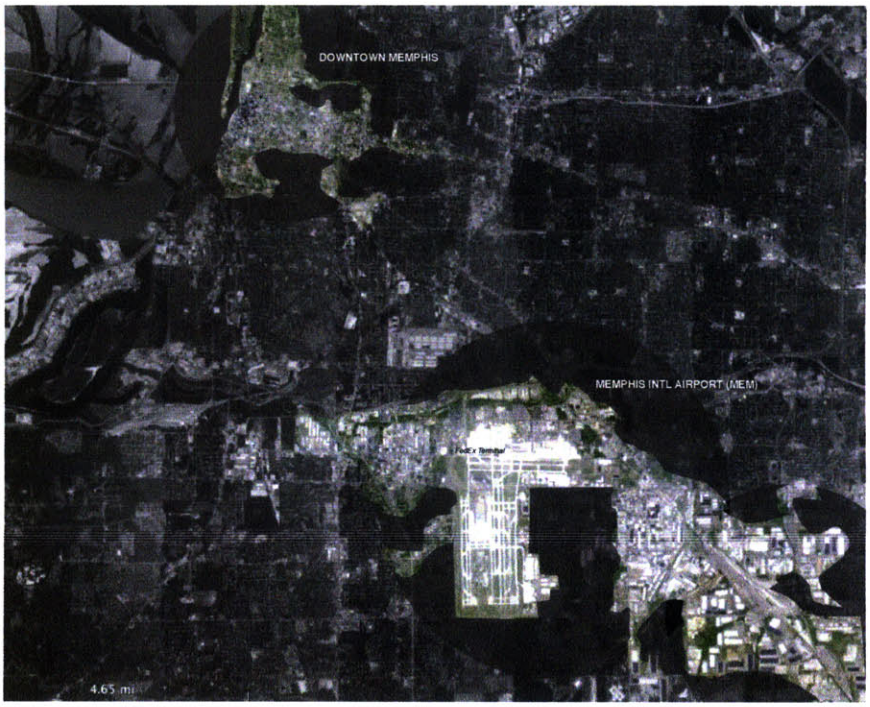
INTRODUCTION

This thesis started as an observation. A little over a year ago, I arrived a bit early for a flight at Dallas-Fort Worth Airport. After exhausting the normal, consumer, activities—check out the magazine rack, duty free store and a long, extended though wonderful lunch—I was at a lack of things to do. To pass the time, I rode the tramway between each of the sprawling terminals for about an hour and a half. I was circling a property a little larger than the island of Manhattan swiftly, encapsulated as the rhythm of the airport paced forward below me. In my mind, the fact that policy makers set aside so much land, so far away from either Dallas or Fort Worth, dedicated to connecting the region to the world through flight was amazing. With the highways, roads, runways and trains, one is occupying a machine of flows—moving bodies that make the global economy possible. And as grand the machine is in its totality, one begins to find specks of land with the potential to be something more than interstitial.

What originally began as a consideration of a digitally enabled urbanism, that is the potential for urbanism to exist because of the occupant's use of technology, this investigation became one that considered the result of our societal turn to the digital. The urbanism of FedEx in Memphis has boomed in the past decade because of the growth of just-in-time manufacturing and has served as the brick-and-mortar behind e-commerce. Employing a third of the region's population, Memphis is, in a sense, a company town for FedEx. In the same way one found interstitial land ripe for consideration in Dallas, one can find a similar potential in Memphis whose airport grounds are similarly a driver of industry, yet wholly unkempt. Like so many suburban or industrial districts, the grain the urban fabric has fragmented into disparate pieces with automotive infrastructure tentatively holding this milieu together.

The interstate and airport infrastructure promised connectivity and efficiency. Good roads and runways, in popular opinion, mean that one can get goods around more easily and more cheaply. Yet, the continued disaggregation has increased the demand for fuel, for time and for resources. The sprawl and fragmentation has created the very problems it originally sought to alleviate. Yet, this thesis is not a commentary on sprawl but rather on the urban island

Figure 00.01 Memphis Downtown and Memphis Aerotropolis
The aerotropolis because of its size and the number of people employed can rival the traditional downtown as the heart of the city.



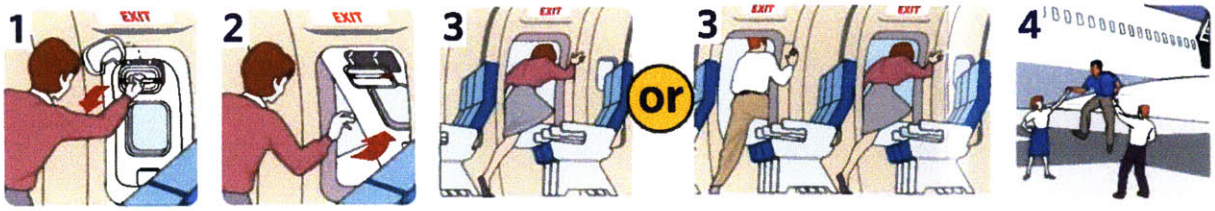
around the airport, selectively grafting an urbane logic onto the network of flows within the district.

The airport is clearly an asset for Memphis, as it serves as the hub for many distribution companies, but is also a liability as the city has fallen behind in maintaining a globally competitive facility and area. This comes at a time where cities around the world are beginning an arms race to develop their airports into aerotropoli that go beyond being infrastructural entities as they become cities as the general public can understand as such. Clearly, Memphis is at a crossroads. This thesis seeks to conceive of an urban logic that shifts development tightly around the airport, as a system that serves as the future aerotropolis for Memphis that appreciates the network of infrastructure and flows around the airport. It serves as a metaphor for FedEx, whose competitive advantage is in its ability to create an overlaying logic that efficiently gets goods to their destinations within an otherwise confused illegible urban and industrial landscape.

This project will consider multiple scales as part of its research. It will first consider the issue of efficiency and time through the lenses of philosophy, economics and architectural foundation. Using the adage "time equals money", it is appropriate to consider the site as a contemporary factory town rather than a normative urban form. Understanding what the affect of time is on urbanism, as well as how one lives within a pause in time vis a vis being in transit, one can understand how one understands the intangible aspects of this site. The second chapter will examine aviation as a foundation for urbanism historically and in the present day. There are latent promises being communicated in the aerotropolis paradigm of growth and this chapter seeks to analyze the successes and weaknesses of this concept as a place to live, work and grow. Chapter 3 considers Memphis and the historic reasons for the city's being as a trading crossroads as well as an investigation of how the city plans to move forward toward greater global competitiveness through its aerotropolis plan.

The final chapter will propose interventions and logics at the scale of urbanism as a holistic vision for the district. These rules will be further developed and exampled through three distinct architectural proposals that attempt to bring clarity to what the formal aspects of this intervention could be like.

In sum, infrastructure and flows will be examined theoretically, historically, economically and ultimately tested through design at the urban and architectural scales.


1
EXIT
2
EXIT
3
EXIT
or
3
EXIT
EXIT
4

CHAPTER ONE
TIME PRESENT

Time present and time past
Are both perhaps present in time future,
And time future contained in time past...

What might have been and what has been
Point to one end, which is always present.

T.S. Eliot,
excerpt from *Burnt Norton*.

The promise of FedEx to deliver a package anywhere on the planet by 10:30 the next morning is the product of absolute, streamlined efficiency. At its busiest, MEM has four to six FedEx jets from around the world scheduled to arrive each minute. This tight coordination sets the global flight timetables for the company, both departures as well as time in the air, to ensure on-time arrivals from all corners of the globe. This synchronization illustrates the company's totalitarian desire to subsume the individual into the mass of global efficiency. It also, similarly, represents a wish to blue specific, various times of cities, vessels, objects and bodies into a global monotime—Memphis time.[1]

To understand, or make sense of time is to delve into the providences of physics, linguistics, anthropology, neuroscience, cognitive science, faith and philosophy. Cosmologist Jim Hartle conjectures that time is an illusion that was a result of evolution in the early days of life. Time is the living brain's mechanism means of dealing with daily events that as a part of its organizational logic and structure carries with it an unstopping sweep of attention that "feels" like time in motion along a one-way path.[2] The sense of time is our brains means of absorbing every detail in a moment, processing the data, saving what is necessary for comprehension and consciousness and flushing what is not. The imposed echo of this information gives the illusion of a forward temporal march through time. In mythology, Chronos was a primordial deity whose birth coincides with the creation of the universe with the birth of his siblings. Simply, he was always here for all intents and purposes. Yet to understand time as an institution of efficiency is to understand the history and ambition for human industrialization.

While time, in a sense, has existed since the dawn of the universe, the use of time as a controlling, synchronizing, force was borne out of necessity. Industrialization brought the need of synchronization to organize the multitude of workers, managers and production processes. It was only though synchronization that efficiency could arise. The processes of scientific management, or Taylorism, sought to streamline industrial processes with empirical study to ultimately optimize the use of materials and time. The use of more time, like the use of more materials lead to higher costs which meant greater inefficiency—waste.

Businessman Francis Cabot Lowell create the Boston Manufacturing Compny whose textile mills would become the face of the Industrial Revolution, and later labor rights, in the United States. The mills in Lowell, Massachusetts were organized as a factory town with hundreds of boarding houses built by company investors to service the mills. To organize the logistics of housing thousands of women as young as ten years of age with their work requirements, an innovation in industrial buildings was put in place. Bells in

cupolas tolled the workers awake, to their jobs, to and from meals, curfews and bed. The bells served as a constant reminder that time was money, the mill owner's money to be exact. While the women were there voluntarily, with year-long contracts, their time was owned by the mill owners.

With industrialization versus a personal sense of time, one questions who controls, or owns, time. In a nineteenth-century English textile mill, a worker commented on the abuses of time-power thus:

In reality, there were no regular hours... The clocks in the factories were put forwards and backwards, morn and night. Instead of being instruments for the measurement of time, they were used as cloaks for cheatery and oppression. A workman was afraid to carry a watch, as it was no uncommon event to dismiss anyone who presumed to know too much about the science of horology.[3]
In JG Ballard's Chronopolis[4], time is outlawed and winding an old watch was an offense punishable by crime. In the story's fictional past, time was used as a tool of the state that served as a means to organize the citizenry. Different clocks represented different classes of people, organizing what activities the various classes could and could not perform at a certain time. Should the crosswalk clock not correspond with your class's color, you could not cross even though truly you would not be on the street as it wasn't your time to be so. Time, was a totalitarian ruler:

TIME TABLE OF THE LOWELL MILLS,

Arranged to make the working time throughout the year average 11 hours per day.
TO TAKE EFFECT SEPTEMBER 21st, 1853.
The Standard time being that of the meridian of Lowell, as shown by the Regulator Clock of AMOS SISBORN, Post Office Corner, Central Street.

From March 20th to September 19th, inclusive.
COMMENCE WORK, at 6.30 A. M. LEAVE OFF WORK, at 6.30 P. M., except on Saturday Evenings.
BREAKFAST at 6 A. M. DINNER, at 12 M. Commence Work, after Dinner, 12.45 P. M.

From September 20th to March 19th, inclusive.
COMMENCE WORK at 7.00 A. M. LEAVE OFF WORK, at 7.00 P. M., except on Saturday Evenings.
BREAKFAST at 6.30 A. M. DINNER, at 12.30 P.M. Commence Work, after Dinner, 1.15 P. M.

BELLS.

From March 20th to September 19th, inclusive.

Morning Bells.	Dinner Bells.	Evening Bells.
First bell, ... 4.30 A. M.	Ring out, ... 12.00 M.	Ring out, ... 6.30 P. M.
Second, 5.30 A. M.; Third, 5.50.	Ring in, ... 12.35 P. M.	Except on Saturday Evenings.

From September 20th to March 19th, inclusive.

Morning Bells.	Dinner Bells.	Evening Bells.
First bell, ... 5.00 A. M.	Ring out, ... 12.30 P. M.	Ring out at ..... 7.00 P. M.
Second, 6.00 A. M.; Third, 6.20.	Ring in, ... 1.05 P. M.	Except on Saturday Evenings.

SATURDAY EVENING BELLS.

During APRIL, MAY, JUNE, JULY, and AUGUST, Ring Out, at 5.00 P. M.
The remaining Saturday Evenings in the year, ring out as follows:

SEPTEMBER.	NOVEMBER.	JANUARY.
First Saturday, ring out 5.05 P. M.	Third Saturday, ring out 4.00 P. M.	Third Saturday, ring out 4.25 P. M.
Second " " 5.45 "	Fourth " " 2.55 "	Fourth " " 4.35 "
Third " " 5.20 "		
Fourth " " 5.20 "	DECEMBER.	FEBRUARY.
	First Saturday, ring out 3.50 P. M.	First Saturday, ring out 4.45 P. M.
OCTOBER.	Second " " 3.55 "	Second " " 4.55 "
First Saturday, ring out 5.05 P. M.	Third " " 3.55 "	Third " " 5.00 "
Second " " 4.55 "	Fourth " " 4.00 "	Fourth " " 5.10 "
Third " " 4.45 "	Fifth " " 4.00 "	
Fourth " " 4.35 "		MARCH.
Fifth " " 4.35 "	JANUARY.	First Saturday, ring out 5.25 P. M.
	First Saturday, ring out 4.15 P. M.	Second " " 5.30 "
NOVEMBER.	Second " " 4.15 "	Third " " 5.35 "
First Saturday, ring out 4.35 P. M.		Fourth " " 5.45 "
Second " " 4.05 "		

YARD GATES will be opened at the first stroke of the bells for entering or leaving the Mills.

*** SPEED GATES commence half-day three minutes before commencing work.

Penhallow, Printer, Wyman's Exchange, 23 Merrimack St.

Figure 01.01 Lowell Mills Time Table
The bells of Lowell Mills synchronized the activities of thousands of women at the facility. While codified, only a powerful elite knew the actual time.

Only by synchronizing every activity, every footstep forward or backward, every meal, bus halt, and telephone call, could the organism support itself. Like the cells in your body, which proliferate into mortal cancers if allowed to grow in freedom, every individual here had to serve the overriding needs of the city or fatal bottlenecks threw it into total chaos.[5]

The organism of humanity runs at the tempo of time. Cultural differences in the pace of time, say Southern time versus a New York minute, causes conflict between places. The stereotypical punctuality of a German, a Swiss or someone from Japan versus the laissez faire pace of an Italian, or a small town Midwesterner come specifically to mind. Yet, the operations of FedEx, with global reach of its services, require a synchronization of all of its assets in a cascading parade of flows. The nightly sort of FedEx requires planes from the four corners of the globe to arrive within a very small window in time, enough time to allow for an efficient sort of millions of parcels in a single of night, for a synchronized early morning departure, staggered only to allow timely arrivals around the world whose schedule accounts for time zone changes and flight time. The workers at the various locales around the world have their schedules controlled by this schedule, regardless of local time. Memphis workers have their time controlled by the need for a nightly sort, which in turn

COMPARATIVE TIME-TABLE,

SHOWING THE TIME AT THE PRINCIPAL CITIES OF THE UNITED STATES,

COMPARED WITH NOON AT WASHINGTON, D. C.

There is no "Standard Railroad Time" in the United States or Canada; but each railroad company adopts independently the time of its own locality, or of that place at which its principal office is situated. The inconvenience of such a system, if system it can be called, must be apparent to all, but is most annoying to persons strangers to the fact. From this cause many miscalculations and misconceptions have arisen, which not unfrequently have been of serious consequence to individuals, and have, as a matter of course, brought into disrepute all Railroad Guides, which of necessity give the local times. In order to relieve, in some degree, this anomaly in American railroading, we present the following table of local time, compared with that of Washington, D. C.

NOON AT WASHINGTON, D. C.	NOON AT WASHINGTON, D. C.	NOON AT WASHINGTON, D. C.
Albany, N. Y. ..... 12 14 P.M.	Indianapolis Ind.. 11 30 A.M.	Philadelphia, Pa.. 12 08 P.M.
Augusta Ga. ..... 11 41 A.M.	Jackson, Miss. ..... 11 08 "	Pittsburg, Pa. ..... 11 48 A.M.
Augusta, Me. ..... 11 31 "	Jefferson, Mo. ..... 11 00 "	Plattsburg, N. Y.. 12 15 P.M.
Baltimore, Md. ..... 12 02 P.M.	Kingston, Can. ..... 12 07 P.M.	Portland, Me. ..... 12 28 "
Beaufort, S. C.... 11 47 A.M.	Knoxville, Tenn.... 11 23 A.M.	Portsmouth, N. H. 12 25 "
Boston, Mass..... 12 24 P.M.	Lancaster, Pa..... 12 03 P.M.	Pra. du Chien, Wis. 11 04 A.M.
Bridgeport, Ct..... 12 16 "	Lexington, Ky..... 11 01 A.M.	Providence, R. I.... 12 29 P.M.
Buffalo, N. Y..... 11 53 A.M.	Little Rock, Ark... 11 00 "	Quebec, Can. ..... 12 23 "
Burlington, N. J.... 12 09 P.M.	Louisville, Ky..... 11 26 "	Racine, Wis. ..... 11 15 A.M.
Burlington, Vt.... 12 16 "	Lowell, Mass..... 12 23 P.M.	Raleigh, N. C. ..... 11 53 "
Canandaigua, N. Y. 11 59 A.M.	Lynchburg, Va.... 11 51 A.M.	Richmond, Va. ..... 11 58 "
Charleston, S. C... 11 49 "	Middletown, Ct.... 12 18 P.M.	Rochester, N. Y.... 11 57 "
Chicago, Ill. ..... 11 16 "	Milledgeville, Ga... 11 36 A.M.	Sackett's H'bor, NY. 12 06 P.M.
Cincinnati, O..... 11 31 "	Milwaukee, Wis.... 11 17 A.M.	St. Anthony Falls.. 10 56 A.M.
Columbia, S. C.... 11 44 "	Mobile, Ala. ..... 11 16 "	St. Augustine, Fla. 11 42 "
Columbus, O..... 11 36 "	Montpelier, Vt.... 12 16 P.M.	St. Louis, Mo. ..... 11 07 "
Concord, N. H.... 12 23 P.M.	Montreal, Can..... 12 14 "	St. Paul, Min. ..... 10 56 "
Dayton, O. ..... 11 33 A.M.	Nashville, Tenn... 11 21 A.M.	Sacramento, Cal... 9 02 "
Detroit, Mich..... 11 56 "	Natchez, Miss..... 11 03 "	Salem, Mass. ..... 12 26 P.M.
Dover, Del. ..... 12 06 P.M.	Newark, N. J..... 12 11 P.M.	Savannah, Ga..... 11 44 A.M.
Dover, N. H..... 12 37 "	New Bedford, Mass. 12 28 "	Springfield, Mass... 12 16 P.M.
Eastport, Me..... 12 41 "	Newburg, N. Y..... 12 12 "	Tallahassee, Fla... 11 30 A.M.
Frankfort, Ky..... 11 30 A.M.	Newburyport, Ma.. 12 28 "	Toronto, Can. ..... 11 51 "
Frederick, Md..... 12 00 "	Newcastle, Del.... 12 06 "	Trenton, N. J..... 12 10 P.M.
Fredericksburg, Va. 11 58 "	New Haven, Conn.. 12 17 "	Troy, N. Y..... 12 14 "
Fredericton, N. B. 12 42 P.M.	New London, " .. 12 20 "	Tuscaloosa, Ala.... 11 18 A.M.
Galveston, Texas .. 10 49 A.M.	New Orleans, La... 11 08 A.M.	Utica, N. Y. ..... 12 08 P.M.
Gloucester, Mass.. 12 26 P.M.	Newport, R. I..... 12 23 P.M.	Vandalia, Ill. ..... 11 18 A.M.
Greenfield, " .. 12 18 "	New York, N. Y.... 12 10 "	Vincennes, Ind..... 11 10 "
Hagerstown, Md.. 11 58 A.M.	Norfolk, Va. ..... 12 03 "	Wheeling, Va. ..... 11 43 "
Halifax, N. S..... 12 54 P.M.	Northampton, Ms.. 12 18 "	Wilmington, Del.... 12 06 P.M.
Harrisburg, Pa.... 12 01 "	Norwich, Ct. ..... 12 20 "	Wilmington, N. C.. 11 56 A.M.
Hartford, Ct. ..... 12 16 "	Pensacola, Fla..... 11 20 A.M.	Worcester, Mass.. 12 21 P.M.
Huntsville, Ala.... 11 21 A.M.	Petersburg, Va.... 11 59 "	York, Pa. ..... 12 02 "

By an easy calculation, the difference in time between the several places above named may be ascertained. Thus, for instance, the difference of time between New York and Cincinnati may be ascertained by simple comparison, that of the first having the Washington noon at 12 12 P. M., and of the latter at 11 31 A. M.; and hence the difference is 42 minutes, or, in other words, the noon at New York will be 11.17 A. M. at Cincinnati, and the noon at Cincinnati will be 12 43 P. M. at New York. Remember that places *West* are "slower" in time than those *East*, and vice versa.

Figure 01.02 Comparative Timetable
Before standard time, the local times in various cities in the United States relative to noon in Washington, DC.

is synchronized to Delta's need for flight schedule slots during the day. The synchronization and regulation of time on so many parties, like the bells of Lowell, are the foundation of this operation—and only FedEx Memphis can hold the watch.

The time of Memphis is the time of commerce. Edward Hall defines the structure of time in The Dance of Life as "cultural time," rules that are globally known, obeyed by all and often taken for granted. This cultural time is "so thoroughly woven into the fabric of resistance that we are hardly aware of the degree to which it determines and coordinates everything we do."[6] To Hall, Memphisians, like other North Americans and northern Europeans operate on "M-Time" or "Monochromic time" that is centrally regulated with actions coordinated to the time readings displayed on the clock.[7] Time is abstract, thus able to be organized to as it flows as an uninterruptable datum, which made it ideal to serve as the foundation for "industrial time". While universal in its character, it also can be sensed internally as the feeling of anxiousness when we are late, or in anticipation of an upcoming event.

The global synchronization of flights and schedules to the nightly choreography of the SuperHub shares a similar relationship to the peak of the British Empire. In 1714, a petition was offered to parliament proposing a prize for a solution to demonstrate a practical method for determining the longitude of a ship at sea and opening the oceans to Britain.[8] John Harrison's marine chronometer would allow sailors to safely travel long distances without reference to land masses. These chronometers would be coordinated to a central "master" clock at the Greenwich Royal Observatory, which in 1884 was adopted by the International Meridian Conference as the Prime Meridian. Britain's mastery of the seas and their precise chronometers would have its explorers and merchants insist on Britain's sense of time in its new colonies. The politics of time became important, as these new Imperial colonies would synchronize its daily activities to time dictated by Greenwich Mean Time. Literally, the little, everyday activities of millions would be coordinated by the real time in London.

The movement of people and goods by rail in the United States required for the regulation of time on a territorial level; time made long distance transit possible. With the death of 14 passengers when two trains on the same track crashed because each of the train guards had different times set on their watches, a need for standard time became apparent. Standard time was established in the United States and Canada on November 18, 1883 with the Standard Time Convention, though an agreement of railroad companies and observatories that became the standard bearers of time. Prior to that, time of day was a local matter, and most cities and towns used some form of local solar time, maintained by a well-known civic clock (be it on a church

steeple, a jeweler's window or on a fair town's city hall). In a single day in 1857 for example, when it was noon in Chicago, for example, it was 12:19 in Columbus, 12:13 in Atlanta, 11:50 in St. Louis, and 11:27 in Houston.[9] The 1884 International Prime Meridian Conference in Washington expanded standard time globally, at which the system of international standard time - still in use today - was adopted. Its effects would not be felt until communication and aircraft technology would allow for rapid travel around the globe where the synchronization of time would enable for a new means of commerce and communication seen in Memphis today.

In the urban context around the SuperHub a similar concerns for time leads to the extreme concern to save time, to strive for maximum efficiency. The form of the city, conceptually, seeks to be maximally efficient as an urbanism concerned on flows and on time as time is money.

Figure 01.03 "America's Distribution Center"
The welcome sign in the Memphis Airport terminal reveals the economic context around the airport rather than the romantic imagery of the city.

SAVING TIME, SAVING MONEY

In the same way the welcome sign of "Memphis—America's Distribution Center" informed transiting and arriving passengers of the economic context around them, a drive through the sprawling urban condition around the airport reveals that the forces of industry were strongly at play over those of civic habitation. This was a place to make money, not a place to live and play. Wide roads and large parking lots, even large when compared to the other suburban tracts of Memphis, were made with the scale of moving cargo, not people. The large corners and wide avenues were made with the radii and size of semi-trucks in mind. These trucks in turn connected to equally large distribution centers and factory buildings. Each of these infrastructural features was engineered with low costs and efficiency of time in mind.

Here, the parable holds true that time equals money. As a result, the surrounding urbanism is difficult to understand, as unique or individual experiences are forgone in favor of the generic, which serves as being more economically viable.

In a way, Memphis takes its cues not from successful urbanism but from industrial roots with ambitions of hyper-efficiency of materials and flows. However, its history of incremental post-war growth vis à vis sprawl has limited what one can understand as the potential of total efficiency through a totality form; the same imagery has served as the ambition of urban-scale factories and factory towns. To understand this efficiency through built form, let us briefly digress.

Driven by his personal obsession with self-sufficiency, Henry Ford sought to develop a vertically integrated plant where raw materials were processed and

manufactured into running vehicles within one facility. Following the success of his powered moving assembly line at his Highland Park plant in 1913, which was a derivative of meat-packing processes, the new plant was to add take his companies marked success in efficient volume production to a new level. The new plant was to learn from the hindrances of his old plant, which was first built for manual assembly. The main design innovation would be to move away from multi-story designs, which was de rigeur in nearly all industries, to expansive one-story units better suited to the assembly line. Ford, in his words, would summarize his ambitions with the new plant as "the focusing upon a manufacturing operation of seven different principles: power, accuracy, economy, continuity, system, speed and repetition."[10]

The company was able to reach functional autonomy, free of the dependency on suppliers, threats of storages, cost fluctuations, utility systems and labor strikes that allowed the company to synchronize the entire processes of making a car. The wish for absolute control lead to Ford to also acquire 700,000 acres of forest, iron mines and limestone quarries in the Upper Peninsula of Michigan, Minnesota and Wisconsin, thousands of acres of coalmines in Kentucky, West Virginia and Pennsylvania and eventually, the company owned and operated a rubber plantation in Brazil. The principle was to maximize the economy of space and time, or in Ford's words, "The entire complex was constructed according to a single idea of simplification of the flow of materials."[11] The plant was thus organized as an assembly line half a mile long, which brought goods from the canal through the various work areas and finally out to the lots with a completed vehicle.

Industrial architect Albert Kahn, who also designed Ford's Highland Park plant where the assembly line and the industrial concept of "flow" was first implemented, was called upon by Henry Ford to develop a plan for the expansive 1700 acres. Though much of the facility developed in a haphazard manner, Ford's underlying conviction was that the factory must anticipate and accommodate change and expansion. Evidence of an organizing logic can be found in the clarity of a circulation matrix through the site that allowed for ordered and efficient growth.[12] The foundational theory in Kahn's work for Ford came actually from his brother Moritz Kahn whose The Design of Construction of Industrial Buildings would serve the vanguard of technical manuals for the building industry.[13]

Among the key principles adopted by Albert would be the attention to compositional elements and construction particulars whose layout was based on the flow of production within the facilities designed, where the prerequisites were based on functional and economic characteristics. In this framework, the design and construction techniques applied to the design were understood

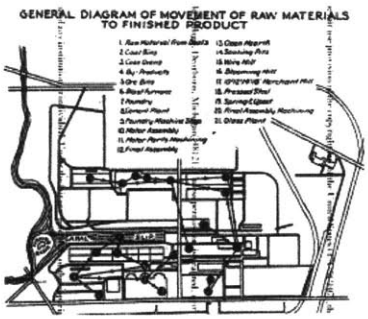


Figure 01.04 Flow if Material at the Ford Rouge Plant
The physical arrangement of buildings at the plant was intended to optimize the flow of raw ore into completed vehicles as efficiently as possible.

as variables that "once unified and properly applied, resulted in the reduction of time, both in conceptualizing and executing ideas"[14] and ultimately, the functional time within. In a sense, the buildings were both industrial items that were the product of, and driven by the industrial functions of production. The foundations of its growth, and perhaps the most applicable aspects of the factory to a re-conception of Memphis lies in clues in the complex's planning. From the beginning, Henry Ford had a preoccupation with growth itself[15] and his concern for adequate room to grow any operation in the future formed in practice a useful planning ideology. The same mentality can be seen in the planning of the precursor Highland Park plant. The organizational models of the flow of materials from inside the building to outside were first tried in that single building were extended to the internal organizational spaces of the factory compound, and continued outward to the territorial expansion of the supply and distribution flows.

The underlying principle was that of maximum efficiency of both time and space through the continuous movement of raw materials and pieces. The logic of growth and design, the urban logic, was organized around the pure efficiency of materials and flows. In Henry Ford's words, "the entire complex was constructed according to a single idea of simplification of the flow of materials."[16] For the most part, the production of a vehicle follows a linear procession through the nearly contiguous buildings. A clear circulation matrix that allows for the efficient movement of materials through the production buildings, as well as the requisite goods to service these facilities supports these buildings. All major rail and street lines, and the boat slip, run north-south along the site, as did the main process lines to the main "Eagle" plant. These main lines would serve as the main organizing structure for the plant's continued growth in the following decades as would it serve as a precedent for other, competing, assembly facilities.

Like FedEx today, the Rouge Plant also sought efficiency through synchronization. Labor was controlled though mechanical apparatuses that signaled and non-compliance on the part of the worker with respect to assigned tasks and work rhythms.[17] The flow of materials was similarly regulated. Visitors who were curious by the industrial marvel happening within the perimeter fences were often given a brochure describing the synchronized operations of the entire Rouge operation, including with the mines in other states[18]:

> "Monday 8 AM: After a trip of approximately 48 hours from Marquette the ore boat docks at the River Rouge plant. Hulett unloaders start removing the cargo, which is transferred to the High Line, and from there to the skip car which charges the blast furnace.

By continuous process this takes 10 minutes.

Tuesday 12:10 AM: Sixteen hours later the ore has been reduced to foundry iron. It is then cast into pigs and sent to the foundry, where, mixed with certain proportions of scrap, it is remelted. This takes about four hours in all. Blast furnace metal is also cast direct, in which case four hours are saved.

Tuesday 4:10 IW: As the conveyor brings the molds past the pouring station the hot metal is cast into cylinder blocks. These then go to the shake-out station and are taken away to cool and be cleaned. The cooling and cleaning process requires several hours.

Tuesday 12:20 PM: The costing now goes to its first machining operation. There are 58 operations in all, all of which are done in approximately 55 minutes.

Tuesday 1:15 PM: About 3:30 the motor block is ready for the assembly line. Ford mechanics have reduced the time required for motor assembly to an average of 97 minutes.

Tuesday 3:00 All: The finished motor coming out over a trunk line conveyor s loaded into a freight car... And shipped to a branch for assembly into a finished car.

Wednesday 8:00 AM: Arriving at the branch plant the motor is unloaded and sent to its station on the final assembly line.

Wednesday I2 NOON: Long before noon the dealer will have taken delivery of the car and paid for it."

The absolute concern for the flow and rhythms of the factory find parallels with the SuperHub of FedEx where the global synchronization of jet craft and the linear movement of goods and individuals. With the FedEx example, the synchronization of FedEx's assets would align its company to "Memphis Time" due to its universal connectivity of its SuperHub.[19] The reliance on this network of goods and services would impose FedEx's sense of time, however, on its millions of clients. To ensure the delivery of a package on time, one must meet the company's various final drop times around the world. Thus, 8:30pm (7:30pm, MEM) in the east coast of the United States, 7:30pm in Paris (12:30pm, MEM) and 7:30pm in Hong Kong (7:30 am, MEM) is each set to see arrivals at roughly the same time and establishes Memphis as the logistics meridian for much of the world. For "time-definite" companies, those who

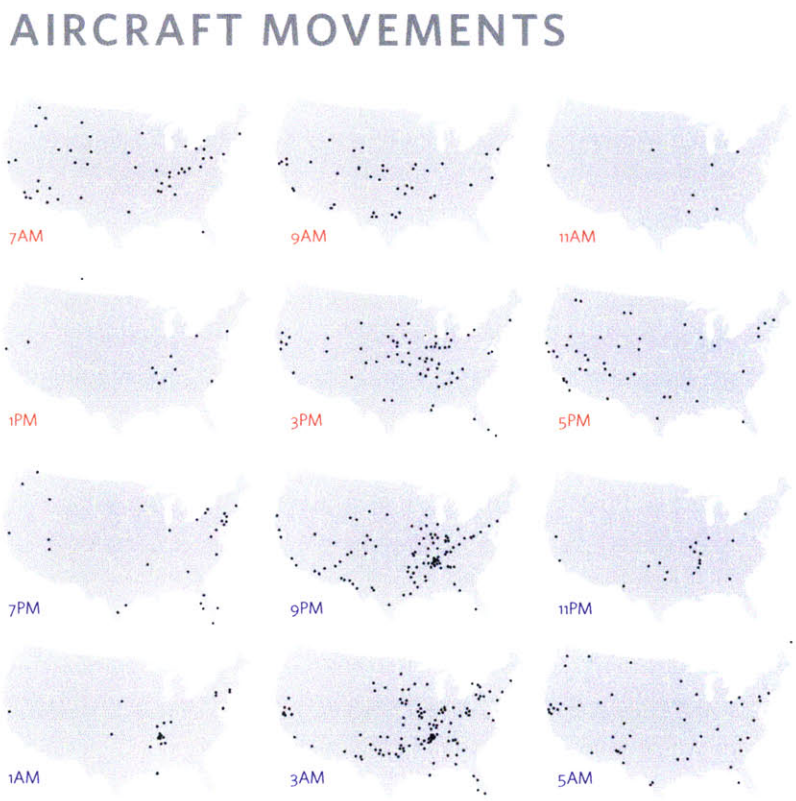


Figure 01.05 One Day of Aircraft Movements of FedEx
The flights of FedEx are coordinated to arrive into Memphis within a limited window to maximize the efficiency of the nightly sort. Delta Air Lines has three similar clusters of flights.

must meet exacting delivery constraints, MEM is an attractive location as the proximity allows for goods to make on-time deliveries on often tight schedules, further reinforcing Memphis's centrality to global trade.

Delta Air Lines utilizes Memphis as a supporting hub for Atlanta, the same model that exists with Detroit Wayne-County Metropolitan Airport, being supported by Minneapolis-Saint Paul International. Similar to FedEx, Delta synchronizes its flights to arrive and depart in waves to support the domestic business schedule—one wave in the morning of transfers and one in the end of the business day sending business travelers back home with fewer flights in between—supplementing the flights in and out of Atlanta as part of the hub and spoke system.

Within the SuperHub of FedEx, 300 miles of conveyor belts organize a facility that has a perimeter of over five miles, parking spots for over 175 aircraft and 8,000 employees at night. The 500-acre facility is organized as a linear progression of packages within the primary matrix,[20] where spaces are organized to efficiently move packages from jet-side, through customs and the sort facilities back into the appropriate plane bound for destinations around the world. Like the Ford example, buildings are organized around the pure efficiency of materials and flows yet contemporary technology (though the barcode and

scanning systems) allows for a greater means of automation that enables the facility to process approximately 500,000 packages per hour.[21]

The highly efficient hub of FedEx also serves as a gravitational point for business-to-consumer (B2C) and business-to-business (B2B) e-commerce companies to locate the physical footprint of their virtual companies. It was estimated that between 2000-2003, 60 million ft^2 to 100 million ft^2 of new warehouses, sited at major distribution hubs were needed in the United States to sustain the growth of new online enterprises.[22] As one of these locations, Memphis is where the virtual becomes real in the e-commerce world. Medtronics (a Minnesota-based company) and Williams-Sonoma (a San Francisco-based company) are two of many companies have some of their largest facilities located near the airport. Unlike the extreme efforts of Ford, or LeDoux with his industry towns, Memphis serves as a fractured hub of industry. Associated businesses are scattered within a 10 sq. mile region that serves as Memphis's aerotropolis zone, with housing and services for employees located far from their distribution centers. Highways and rail provide the prime example of planning, providing a highly efficient network for transportation and distribution for the goods passing through. The form of Memphis, while disaggregated has an infrastructure that is designed for efficient movement of goods, even at the sacrifice of a clear organization otherwise.

It is FedEx's technological assets that allows the company to create a highly efficient logistics system in an otherwise disorganized, disaggregated urban system; it's GPS, location databases and disciplined distribution system allows the company to be highly efficient in an otherwise fragmented urban landscape.

UNDEFINED GENERIC

Igor Navorsky, the protagonist of the film "The Terminal" based on the story of Mehran Karimi Nasseri, asks a TSA agent how he could bide his time in the airport when he is denied entry into the United States and unable to fly back to this country of departure. Without a clue as to how long his extended layover would be, the agent relies with the only answer he could, "there is only one thing you can do, shop."

The surrounding urban context around the airport can be called as simply sprawl. The foundations of the current industrial landscape were originally created to support a growing Memphis population in the 1960s following the trend of suburbanization, through white flight, found in other parts of the United States. Prior to this migration, the area was largely farm tracks with a small municipal airport and a rail yard. The creation of the interstate and highway infrastructure around Memphis, namely Interstate 240 and Interstate 55, led to the quick, disaggregated development in the area around the current airport. With the relocation of FedEx to Memphis from Little Rock in 1973, the area would quickly transform to an industrial area where the various landowners creating distribution oriented buildings without urbanistic regard except for the requisite ease of movement onto major arterial roads and the highway system.

What has resulted can be considered undefined-generic urbanism, where any street corner, or any particular location, is indistinguishable from any other without the aid of street signs and artificial cues. Set backs are ad hoc, heights varied and landscaping unremarkable. While the infrastructural details of utilities and roadways are absolutely clear, the development of the actual parcels has yielded such an extreme variety that the spaces is one that where it is difficult to create a mental map, even to this writer who spent days regularly driving the same streets. The regularity of irregularity thus yields a generic condition that easily washes out of one's attention.

For more than just commerce, developers have attempted to create utopias within certain parcels, trying to create a pastoral environment. Patches of grass are planted within concrete curbs and planted with trees. This pastoral appliqué provides a common language that attempts to place the occupant in a fictional narrative, a simulacrum of comfortable nature, of course with easy parking. The limited, contained amount of plant life surrounded by concrete is treated as signage, as a veneer of verdant life. Though signage and simulacrum, one has a sense of place yet one that is artificially created, artificially replenished—yet one that is satisfying in this alternate existence. This signage acts as a beacon, a marker in the context of the banal—the only

Figure 01.06 The Utopia of McDonald's
The prototypical plan McDonald's Real Estate development provides to franchisees reveals the uptopian image of the asset with pastoral knolls and clear, efficient areas designated for both efficiency and commercially-available serenity.

means of conveying meaning of what this "place" is be it fast food, convenience store or gas station. Thus, imagery, is what grants meaning to the generic. Simulation charges where we can live, work and play within the present tense environment of the airport.

While these sites are planned (engineered) with specific criteria of parking dimensions and turning radii as the primary considerations, the residue of odd shaped, grassed islands, the prominence of spaces defined by painted yellow lines and landscaped parking lots create unintentional realism, a defined generic condition, that is informed by the series of flows within the sight. These details, visually illogical but carved from the logic of movement reinforce the manufactured serenity of these enclave destinations. These little consequential remains also key into the larger defined-generic condition found within the FedEx site that does not seep out to the larger urban context around the airport.

The defined-generic is a condition that remains banal but is cued from the requirements of the program they serve. The large, unassuming blank facades and large warehouse masses of the SuperHub stand apart from other distribution buildings in that the form of the FedEx facility is informed by the requisite dimensions of the aircraft, the conveyer system within and the machinery needed for the highly specific functions within. As the parable goes, the SuperHub is form that follows function. This defined condition is compared to the largely rectangular structures repeated ad infinitum around the airport. While some structures support small goods and others industrial machines, the lack of specificity in the design of the structure and site, as a result of typical speculative development, none are distinguishable from the other formally.

Similarly, the physical structure of the airport can also be considered as defined-generic as the basic forms of any airport terminal are created from the same recipe of requirements and largely indistinguishable from another airport terminal other than in the architectural flourishes. The definite requirements of program and machines create a defined and logical structure that too is imbued with meaning when signage is applied.

Aerotropolis authorities uniformly saw "place making" as an issue with regard to the spaces around the airport. There was a recognition that the surrounding area was drab, unsightly and without character. At the time of writing, the airport is undergoing a tree-planting effort and considering new "themed" streetlights for along Plough Boulevard which serves as the main road into the airport grounds.[23] The role of simulation, even within the grounds of the airport, is at play. In recognizing the need for place making, the plan in a similar way as its context seems to place-mask rather than creating usable spaces. The trees and lights rather create a two-dimensional visual barrier, masking the expanse around the street, and surrounding buildings and airport, creating the illusion of a lush, verdant drive with nothing but the banal status quo behind the leaved canopy.

TIME PRESENT

T.S. Eliot in Burnt Norton, the first in his Four Quartets, opens:

> Time present and time past
> Are both perhaps present in time future,
> And time future contained in time past.
> If all time is eternally present
> All time is unredeemable.

Time serves as an abstract principle that fluidly cascades and informs the other tenses of time. In this sense, all temporal experiences, informing our sensory and conscious experiences, are in the present. Every moment and memory cannot be redeemed because it is not away from us to be redeemed. Time present, as a metaphor, is the totality of time in the current moment—an absolution of now removed from (or perhaps as a consequence of?) the future and the past. Eternity is collapsed into a pocket of now. Eliot continues:

> Time past and time future
> What might have been and what has been
> Point to one end, which is always present.

This foundational discourse in time, and in particular time present, provides an understanding of the situation of this proposal. Often in the case of analyzing contemporary life, the airport and spaces of transit are seen as disposable spaces in consciousness—they provide no real value or meaning to the experience of space. The criticism anticipates a linear placement of experience in time, namely the present is of consequence, usually through memory or consciousness, to our future self. Yet, in Eliot's case, the present is an insular pocket of time that contains its own experiences in isolation of the future or the past. This is the space that Hartle says is "our powerful sense of 'now,'" which lies before our mind has clearly acquired information turning the immediate senses into a memory record rather than raw inputs.[24] Hiss considers this period as a "portable display case or shelf, a temporary stage that can hold and make available everything we're giving out attention to."[25] To be in transit, to live and work between our departure and arrival is to freely give yourself to this "temporary stage".

We can better understand being in transit by using Hiss's metaphor of the jury box.[26] When chosen to serve in court, is asked to sit in the same spot for hour after hour, with one's attention keenly set on the evidence and stories recounted in front of them, ultimately toward the outcome of deciding on guilt or innocence within this insular event. In the eyes of the court and fairness, what has happened in your life before serving on the jury, and what will happen

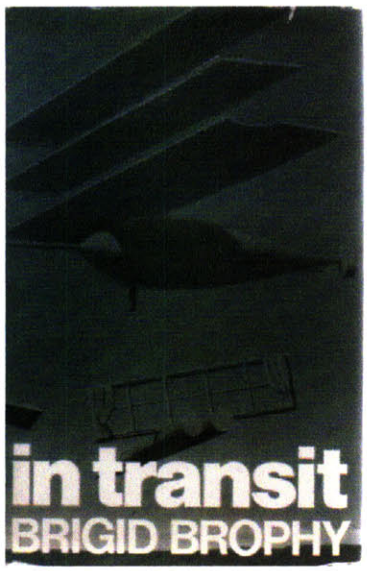


Figure 01.07 Cover of "In Transit"

after the verdict is rendered is of no consequence—ones time in the box has no real bearing on one's life but is rather a manicured detour within time present. While this period is interruptible, one can go home for the evening or shift one's attention during the case, the past is defined by what happened before the charges are presented and the future is what comes after the verdict. The sense of what is past and what is future is removed from the actions and events of the elongated now.

In feminist writer Brigid Brophy's In Transit, the protagonist, Evelyn Hilary O'Rooley but who is called Pat, decided to forgo her continuing flight to remain by choice[27] in the transit lounge where "nothing more can be expected of [her] until arrival arrives" within this "fully accounted for, justified and sewn up detour in [her] life line." The scene has our protagonist remain in the present tense, time present, as she remains for a "simulacrum of perpetuity remain in the present moment, in at least semi-sempiternal transit between departure from the past and arrival at the future"[28] She is in an in between condition, uprooted and forced to be international. Like in Eliot's time present, her past and future are currently tied to her present, "inhabit[ing] this tense"[29] in the "texture of now."[30]

As our narrator beings to become aware of her own transitional state, she becomes unaware of the languages of what she can hear and speak. This awareness begins a cascade leading to our protagonist's uncertainty of her gender—where Pat is Patrick or Patricia. While some of this character's transformation is a function of Brophy's avant garde literary style, it serves as an entrée into considering the ability for one in the time present to adopt alternative personas—be it of varied gender or to live out alter egos. Certain cities have realized the opportunities to live outside of ourselves while in transit, notably through the catchphrase "hat happens in Vegas, stays in Vegas." The mythology of the travelling businessman plays into this other self. Partying, strip clubs, casinos and prostitutes reflect a darker, more primal, side of human nature yet become are part of the mythos in a situation where one can live a second life without repercussion nor interference in one's primary life; while in transit, one allows him/herself to forgo more often the learned trait of delayed gratification, allowing oneself to participate in riskier, perhaps deviant, behavior.

The place of the present is not to be confused with non-place[31], a designed to be passed through or consumed rather than appropriated, leaving little or no memory of or no trace of our engagement with them. A non-place, as Marc Augé describes it, is not relational, historical or concerned with identity—a location between your journey's beginning and end and does not exist as an individual place.[32] It is a byproduct of super-modernity, a time of excess,

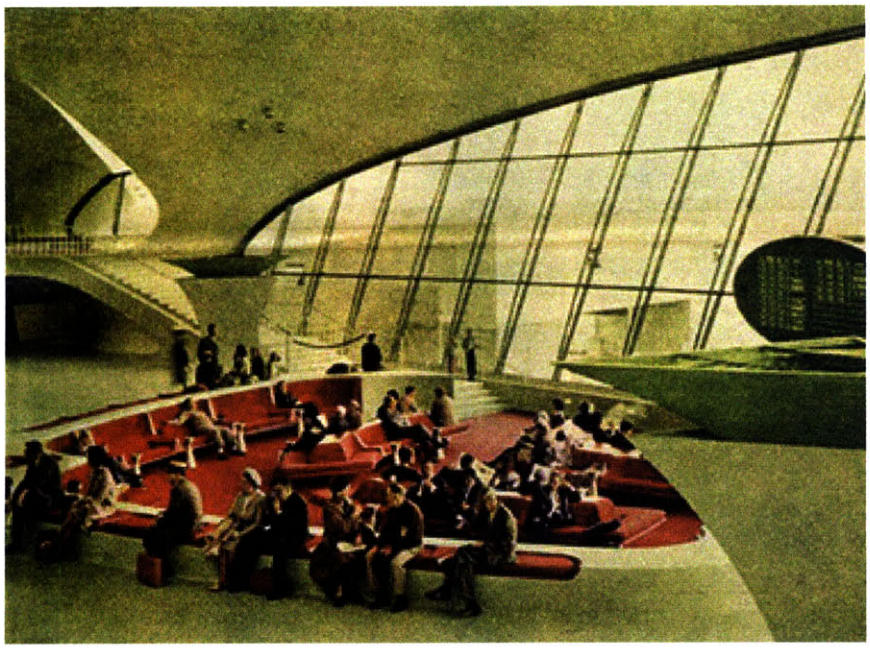


Figure 01.08 Waiting at Terminal 5
The sole, small, waiting and observation lounge in Saarinen's Terminal 5 shows the different notion of being "in transit" in the 1960s versus today, where sitting in the airport is *de rigeur*.

abundance and a flurry of action, that "does not signal the negation of narrative and identity, but to their histrionic multiplication in a deluge of space, time, and event;"[33] it is a residue of our contemporary condition. As opposed to place, where it "is never completely" erased from out memories, the non-place is "never totally complete"[34].

This state of the indefinite can be found in the precedents of Eero Saarinen, who both designed grand architectural spaces that served as blurry places to be passed through. The metaphor of movement created lofting and swooping architectural forms in both his TWA Flight Center (Terminal 5) for New York's Idlewild (now John F. Kennedy) Airport and Washington Dulles Airport. The iconic architecture reflected the excitement of flight in their time to great acclaim; the previous was called by Robert Stern as the "Grand Central of the jet age."[35] Even in their grandeur, they both serve as examples of non-places. In the New York example, Saarinen wanted to create "a building in which the architecture itself would express the drama and specialness and excitement of travel... a place of movement and transition..." The terminal served as an exciting, and famed, backdrop to flying yet provided little amenity to those passing through, notably containing only one sitting area for passengers waiting for their flight. The building was designed to shepherd passengers through the building with the jet as the main point of destination for the traveler, and not the building itself. While memorable sculpturally, the building does little to actually foster any engagement with the building itself. Similarly, the terminal at Dulles lacked facilities in the building that served as amenity, relegating the function of the waiting room to mobile waiting rooms, lovingly called "moon buggies" by travelers that would connect to awaiting jet craft just immediately before take off.[36] The lack of waiting facilities reflects a clear intent

Figure 01.09, 01.10 Mobile Lounges at Washington Dulles
The distinctive mobile lounges not only connected the terminal and the plane before the invention of the jet bridge, they also served as mobile waiting rooms, some even serving refreshments.

by the designers and the airlines of the function of the building—to serve as intermediate spaces and not as places of engagement.

Some airports today are breaking from the model set by Saarinen's works in an attempt to become spaces of production and not merely of consumption. One can see this in both the development of office buildings on airport grounds, as is proposed with this project, as well as conference rooms and private work spaces in airport terminals across the globe. There is also the development of a nomadic class, replete with titanium loyalty cards that are a result of the globalized economy. Like Ryan Bingham from the film Up In The Air who, tellingly says that this, the condition of being in transit, the elongated now of the present tense, is where he lives, with the systemized friendly touches, the cheap sushi, digital juice dispensers and recycled air that keep his world in orbit. In these two cases, the intention to remain, to exist, in transit. This condition provides a different means of understanding space. The airport is no longer simply a space for commerce and waiting, it becomes an economic center for production, work, meeting and even living as an extended detour. This change has forced airport authorities to consider alternative uses for their properties that are usually not aviation-related, and creating experiences that allow for the traveler to linger a bit longer—to be entertained as a programmatic function as much as aircraft movements. Like the urban context now, simulation and imagery plays an important part in rooting oneself to a place, or an imagined conception of place, through follies and narratives in space. The generic, yet defined, nature of the airport is a result of the multitude of requirements to move people, goods and machines around the tarmac leaving little room for architectural folly. Additionally, the shrinking public will to pass millages and bonds to finance grand public works like airport terminals have reduced the financial resources to achieve the awesome formal ambitions of the TWA Flight Center in the present day. As a result, the reliance of follies and simulacra to create a meta-narrative within the airport allows for some understanding of culture or historic context beyond the sterile area of the terminal.

ROOTED IN SIMULATION

This device can also serve to provide a simulated notion of "visiting" a city for those whose transient lives and employment duties may confine the traveler wholly to interior spaces during their trip—beginning in the aircraft cabin, with stops in the terminal, a bar and hotel conference centers—without ever actually experiencing the city they have supposedly flown into. In the same way themed gift shops ensure an opportunity for travelers to buy mementos of tourist locals one "should" have visited on their trip, the folly allows for the traveler to simulate a sense of experiencing something that is authentic about the city itself. These fall into several categories, each in some way refers to an event, a myth or a history to apply meaning to space.

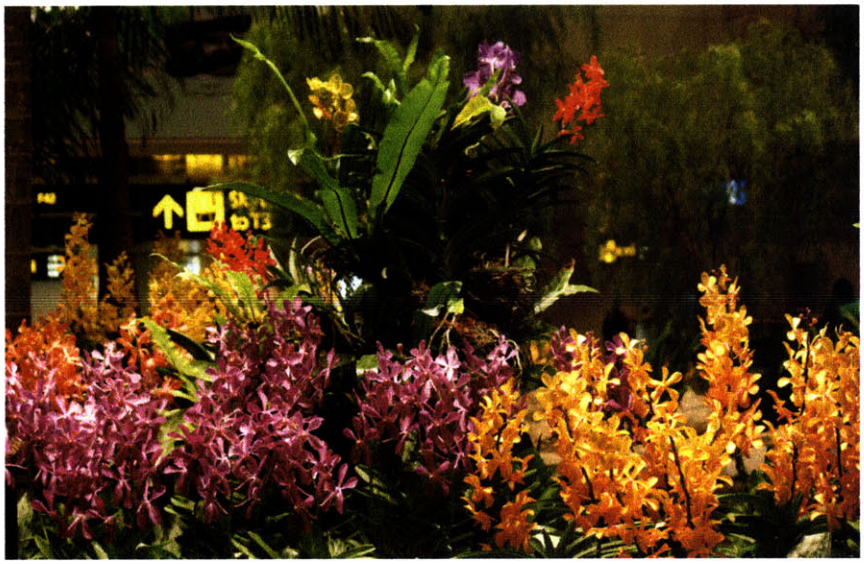
Figure 01.11 Suvarnabhumi Airport
The recreated Hindu shrine reflects the religious heritage of the city a few miles away within the secure, sanitary terminal designed by Helmut Jahn Architects.

First, rooted follies recreate the symbols and assets of key historic moments (or fantasies) about the community. This provides a connection to the cultural milieu of a place and acts as a cultural ambassador to the true history of a place, even if through caricature, through recreated amenities that are rooted in an actual history. In the case of Bangkok's Suvarnabhumi Airport, recreations Ayutthayan antiquities as well as a full recreation of a Hindu shrine[37] in the middle of the main concourse. New Orleans's Louis Armstrong Airport features "Jazz Alley" whose food court comes with piped jazz music and wood trim to simulate a stroll through a French Quarter alleyway. Here, authentic local flavors are served from Jambalaya to the sweet beignet. Further in the terminals are faithful recreations of the hot dog resembled stands serving local "Lucky Dogs". Disney's EarPort at the Orlando International Airport plays an interesting intellectual game of being a simulation of the simulacra of Walt Disney World. While serving as a shop for last minute souvenirs that one did not get while at the parks (the material is guaranteed to be the same that is found at the resort!), little ones also have opportunities for last minute photo opportunities with castles and costumed characters. In a sense, it's the best thing next to actually being there.

The ne plus of this category can be found in Amsterdam-Schiphol with a fully operational annex of the famed Dutch Rijksmuseum featuring highlights from the main museum's famed permanent collection of Dutch masters as well as temporary exhibitions from around the world. The building housing the museum was specially built to protect the artwork from the ground and air vibrations from the take offs and landings outside. Just like at the main museum, if you really like something you see on display, one can just walk downstairs to the gift shop and pick up a poster and get over to your gate in time for takeoff.

The second category of simulation employed is the created fiction where

Figure 01.12-16 Simulated Spaces in the Airport Terminal
(From the top, turning clockwise.) An Edo Dynasty street serves as a duty-free mall at Tokyo's Haneda airport. In Singapore Changi, rainforest gardens simulate a serene environment within the hustle and bustle of the terminal. New Orleans's airport relies on the mythologies of the city to create unique experiences in the airport including the "Jazz Alley" food court. Suvarnabhumi relies on its religious milieu. Orlando has Disney's Earport as a tenant as it creates the Disney World experience within the terminal.



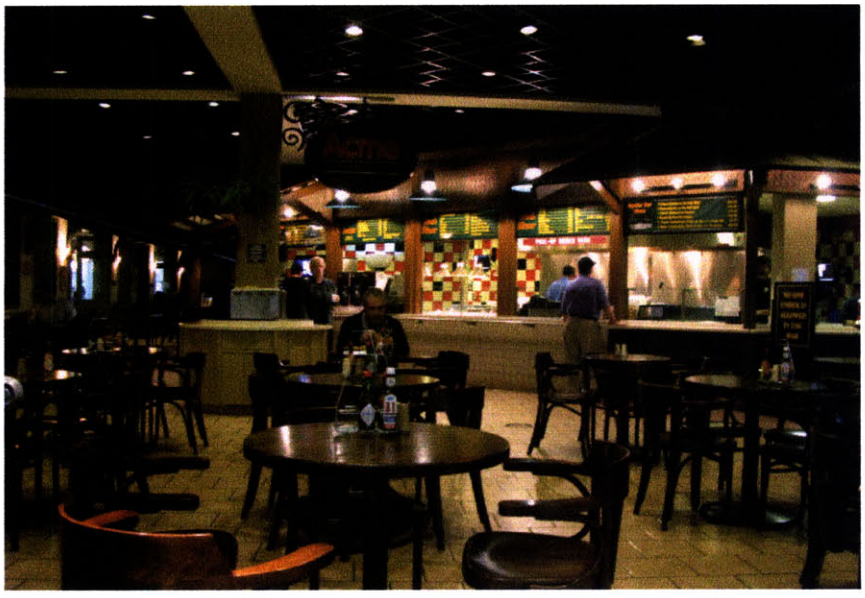


Figure 01.10 Space Shuttle Enterprise
The prototype space shuttle is on display at the Udvar Hazy Center Smithsonian Air and Space Museum on the grounds of Washington Dulles International Airport.

an idealized condition, or a romantic image of a place is created though the referenced cultural aspect may have never existed at all. Like the real Walt Disney World the Earport references, storytelling and theming create an environment that allows the visitor to immerse themselves into a world better than the actual world—a hyper-experience of the city the airport is serving. Tokyo's efforts to grow Haneda airport as a close and convenient alternative to Narita have lead to the construction of a recreated Edo period village in the middle of its main concourse. Inside, one finds the contemporary luxuries of duty free shops and souvenir stands. Other than the wonders of being impeccably clean, the romanticism of Japan's imperial past mixes uncomfortably with its modern, technology-led present miles from a city whose imperial past has largely been lost. Similarly, Singapore's rainforest gardens feature a highly fictionalized representation of the tropical rainforests that have yielded to the modern high-rise towers found across the island nation. Colorful flowers, artificial bird chirps and a lazy river with koi provide a serene, yet completely artificial respite from the hustle of the busy airport (where a few steps away, passengers can play game-show like challenges for prizes).

The third folly is the self-referential. Conceding that the airport is foremost a transit facility, some airports dedicate space to items dedicated to flight. Washington Dulles houses the Stephen Udvar-Hazy Center of the Smithsonian Air and Space Museum that not only houses famous aircraft, but will also house the Space Shuttle Discovery after retirement (replacing the experimental Enterprise destined for New York City) and the SkyCity entertainment development at Hong Kong International's Terminal 2 hosts a flight museum of sorts, that includes a "a full-motion plane-cabin ride simulator 4D Motion Ride."[38]

Augé, in citing de Certeau, considers a traveler's space, and the parallel movement of the landscape in which the traveler receives as partial glimpses, "a series of 'snapshots' piled hurriedly into his memory"[39] as the archetype of non-place. Certainly, the rush to photograph some famous sight causes a break or discontinuity between the spectator, the traveler, and the space of the landscape s/he is rushing though, leaving this memorial void to be filled with facts from guidebooks. These follies could certainly act as a distraction of the airport and the traveler's movements through space still relegated to similar "snapshots" of consciousness. The gap in Augé's argument is that it considers the object of focus to be wholly removed from context. His cited example of the Parthenon, understood as an object in opposition to its context, leading the environment to be ignored. Yet we can understand these follies as objects that create a dialogue with their environments though opposition. One better understands one's place in a busy terminal by being reclusive within the

enclave of a faux rainforest, or with beignet in hand in the themed food court. The narrative allows one to retract oneself from the airport because one is aware and understands the nature of the airport and wishes to be distracted from it. The meaning of place is granted because they root themselves in an isolated moment, a pocket of time within the expanse of time of being in transit. This enclave in time, of course, has lead to the proliferation of smoking lounges and sky clubs.

Perhaps more appropriately, the contemporary airport is not, as Augé considers, non-place but again, as exemplars as the defined generic in the airport—still imbued with significance through their simulation of place and thus, granting meaning to the place and the object itself.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CHAPTER TWO
AEROTROPOLIS

I feel at home everywhere I go.

American Tourist in Paris-Orly,
Jacque Tati's *Playtime*.

This airport city, named "aerotropolis" by Dr. John Kasarda,[1] are business, transit and residential communities built around and economically supported by an airport. Like railroad towns in the nineteenth century and seaports in the eighteenth century, airports have become in many senses the analog for the twenty-first century port city, containing economic environs of time-sensitive and just-in-time manufacturing, distribution and logistics centers, hotels, conference spaces, and office buildings. While the image of a city as being economically tied to a (air)port has existed for millennia, the image of a city built as a consequence of the (air)port is a new urban form that is more concerned with the number of international non-stop destinations than its number of public squares.

Considering, in terms of gross area, Schiphol Airport is larger than the historic center of Amsterdam, and Dallas-Fort Worth Airport is larger than the island of Manhattan, the scope of these aerotropoli is international in scale and challenges the social and cultural norms of what one considers a successful city, all the while difficultly trying to bring successful form to ambitious plans. Thus the role of air travel and airports as the center of a new urban form has changed from transit infrastructure to urban and economic stimulator.

HISTORIC VISIONS/FICTIONS

The imagery of the airport city, a place where citizens are quickly connected to fellow citizens and the world, has existed as long as commercial air travel became reality in the second decade of the twentieth century. For many, including civic leaders and denizens, the airport is a symbol of soft power, of modernity and wealth.

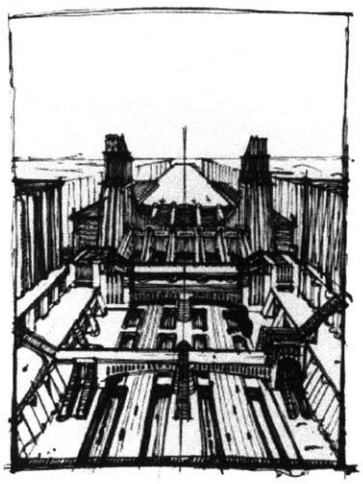


Figure 02.01 Citta Nuova
An earlier sketch of Sant'Elia's transportation center proposal.

Reference to flight was a common aspect of Futurist iconography, starting with Filippo Tomasso Marinetti's Futurist Manifesto. Inspired by Marinetti and the works of artist Umberto Boccioni, Antonio Sant'Elia produced a series of design drawings for the futurist Citta Nuova ("New City"). This designed city celebrated a mechanized human environment where vehicular movement zipped across the lower levels of the city while pedestrians wove in and out of buildings through elevated walkways. Sant'Elia, since his unsuccessful designs for the Milan railway terminus, seemed infatuated with a high-octane vision of the future. In his words:

> We shall sing of the vibrating nocturnal fervor of the arsenals and the building yards ablaze with violent electric moons; of swollen railway stations, avid for smoking serpents; of factories hung from the clouds by means of the twisted arabesque of their smoke of bridges bestriding rivers like giant gymnasts... of bold steamboats scouting the horizons, of broad-chested locomotives pawing the tracks like huge steel horses bridled with pipes, and the gliding flight of airplanes.[2]

Created as a series of discrete drawing, there is no master plan that shows the relationships between the various buildings and streets Sant'Elia designed. With his and the futurist's fascination with transportation and movement, it is reasonable to assume his design for a "Station for airplanes and trains" to be central to his New City. Though represented through buildings, the drawings are concerned with matters of infrastructure rather than the building themselves.

In Sant'Elia's final drawings prepared for publication, the station stood as a discrete object without surrounding context, as an un-urban object. Similarly, the actual modes of transportation are missing—trains as un-scaled black rectangles and airplanes omitted. These artistic devices cause the focus to be on the station and its architecture, rather than an understanding of its urban situation. However, in Sant'Elia's initial sketches for the same perspective, the signs of a dynamic city are present with this comprehensive transit station central to its design. Though much more figural, one gets a sense of a grand boulevard, flanked by a street wall of indeterminate building facades, dedicated

Figure 02.02 King's Dream of New York
The cover of Petit's design on the popular pulp publication.

to rail and air usage, passing under pedestrian walkways and presumptively over underground highways. In the background on the boulevard are the figures of small, cross-like airplanes.[3] Graphically these small airplanes lends a sense of infinity both into and away from the page as transportation moves in all direction of the station, unlike the final drawing where the station is of importance. It is without doubt, however, that air travel was not simply a side aspect of this futurist city; air travel was central to city's identity as utility, political tool and ideological icon.

A possibly precedent for Sant'Elia may have been Eugène Hénard's 1910 proposals for Paris.[5] Hénard's proposal superimposed multi-modal transportation within the narrow street section as part of a further urban superimposition atop the existing French capital, including airplanes in the skies above. The fanciful image of planes landing on building tops, although unrealistic, is a romantic image of how planes both engage the city below, as well as the architecture of Paris. From the United States, futuristic images of the metropolis appeared, notable that of Charles Lamb whose 1908 saw similar interest in multi-level transportation very much like those seen in Sant'Elia's work. Lamb's design would become, though unacknowledged, the inspirations for the popular pulp publication "King's Dream of New York", where illustrator Harry Petit's dirigibles and heavier-than-air craft fly above busy streets and skywalks buzz with pedestrians. New York City, as the world's most modern city at the time, captured the imagination of Americans as well as many in Europe with its vertical towers, and new subway system (the most modern in the world at the time). If anything, the real development in Manhattan gave credence to the more lofty designs of Sant'Elia.

American images of the future transit-dominated metropolis stuck with vision of Manhattan-inspired towers similar to those in Lamb's 1908 vision. Other pulp images in Amazing Stories magazine 20 years after Lamb's publication still reveals the popular imagery of a multi-level New York with bridge-linked skyscrapers and planes of various types flying with ease between the various towers. Noticeably, atop Earl L. Bell's The Moon Doom, large landing pads with parked biplanes top the foreground skyscrapers like large modern helicopter pads. Lloyd Wright, son of Frank Lloyd Wright, published a thought out proposal for an airport skyscraper in the Los Angeles Examiner in 1926. Like the east coast visions the tall multi-level tower rose out of a mesh of ground transportation infrastructure, rising up to multi-level runways and dirigible masts. The reinforced concrete, bronze and glass cruciform megatower would house 150,000 people while serving the needs of dozens of aircraft at one time. The tower would also serve as a full community with industrial uses in the lower levels rising to residential, administration and amusement uses in higher floors. One distinction from its predecessors, however, was the consideration of

freight coming by aircraft, which at the time was not common due to the cost of flying.

The airport tower was popular in the collective imagination, though only one building actually built to facilitate as an aircraft terminal—the Empire State Building. The tall art deco mast was designed to serve as a docking station for dirigible aircraft. Originally, aircraft would connect with the landing platform on the 102nd floor with a narrow gangplank. Passengers would take an elevator from the 86th floor observation deck, which also served as the waiting room and check-in facilities. The first docking was attempted in 1931 with the dirigible "Los Angeles" and immediately revealed the impracticalities and dangers of the mooring concept.[7] Soon after the $106,0007 mast was completed, doubt on whether mooring was safe came to light. Dr. Hugo Eckener, commander of the German Graf Zeppelin explained that the air over the city was "irregular and spotty as the grags of the skyscrapers, particularly at the level of building tops" which would put the ship "in constant danger of veering off and crashing into some other building, even on a quiet day".[8] Similarly, changing wind directions could spin the dirigible wildly around, and tugging at, the mast.

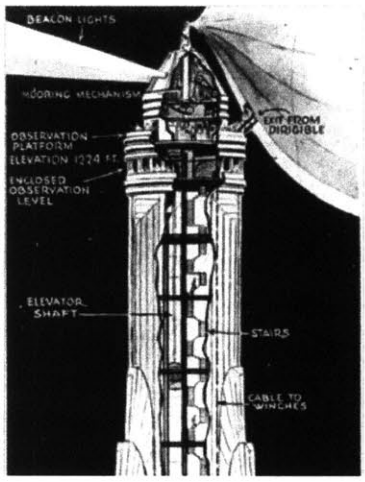


Figure 02.03 Mooring mast of the Empire State Building
The design quickly revealed the impracticality of diribiles within the interior of the city.

While most often noted for the ideological organization of open spaces and massive towers, both Le Corbusier's Plan Voisin of 1925 and the plan for La Ville Contemporaine were organized under the conditions of industrialization and transportation; each featured aircraft runways in the center of the an urban field of slab buildings with density that set his European proposal apart from the American visions. When considered with the proposed grand highways, these cities affirmed with Le Corbusier's belief that "a city made for speed is a city made for success."[9] In the case of the Plan Voisin, the grid of tall, cruciform buildings is broken in the center only to provide a landing strip for airplanes, under which massive highways ran. Le Corbusier made the appeal of flight explicit. In his essay 'Airplanes' in L'Esprit Nouveau, he wrote: 'The airplane is indubitably one of the products of the most intense selection in the range of modern industry. The War was an insatiable client, never satisfied, always demanding better. The orders were to succeed at all costs and death followed a mistake remorselessly. We may then affirm that the airplane mobilized invention, intelligence and daring: imagination and cold reason. It is the same spirit that built the Parthenon."[10]

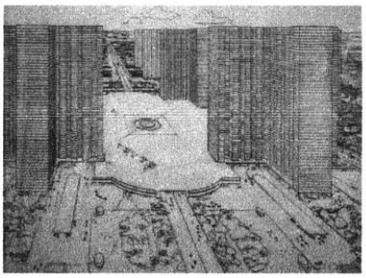


Figure 02.04 Plan Voisin
An airfield anchors a number of office and residential towers.

The emphasis on transportation and aircrafts was undoubtedly a result of the financial support from the aircraft maker Aéroplanes Voisin, where the plan was named in recognition of one of the company's founders, Gabriel Voisin. In each case, the ubiquity of flight was central, but also a public function rather than private transport.[11] It would easy to dismiss the inclusion of air travel, with abandon to the impossibility of flying so closely between buildings, as

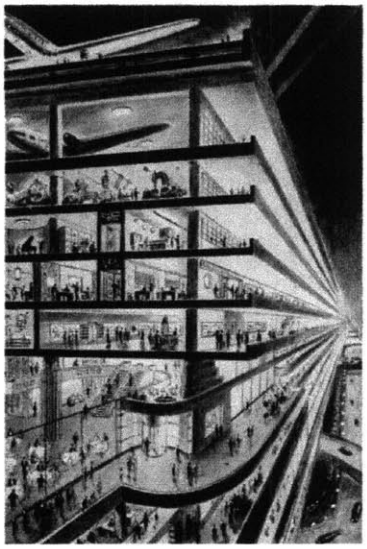


Figure 02.05 Section of the Dream Airport
The section resembles a mixed-building like Rockefeller Center more than an airport from the era.

Figure 02.06 Bird's Eye (Plane Level)
View of the Dream Airport on the Hudson River's edge in Manhattan.

a central part of Le Corbusier's urban form as an honor to his patrons, yet La Ville Contemporaine, designed three years before Plan Voisin, and served as an inspiration for that project, also incorporates a comprehensive transit center resembling that of Sant'Elia. In both Le Corbusier's and Sant'Elia's works, the practicalities of landing planes among skyscrapers would elicit fear among passengers and residents alike.[12] The difficulty in applying the airport into a built urban form is that it limits the ability for the airport to grow and keep pace with technological changes. Rectifying this problem, Le Corbusier in designing Ville Radiuse (1930) would depart from the model set with Voisin and Contemporaine, both plans with distinct boundaries, and moves the transport zone, including the airport, to the outskirts of the infinitely expandable town.

The 1946 New York City Dream Airport came from the mind of one of the most successful real estate developers in the city, William Zeckendorf that would have made the lives of anyone who has rued a trip to New York's distant airports. Located along the Hudson River, the sprawling $3 billion terminal project would have brought air service right beside Manhattan (which would also be one of the project's chief selling points). In addition to servicing 68 flights an hour, nine floors of restaurants, offices, waiting rooms, docks for waterfront liners would turn the project into a retail, commercial and transportation center that would, in the developer's estimates, recoup the initial costs in 55 years. These spaces were made comfortable by the new technological marvel of air-conditioning, ridding the interior air of noxious fumes. The Dream Airport represented a second trajectory in the imagery of the airport city. Rather than a city created from a tabula rasa, these proposals were interventions within a real, existing city.

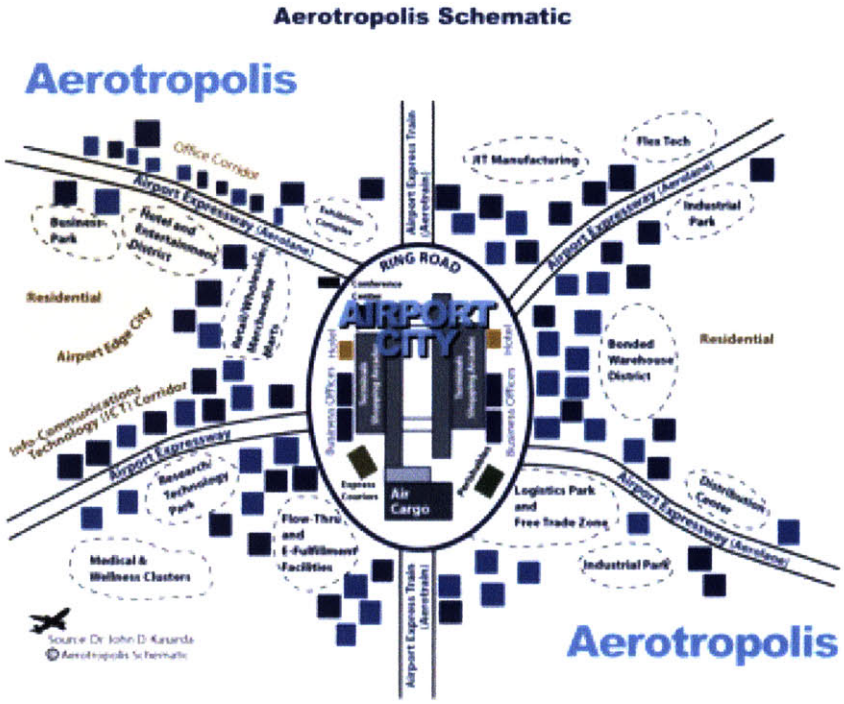
A separate proposal of the Rotary Airport renders another airport off the coast of Manhattan. Norman Bel Geddes's 1931 vision rendered an airport floating off the tip of the city's historic center at Battery Park. Rather than proposing a full urban form, the airport would support the economic and social activity downtown by connecting to it, rather than supplanting it as with the Dream Airport. By locating near existing subway and road infrastructure, the proposal would alleviate the need for more automobiles. The novel aspect of the airport was that the entire airport would rotate to meet planes from the prevailing winds, much like the modern aircraft carrier. The airfield sought to minimize its impact on the future development of Manhattan's skyline, but maximize air passenger safety while clearing the nearby obstructions.

Bel Geddes would revise his ambitions for a New York airport when he was hired to design the General Motors-sponsored Futurama pavilion at the 1939 World's Fair. Unlike the Rotary Airport, the airport was moved on land, reflecting technological changes happening in the aviation industry. 'Airport

Tomorrow' would be located a short distance from the site of the Rotary Airport to a site across the river from the southern point of Manhattan. This airport's design would again take cues from its predecessor and used a circular design, which by this time was becoming a dated form. It was to be an airport for the 1960s, but with a clear and dated 1930s outlook of the future.

The Rotary Airport, as with London's Liverpool Street proposals by Lindy and Lewis and Glover's King's Cross proposal, shared similar issues as the other mentioned examples. Expansion was not easily possible, but more importantly lacked the support infrastructure common to airport facilities today. Without maintenance or hangar facilities, these proposals were seen as a connective interface with the city, akin to the jet way, rather than a comprehensive facility as with the Dream Airport. The measure of success was to minimize travel distance and time from the heart of the city to any other, rather than seen as the instigator of development. Yet, architecturally, these projects perhaps represent the clearest idea of how an airport form can begin to mediate with the milieu of the city in its own era.

Figure 02.07 Aerotropolis Schematic
Kasarda's scheme for the airport city.



THE ECONOMIC PROMISES

While many cities are pursuing development of businesses around local airports, an aerotropolis sets itself apart as a larger urban entity that transcends just economic interests and includes comprehensive transit, residential, cultural, commercial and industrial amenities. For much of the history of airport-centric development is that it has been organic and haphazard. As the demand for various services arises, piecemeal solutions have created a patchwork of physical and infrastructural development. Yet, contemporary examples require comprehensive planning to create place and community. Kasarda argues that these new cities must consider:

- Multi-modal transportation systems and highways to improve the one-the-ground movement of people and goods.
- Planning and separation of goods-processing activities (manufacturing, trucking) from white-color service facilities and airport passenger flows.
- Clustered development rather than strip development.
- Human-scaled, mixed-use communities for airport and business workers as well as frequent air-travelers providing local services and a sense of neighborhood.
- Place-making and way-finding enhanced by architectural features and iconic structures.

In Amsterdam, home to the world's first aerotropolis by design, planners have used the mantra of:

> The airport leaves the city.
> The city follows the airport.
> The airport becomes the city.[13]

One can understand the appeal the aerotropolis as it is built as a contemporary iteration of corporate forms of development. Like the corporate park, the bounds and purpose of the aerotropolis is clearly defined and in contrast to the costly sprawling tentacles of Rem Koolhaas's "generic city". With a clearly defined center of a region's existing airport, compounded with the promise of "returns on (previous) investment", the aerotropolis offers a locale with clear hierarchy and the potential to serve as a location for employment and global competitiveness.

For cities and states, the allure of airports and aerotropoli has less to do with improved urban form and civic amenities and more to do with the politically charged issues of job creation, attractiveness to business and industry, economic development and, like Sant'Elia and Le Corbusier, the appearance of modernity and soft power.[14] The result is an airports arms race, resulting in the rapid development of entire cities as entries into this global zero-sum game. An airport that is well connected by air is appealing amenity to businesses whose scope may be international in ambition, as the choice of flights; destinations and flexibility in scheduling are strong benefits. The aerotropolis serves a service and professional population who benefits from being quickly connected to the world yet find the comforts of community close-by while through these planned airport communities, find livable places that can also be useful amenities by which a company can recruit top talent. Companies, who rely on airport proximity to get their goods around the world, find these communities ideal for their location, as speed is often a strong competitive advantage. Just-in-time manufacturing models made famous companies like Dell Inc. have found competitive competence in their location near airports, enabling the company to minimize inventory, shorten production time and as a result, allowed for greater benefit to the consumer through pricing and customization.

As any recent flyer would realize, the airline industry and the aerotropolis model of urbanism is deeply linked to the era of cheap oil.[15] Concerns for the future of aviation has been a major reason for Britain's reining in of their airport expansions programs. While this paper will not argue the issues of carbon emissions from jetliners, the popular and political sentiment toward greener development plays a serious part in the tenability of the aerotropolis. Kasarda argues that the airport acts as a centralizing force attracting businesses

seeking closer proximity rather than distance in the case of typical suburban development. The aerotropolis then, though reliant on fuel-dependent technology, offers a greener means of city building as it seeks consolidation of programs that would otherwise be distributed in the suburbs and exurbs of a region.[16] This consolidation can also bee found in the co-location of distribution across multiple modes which in aggregate reduces the consumption of fuel as items only have to move within a limited distance of the aerotropolis district.

The aerotropolis's success as a formal object serves economic ambitions can yield jobs and tax revenue, both issues close to governments' and politicians' hearts. Their popularity as urban growth models ultimately lies with this promise.

THE CURRENT RACE TO DEVELOP

The mid-century developments of Dallas-Fort Worth airport as well as Memphis airport exemplified the role airports could play in the economic vitality of a metropolitan region. Much like today, the race for modern airports led to the rapid expansion of air travel capacity for both cargo and passengers as each city sought to have the world's most modern, and convenient, airport. The airport was a metaphoric welcome mat and an icon of the city's arrival into a global marketplace.

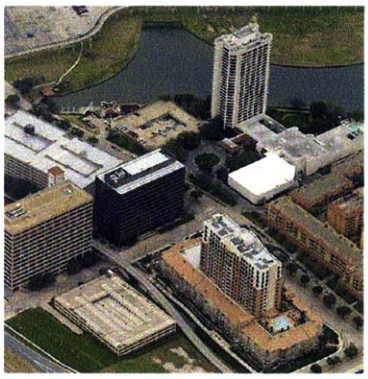


Figure 02.08 Las Colinas Urban Center
High-rise towers in the Las Colinas development in close proximity to DFW, surrounded by single family homes.

The aggressive development of Dallas-Fort Worth International Airport (DFW) has created entire communities whose economic growth and vitality has been due to its proximity to the world's third busiest airport and primary hub of American Airlines, once the world's largest airline. With land leases, commercial developments, hotels, gas rigs within the borders of the airport, and corporate parks and housing subdivisions beyond the border has made the "DFW Metroplex" the state's fastest growing areas and the headquarters of 24 of the world's largest companies including Verizon and Exxon-Mobil. Overall, 65% of DFW's $619 million in annual revenues comes from sources other than airlines.[15]

Surrounding communities have seen enormous growth as a result of their proximity to DFW. The communities of Southlake and Colleyville, each 10 minutes from the airport, have transformed from bedroom hamlets for Dallas and Fort Worth thirty years ago have grown to become popular communities for corporate transfers as the area has become a booming market for upper-middle class homes. At the high end, homes in neighboring Westlake have hit the market at prices above $7-million.[16]

The potential for DFW to become an airport city, in the truest sense, is stymied by the market demands of the DFW Metroplex. The desire for suburban-style living has forced the continuation of lower density developments.[16] Las Colinas, an upscale development within Irving, Texas was planned as a mixed-use development of business and personal addresses within close proximity of DFW. Yet, this suburban demand of the Metroplex has resulted in a population density for Las Colinas approximately 20% smaller than that of Dallas[17] even as the community touts its own "urban center".

The first modern aerotropolis can be found at Amsterdam Airport Schiphol (AMS) in the sense that the organic, ad-hoc development seen in previous examples developed as part of a defined master plan or vision concerned with both economic and formal issues from the onset, and is situated within the immediate grounds of the airport. Over the course of the past two decades, the

airport through its Schiphol Real Estate Group has been involved in commercial development on the Schiphol property, branded as the "AirportCity", and has built hotels, meeting spaces, entertainment facilities, office and logistics complexes, and retail and commercial activities, supported by a multimodal transportation system just outside the walls of the terminal buildings. The AirportCity employs nearly 58,000 people and has market rates for office space that exceed those in downtown Amsterdam.[18]

Nicknamed the "Financial Mile of Amsterdam", Zuidas is modeled after London's Docklands and the Parisian La Défense as an ambition to make Amsterdam more attractive to technology, innovation and financial multinational corporations, so far having attracted ABN/AMRO Bank's consolidated headquarters, and ING. Zuidas is located about five to eight minutes from AMS and is connected to Amsterdam and AMS by the A10 ring road; plans for underground for dedicated underground tunnel access and public light rail/metro options to Schiphol and Amsterdam are currently being investigated. Unlike developments in Memphis or Dallas-Fort Worth, the inclusion of mixed and stacked-use planning speaks to the vision of creating an urban space instead of a pure economic space[19], further emphasizing Kasarda's notion of clusters rather than strip developments along A10. The Zuidas Vision of 2001 currently plans for 44 % offices, 44% housing and 12 % facilities.[20]

AMS best exemplifies an urban scheme promoted by Kasarda in where the core of the new aerotropolis centers on an Airport City—a transit, business and entertainment center. With AMS's AirportCity business complex and cultural amenities including a branch of the world famous Rijksmuseum, the immediate airport grounds anchor what is developing into a second business center of the metropolitan Amsterdam area. The success of the AirportCity as a new urban center is reinforced by developments happening within a ten-minute transit radius from the airport grounds including the new, rapidly developing business district of Zuidas, supported by policies intended to distribute risk and organization of long-term operations, making this area physically and economically desirable.

While many major airport hub cities are investing in their airports as economic engines, only one is currently attempting the aerotropolis as an urban intervention as well. Initial discussions begin in the 1980s for an expansion and renovation of Detroit-Wayne County Metropolitan Airport's (DTW) facilities as it grew to become then-Northwest Airline's second largest hub. Discussions about a comprehensive economic center began in earnest in 2002 when the 1.6-km long McNamara Terminal opened to passengers, replete with runway and infrastructural upgrades. The new 121-gate terminal greatly improved air travel capacity as well as allowed Northwest Airlines, now Delta Airlines, to

increase capacity and use Detroit as its main gateway to Asia.

In addition to DTW, Willow Run Airport (YIP), serving mainly freight and corporate clients, sits ten miles away along Interstate 94 and several rail lines that serve as part of the NAFTA corridor from Canada to Mexico. Recognizing that the Detroit metropolitan area had a mature transportation infrastructure bookended by two airports with excess capacity, policy leaders began planning an aerotropolis on over 1,200 acres of brownfield and undeveloped land. In 2006, as part of the planning process, the University of Michigan organized a charrette[21], in collaboration with civic and industry leaders, to provide a regional planning guide for metropolitan Detroit, centered on the aerotropolis. At the heart of the final plan was an economic center called Pinnacle Aeropark, a comprehensive mixed-use business community.[21] The ambition for Pinnacle was to house high tech, logistics, retail, commercial and recreational developments anchored by a world-class thoroughbred racing track that could also make the development a tourist destination as well as business destination just immediately south of DTW. As planned, the track would serve as the first phase, bringing with it hotel and retail development. Following the tourist-oriented development, housing and the first industrial and commercial developments would be added. In tandem, development along the I-94 corridor to the north would bridge the stretch between the two airports.

Figure 02.09 Pinnacle Park, near Detroit Metropolitan-Wayne County Airport

The plan would require the cooperation of a number of cities and public and private agencies in two counties to carry the plan forward. The jockeying of power between the various cities, including Romulus where DTW is located, and disagreements with the developers of Pinnacle Aeropark left the project stalled for a number of years. In 2008, Pinnacle Race Course finally opened with shops, restaurants and a hotel, yet the ambitious formal urban plan of the original plan was lost in favor of a more development-friendly plan with the large racetrack surrounded by suburban-like arrangement of development parcels. The potential for a semi-urban development was lost.

The financial crisis and quick collapse of the automotive industry in 2008 hit the region hard, but gave the civic leaders motivation to renew their efforts in using the Aeropark as a means of creating new jobs and economic activity in the region as its hold on automotive manufacturing was slipping quickly. As of May 2009, seven local governments and both Wayne and Washtenaw counties signed an intergovernmental agreement to form an independent development corporation to advance the project. The first success came in June 26, 2009 as General Electric announced plans to locate a manufacturing and software technology center within the aerotropolis, as well as serve as a worldwide training center for the company.[22] While initial outcomes are now positive, whether the development will be able to create a livable "community

within a community"[23] remains uncertain.

Figure 02.10 HKIA In-town Check-In
Travelers can check-in and enter the secure area of the airport from inside Hong Kong and Kowloon, extending the footprint of the airport.

The grandest ambitions and examples can be found in the East, as state treasuries bolstered by strong export economies, as well as sovereign wealth funds in the case of the United Arab Emirates provides the purse for new cities being built from scratch where the ambitions of an aero-centric city come to full fruition.

Hong Kong International Airport (HKG) is built on the island of Chek Lap Kok by land reclamation. Prior to the relocation of Hong Kong's main airport away from the dense district of Kowloon, the island was underutilized and bare. The move away from the downtown created opportunity for Hong Kong not only on Chek Lap Kok, but also on neighboring Lantau Island, strategic transportation development throughout Hong Kong. Ten such infrastructural and urban projects were codified in together as Airport Core Programme in 1991 with the signing of a Memorandum of Understanding between British Prime Minister John Major and Chinese Premier Li Peng. The HK$200 billion project sought to increase the region's overall global competitiveness. By centering on the airport and surrounding port lands, Hong Kong could see economic returns while finally replacing the old Kai Tak Airport whose expansion was made impossibly by the expansion of downtown development around it. Politics played a role in approving the plan when the Hong Kong government did as the it desperately sought to restore confidence in the wake of the 1989 protests in Tiananmen Square, and with the handover of sovereignty from the United Kingdom to the People's Republic of China a few years later.

The new SkyCity development is located at the tip of the airport, connected to Terminal 2 of HKG, aims to create a 24-hour environment at the airport with a large business and entertainment complex located on land owned by the Airport Authority Hong Kong. Like the World Trade Center in Amsterdam, the prime location near the airport grants prime real estate for business, but also creates a location for travelers to shop and enjoy during an extended layover. Currently in operation, is the AsiaWorld-Expo, the largest convention and exhibition center in Hong Kong, the AsiaWorld-Arena entertainment venue and the SkyPier ferry terminal. The SkyCity Marirott Hotel and a nine-hole golf course offer rich amenities to travelers of HKG. Entertainment and retail operations branded under "SkyPlaza" are currently in design or under construction. Even with these touristic amenities, the ambition of an event center has already seen marked success, hosting concerts for international bands like Coldplay and Kylie Minogue, as well as international conferences. Transportation became a central organizing feature of SkyCity and aimed to connect the site by air (via the airport), by sea (with extensive ferry services to Hong Kong, Macau and mainland China), and by land (by new public

transportation and surface roads that were also results of the Airport Core Programme) onward to Lantau, Kowloon and the rest of Hong Kong. Adjacent to the airport and connected by ground transportation is the North Lantau New Town adjacent to the airport and is largely envisioned as a high-rise residential center for those who work or regularly engage with the Airport. Comprised the towns of Tung Chung and Tai Ho, the New Town is intended to both be connected to the airport yet also serve as successful, self-sustaining communities on their own. Currently, only Tung Chung has been realized with the first district dedicated to supporting the airport.

Figure 02.11 Tung Chung
The full, support community for the employees of HKIA and other residents of Hong Kong.

A focus of the planners of Tung Chung was to create a livable community. The incorporation of transportation systems and transit-oriented design has enabled the town to develop successfully as it provided a well-planned foundation onto which developers and the government could build the highly dense city organically. The Hong Kong MTR and Airport Express provide a quick and easy commute to the financial center as well as to the airport, which makes these areas to find desirable, affordable housing. The transportation system also allows for the creation of community centers throughout the new town where concentrations of retail, services and public amenities are found. The government's efforts in building public housing for 20,000 and a subsidized home ownership scheme as well as transit-related benefits to developers incentivized relocation and guaranteed density to Tung Chung. The center of Tung Chung is also a popular destination for tourists as it serves as the base for the Ngong Ping Cable Car to the popular Big Buddha and Lo Ping Monastery. Around the base station is the one of three shopping centers supporting the Tung Chung, the Citygate that provides retail services and employment opportunities for residents. As a transit-oriented development, it offers for residents as well as acts as a stimulator for the local economy as Hong Kong's largest brand outlet mall as well as acting as both the front door and heart to the city for thousands of people daily.

Figure 02.12 HKIA SkyCity
Attached to Terminal 2, the SkyCity development includes performance venues and business amentities. Designed by SOM.

Though concrete plans for new districts of Hong Kong are being built, the airport itself poses interesting questions of the relationship of the existing city and the terminal. In other words, Hong Kong International blurs the edge of the airport and the city. Through its unique Airport Express in-town check-in scheme, and network of ferries, the secure sterile area of the airport literally extends from Chek Lap Kok Island where the airport is located, into the heart of Hong Kong, Kowloon and as far as Shenzen in Mainland China and the Macau SAR. As passengers check-in and pass through security in town, they remain in secure spaces until their arrival at the main terminals at the airport. For the passenger, the secure space of the terminal has extended into the city. Similarly, passengers may remain in the sterile zone as they board a transfer ferry from Chek Lap Kok to the mainland of China at Shenzen Airport or to

Figure 02.13 Footprint of HKIA
The footprint of HKIA, including secure-zone ferry routes and in-town check-in spans three countries.

Macau SAR. As such, though passengers pass through Hong Kong waters, are not considered to have entered Hong Kong for immigration purposes, as if they had taken a traditional flight transfer within the same terminal. With these programs, the airport is not a separate city, but an overlay upon the city harkening back Sant'Elia's vision yet in a post-9/11 security context.

With the wealth accumulated from its sovereign wealth and oil funds prior to the financial collapse, the Emirate of Dubai sought to build an airport unrivaled in size and capacity in its ambitions to diversity its economy. Al Maktoum International Airport (DWC) completed its first phase in mid-2010 and has the capability to receive cargo planes. When completed in its entirety, it will be the world's largest passenger and cargo hub with a design capacity of over 12 million tonnes of cargo a year and in excess of 120 million passengers annually, three times the cargo capacity of MEM and a third larger than Atlanta-Hartsfield International Airport, currently the busiest passenger airport in the world.[24] The completed airport will have the capacity to receive passenger jets as large as the Airbus A380 as well as support royal and executive jets in three terminals that will include two luxury facilities. The airport is situated at the center of a larger development.

Dubai World Central is the umbrella brand of six project companies that together will create a new city twice the size of Hong Kong island. Each of the different cities (Residential City, Logistics City, Enterprise City, Commercial City, Aviation City, Staff Village and Golf City) including the Al Maktoum International Airport offers themed working and/or living areas. Part of the plan involves investment in the sciences with the Enterprise City including the

opening of a university for 3,000-4,000 students, aircraft repair and logistics, world-class golf resorts and residences, and a new commercial and financial center for Dubai.

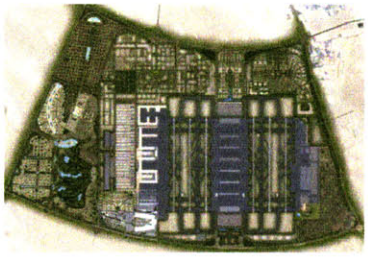


Figure 02.14 Al Maktoum Airport Plan

The plan as an urban generator seems problematic from the onset, though construction has not started. As each city is being created as individual companies and phases, each has been themed as a mono-functional district similar to mono-use zoning with its own form that eases sale and development. What seems lacking, especially when compared to Hong Kong or Detroit's ambitions is a unified sense of livability. With a total development almost twice the size of Manhattan, the strict adherence to the single-themed districts may cause issues of sustainability, livability as well as social equity (especially considering a so-called "Staff Village") and it's reliance on a dated model of urban planning may also stifle competitiveness, especially when considering efforts elsewhere in Dubai, the UAE and the rest of the Middle East in this, Dubai's vision for a front door to the rest of the globe.

With similar aims to the Dubai project, the completion of Seoul-Incheon International Airport (ICN) in 2001 marked a significant step in galvanizing South Korea's emergence into the global marketplace. The opening of what has been voted as among the best airports in the world was the first step of a larger project for South Korea to ensure it's economic strength and to maintain competitiveness. A report from Booz-Allen & Hamilton reveals that South Korea is facing external economic pressures from its Chinese and Japanese neighbors in North Asia as well as fellow "Asian Tigers" and is seeing a slowing growth rates since the late 1990s as the country moves away from a manufacturing-based economy.[25] The creation of the Incheon Free Economic Zone encompasses three regions with a total area of over 200 km2 and is planned as a self-contained community of business and living areas, logistics centers, an international business center, schools, and shopping and entertainment. A medical center to capitalize on the rise in Asian medical tourism is also planned.

With ambitions to use this development to recruit entire industries, talent and most importantly investment, ICN, in a practical sense, is the center to the entire development. Each of the development's three unique districts—Songdo, Yeongjong Island and Cheongna—is located strategically with regard to access and proximity to ICN. New highway and rail infrastructure will connect the Songdo International Business District with ICN via the new 12.3km Incheon Bridge, currently under construction. Immediately next to the airport on Yeongjong Island is Yeongjong International City whose proximity to the airport allows it to become the connection to the mainland to Cheongna. In addition to local ground-based transportation, plans existed for the government of

Figure 02.15 Songdo IBD near Incheon Airport

Incheon to partner with the popular Asian low-cost airline Tiger Airways to create Incheon Tiger Airways, based out of ICN, to stimulate easier business and pleasure travelers from Japan, China, Mongolia and Russia but have since been scrapped.[26]

Immediately surrounding ICN is the Yeongjong Island development district, envisioned as an airport logistics, travel and tourism destination capitalizing on its adjacency to the airport. Residences are aimed toward foreign leisure and business travelers. Cheongna is planned as a similar development to Yeongjong as a leisure city featuring sports venues as well as theme parks but also as an enclave for foreign businesses with convention centers and financial centers geared toward multi-national corporations. The third development community is the Songdo International Business District located several minutes from ICN. Songdo is the most ambitious example of an aerotropolis in its size, technology and urban design currently in development. The city's vision is to be a world-class aerotropolis that contains the amenities and resources to attract businesses from around the world and house a population of about 250,000 as it is sited 3.5 hours to one-third of the world's population. With ambitions of being a world city, it takes cues from around the world in its design: Songdo IBD boasts the wide boulevards of Paris, a 100-acre Central Park reminiscent of New York City, a system of pocket parks similar to those in Savannah, a modern canal system inspired by Venice and convention center architecture redolent of the famed Sydney Opera House. The cultural fabric of Songdo IBD will also be a rich one with a stunning opera house, concert hall, museum and aquarium.[27]

Yet beyond the kitsch of marketing, real concern for diversity, density and best practices in the art of city making were incorporated into the ambitious plan from the American-firm, Kohn Pederson Fox, as well as an adoption of sustainability principles from the United States Green Building Council's LEED program. The project is part of the USGBC's LEED pilot program for neighborhood development. The 100-acre Central Park not only provides the amenity of open space, it is also central to the district's water saving infrastructure as its design will utilize seawater for irrigation as well as part of a larger network designed to mitigate storm water runoff back into the surrounding sea. A comprehensive transportation plan further helps to expand Songdo's environmental plan while partially offsetting its reliance on carbon-heavy air travel as a driver of economic growth. The designers have made a pedestrian city their ambition with regard to the plan of the city as part of the move away from carbon-based transportation. Parcels will target LEED certification for newly constructed buildings.[28]

A main boulevard cuts through the heart of the financial district an outward

through the other neighborhoods of Songdo. As the main spine, it also acts as an organizing device for not only the horizontal development through the site but also vertically. In a concern for access to sun and light, the designers proposed a concept of an "urban tent" where by buildings taper down from the Incheon Tower—the second tallest building in Asia when completed—as one moves away from the landmark. The only break to the gradual rise in height is for the Central Park.

The city will also be the world's largest ubiquitous city, where sensing technology will give a real-time snapshot of the functions of its people and its infrastructure. This project marks a large-scale collaboration of a technology firm, Cisco and their Smart + Connected Communities initiative, with civil planners and government as an aspect of city building. Not only will students and business workers have access to teleconferencing capabilities and ubiquitous wireless internet, utilities and services including safety and will be connected to the internet allowing citizens and the municipality to see usage, problems and demand in real-time. This opens up a new potential in how one engages the city with much greater personal empowerment and individual specificity.

FLY-IN COMMUNITIES

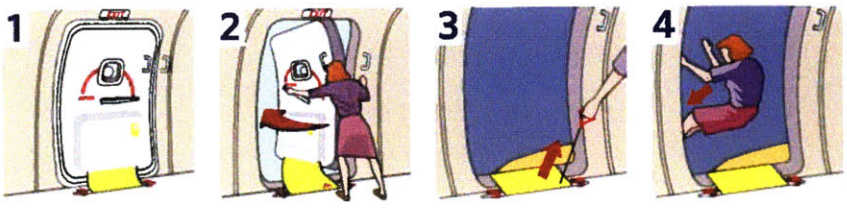
Figure 02.16 JumboLair
Homes include ample parking for planes of all sizes, and exclusive use of a private runway.

For some, the ultimate hybrid of airports and urban form is the fly-in community. Seemingly odd, these communities follow a market demand for homogenous, suburban living among individuals with shared interests. There's Cassadaga, the "Psychic Capital of the World" and Gibsonton, Florida, a community of circus "freaks"; an aviation community is not unimaginable.29 These planned developments can be found in 25 states and several countries,30 but it was with John Travolta's purchase of a home in the Jumbolair Aviation Estates in central Florida when these gated-communities entered popular perception. The homes in the development abut Greystone Airport, a private-use airport with a runway long enough to allow operations of Travolta's Boeing 707. The community sits on 550 acres where 125 families reside along a 7,550-foot runway unhindered by municipal noise ordinances. This, like many other airparks, are designed so that each resident could own their own airplane which they would park in their own hangar, usually on the owner's property or integrated into their own home.

Speaking of Jumbolair's celebrity resident "he uses the 707 as the family van. The Gulfstream is his sports car," says developer Terri Jones whose husband was the creator of the community and was an avid pilot herself.

A similar community near Daytona Beach, Spruce Creek, considered to be the first of such airparks, had long-time airport city consultant McKinley Conway among its investors and planners. The enclave was envisioned as a community where Conway could taxi his airplane to the offices and plants he wanted to visit and park at the door at a time where airfields built during World War II were being declared surplus by the government. Spruce Creek Airport today operates exclusively to service its residents in a gated enclave and residential airport development. Over 1,300 homes, a championship golf course and country club, and 24-hour patrolled security surround the airport. As a transit facility, there are 438 aircraft based at this airport: 67% single-engine, 31% multi-engine, 1% jet and 1% helicopter with an average of 68 flight operations daily.[31] During the ensuing decade Conway planned and promoted such developments at a number of former military bases in Georgia and Florida and at other sites from the Northeast to the West Coast. His experience was summarized in a book The Airport City published in 1977.[32]

While a niche real estate market, there are several companies dedicated solely to these developments with projects in mainly nations with large landmasses and wealth such as Russia, Brazil, Canada and Australia. Today, there are several hundred fly-in developments around the world.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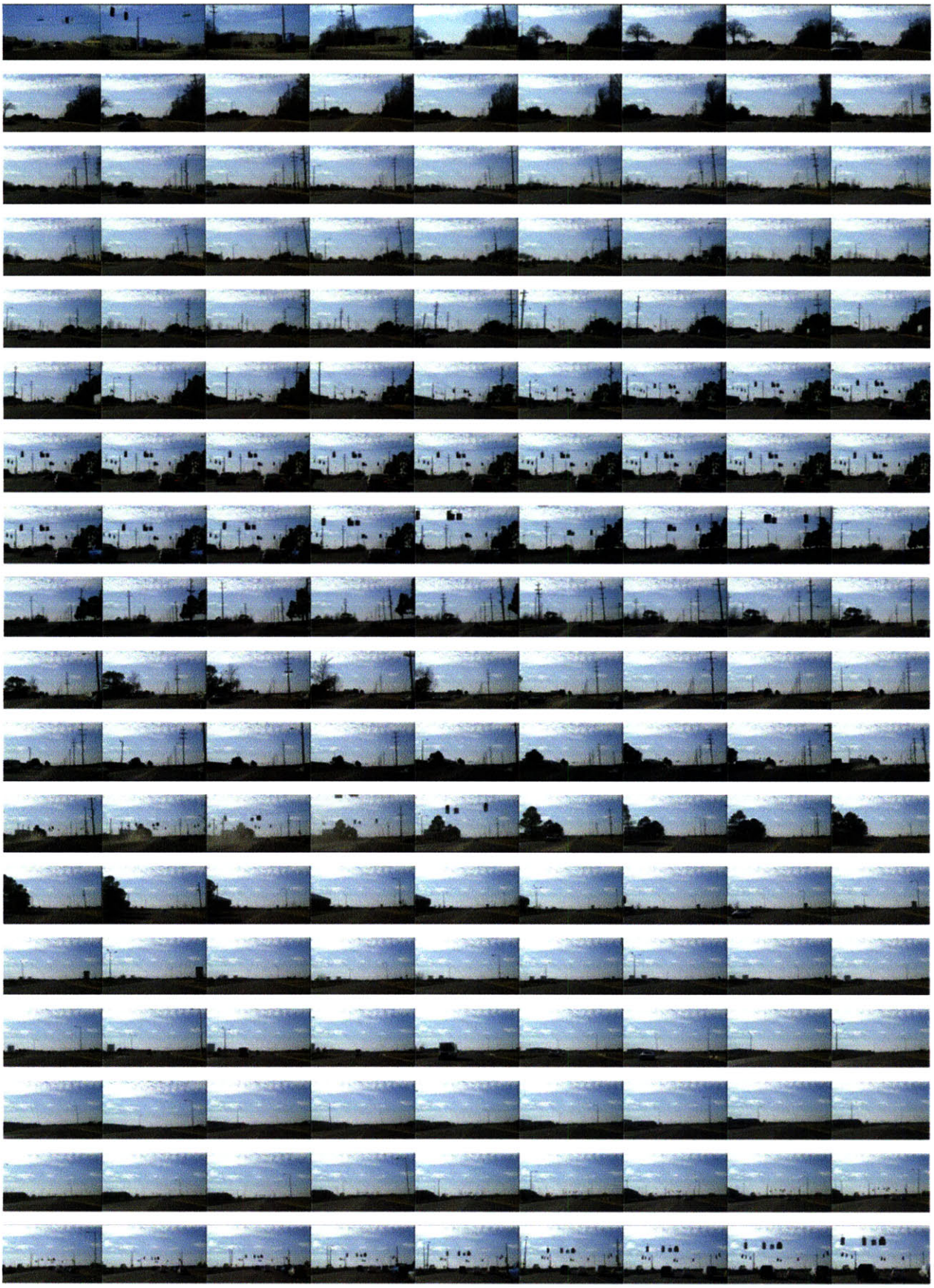
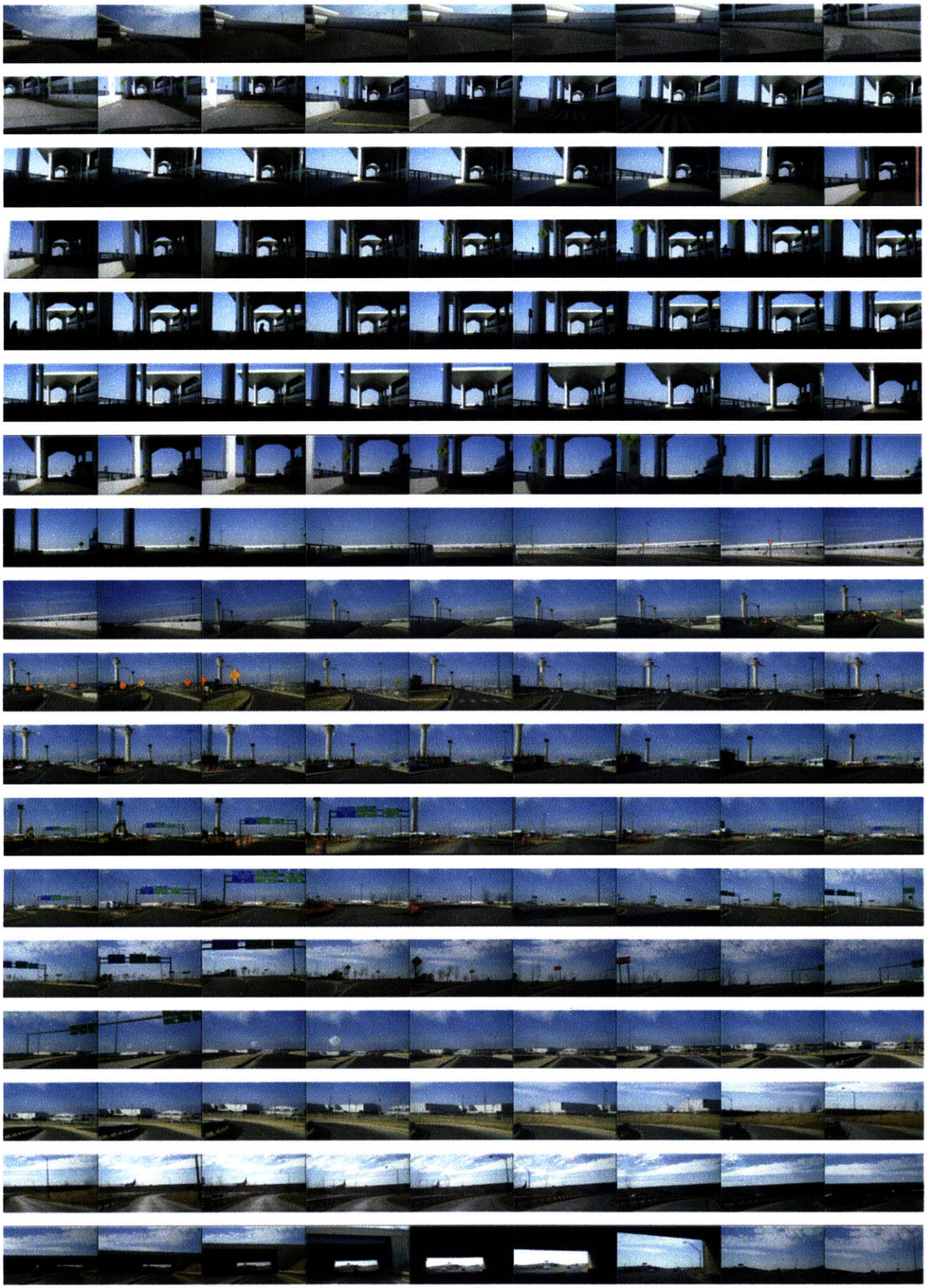
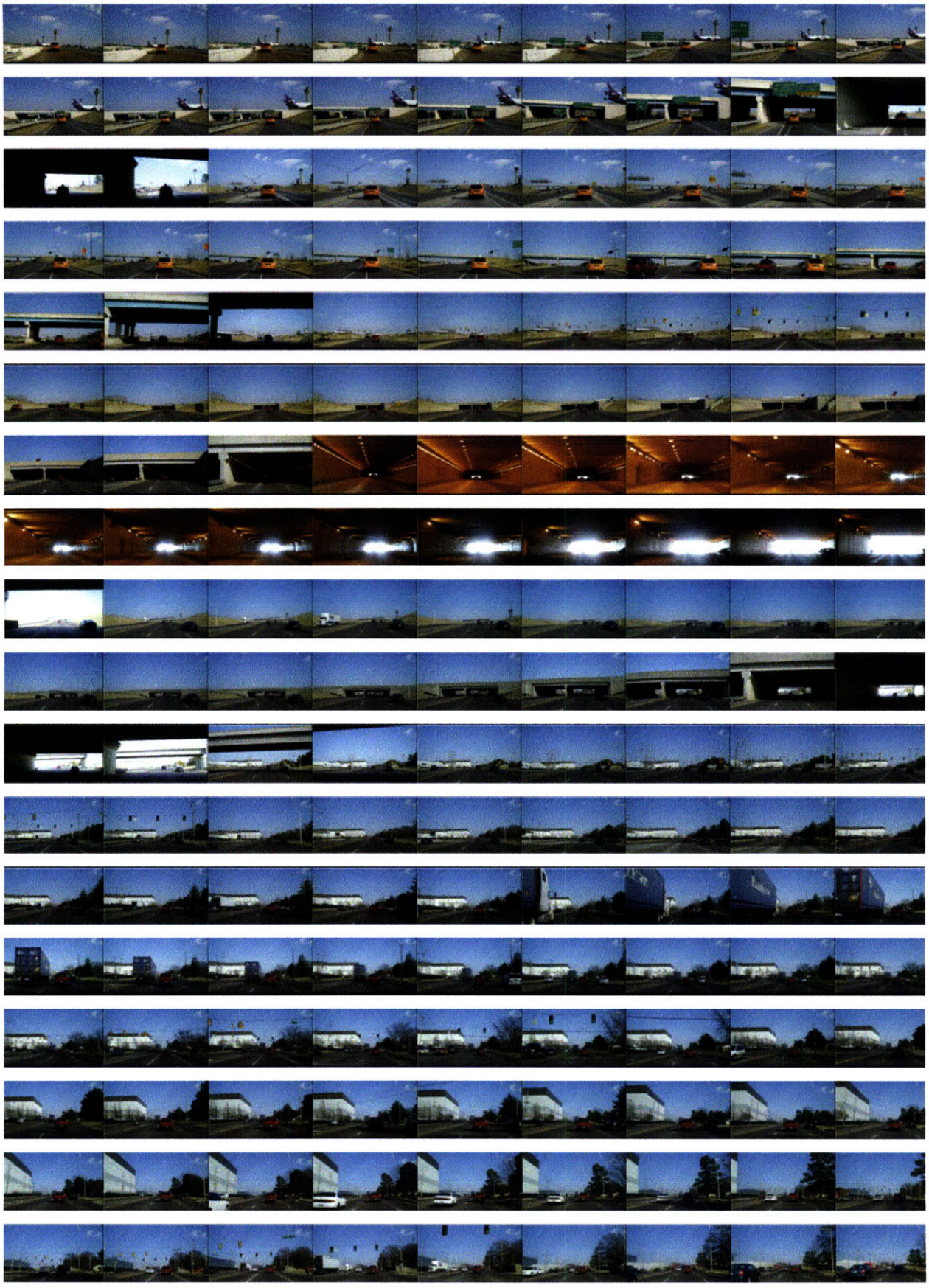
CHAPTER THREE
MEMPHIS

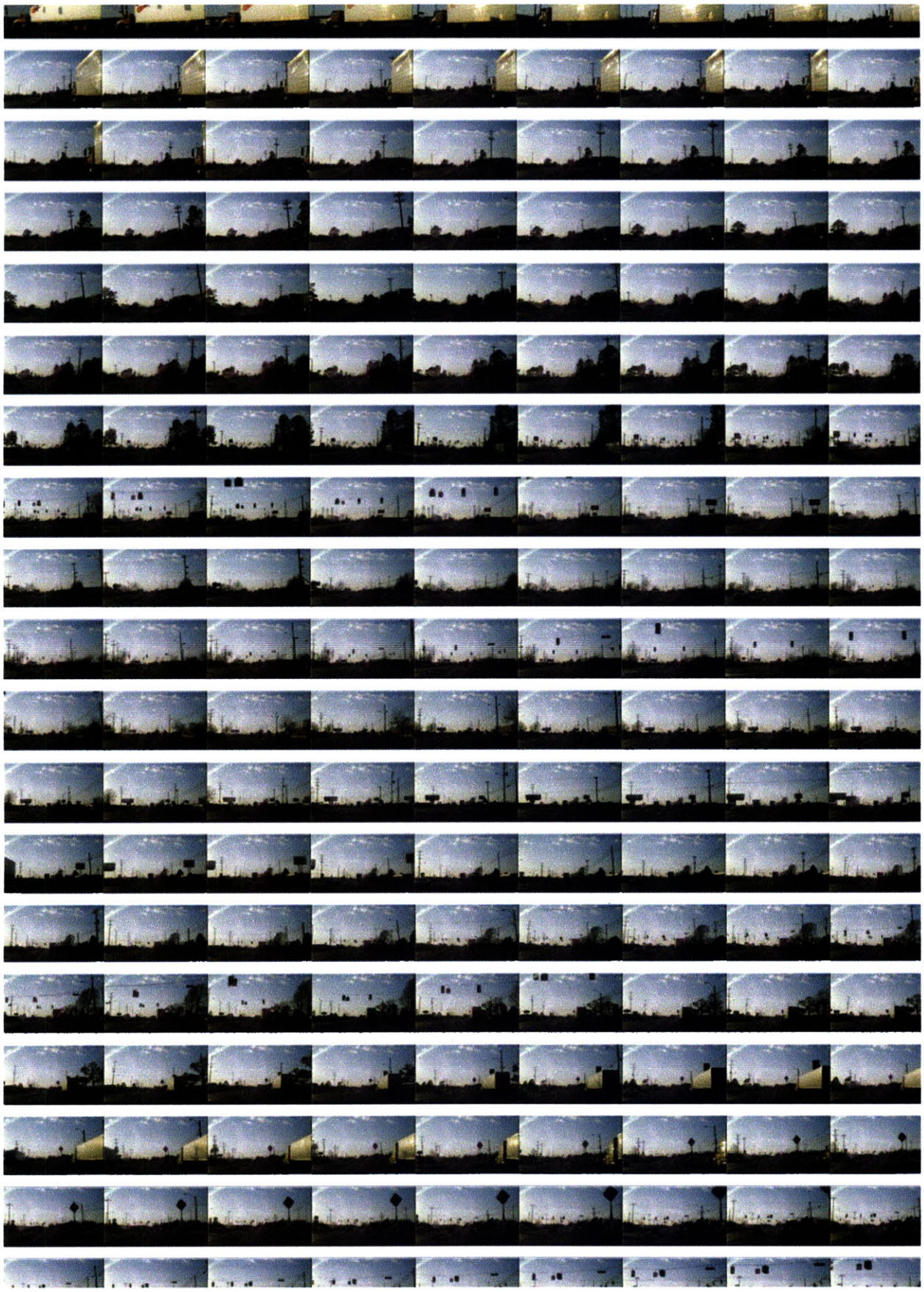
Long distance information, give me Memphis Tennessee
Help me find the party trying to get in touch with me
She could not leave her number, but I know who placed the call
'Cause my uncle took the message and he wrote it on the wall.

***Memphis, Tennessee*, Chuck Berry.**









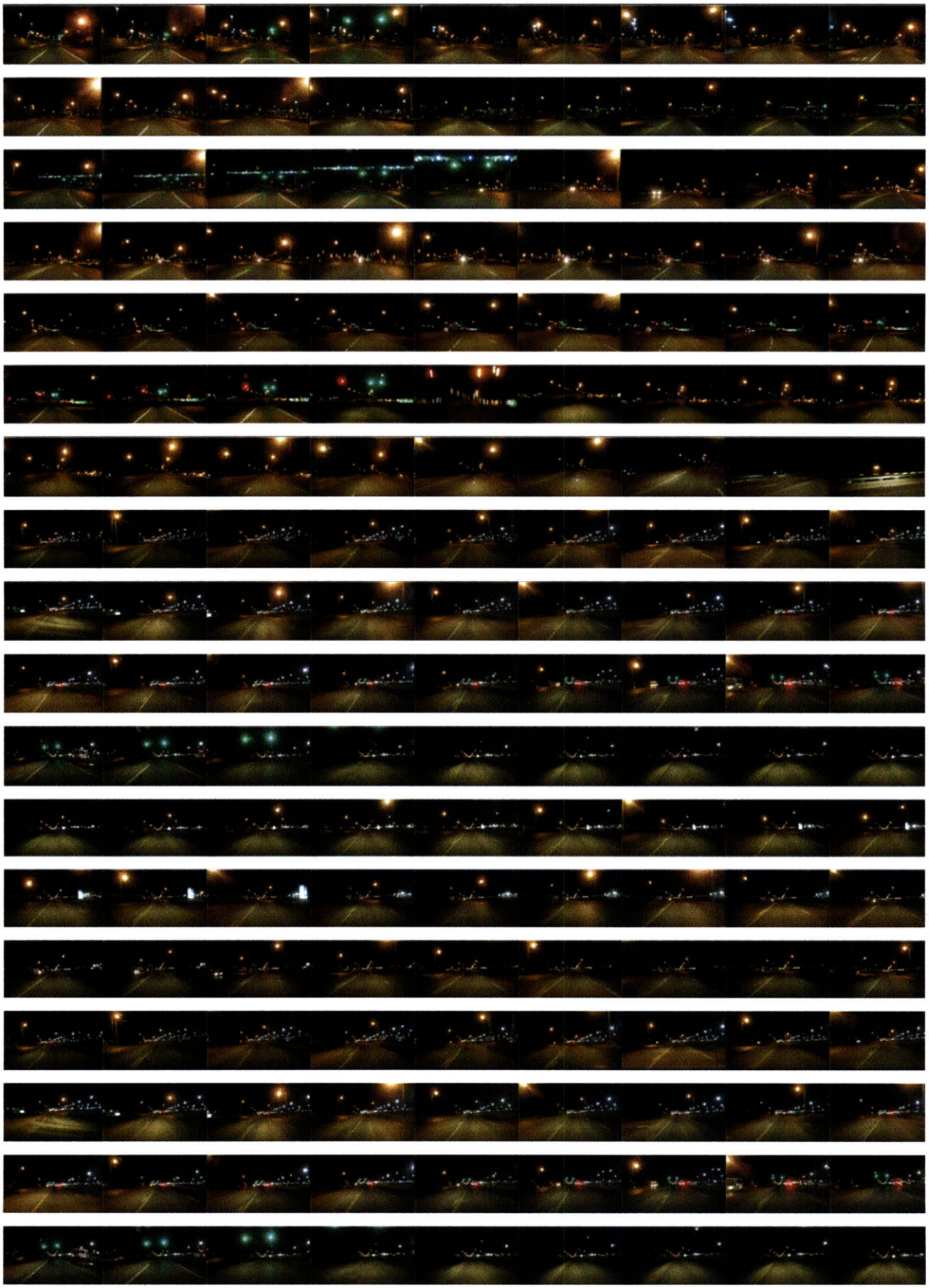


Figure 3.01 Airways Boulevard
Figure 3.02 Airport Approach
Figure 3.03 Democrat Boulevard
Figure 3.04 East Brooks Road
Figure 3.05 Nightsort along Winchester Boulevard

Still images from footage at 1-second intervals of the various drives along each of these paths.

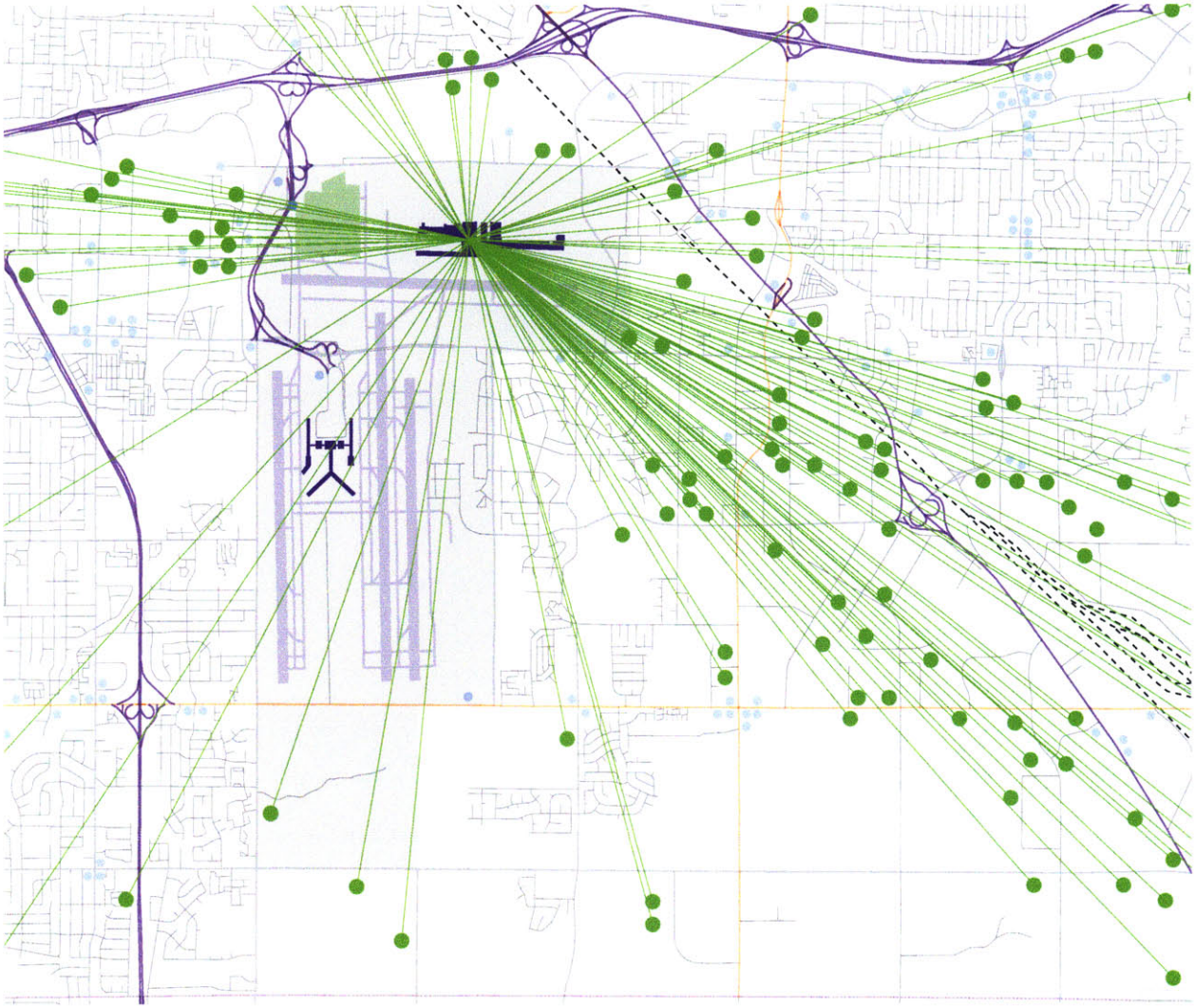


Figure 3.06 FedEx Constellation
The constellation of distribution or logistics related companies around the site (in green) versus "residential" programs like restaurants and markets (in blue).

Figure 3.07 Multimodal Memphis
Memphis is connected thoroughly via the Mississippi River, six major US rail lines, the interstate system (one of which is deemed a NAFTA highway)

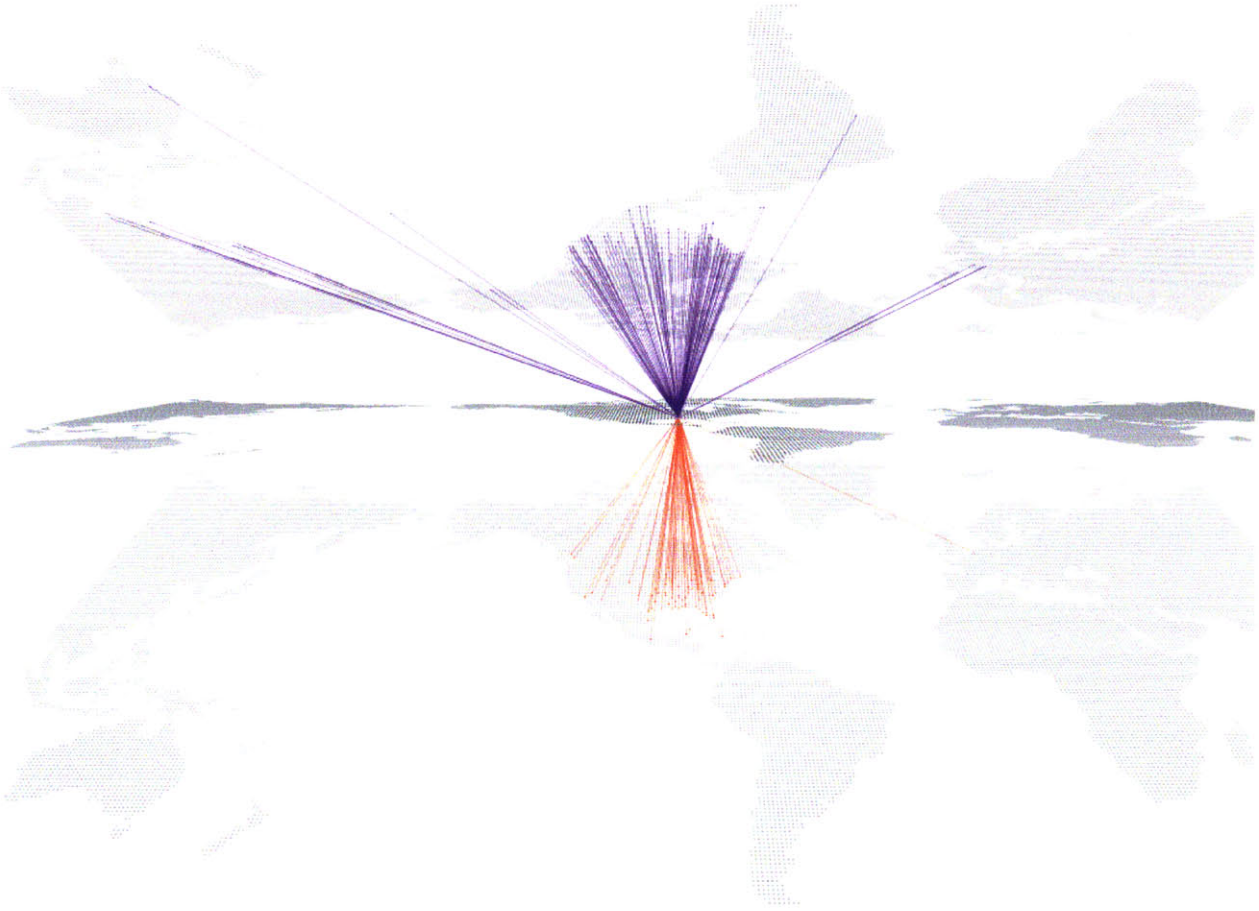


Figure 3.08 The Airport Constellation
The global connectivity of Memphis through its non-stop flights--red for Delta and purple for FedEx.

Figure 3.09 Global Connections
All international flights, mapped reflecting relative frequency.

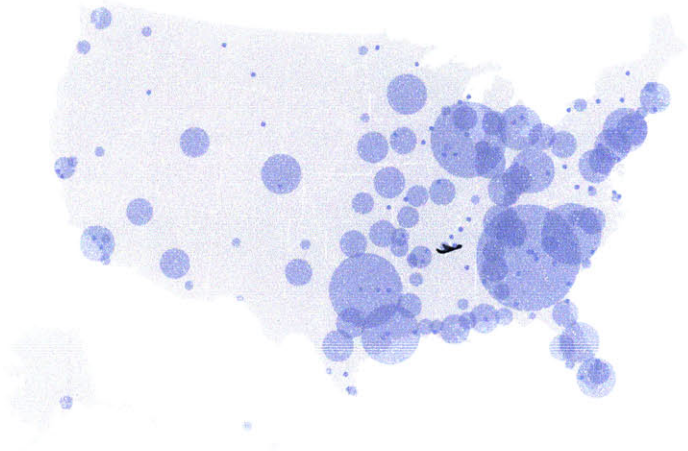


Figure 3.10 Domestic Connections
All domestic flights, mapped reflecting relative frequency.

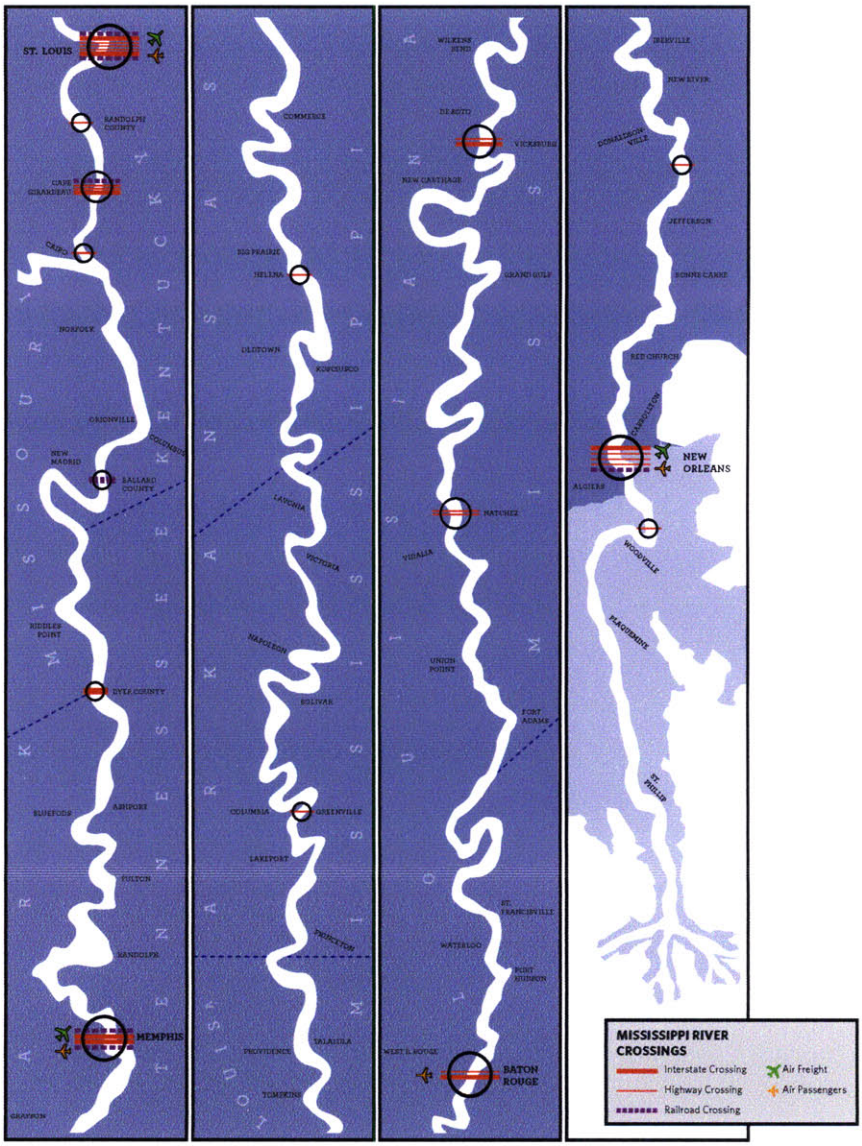


Figure 3.11 River Crossings
All river crossings across the Mississippi River from the mouth to the fork with the Ohio River. Memphis is second to only St. Louis.

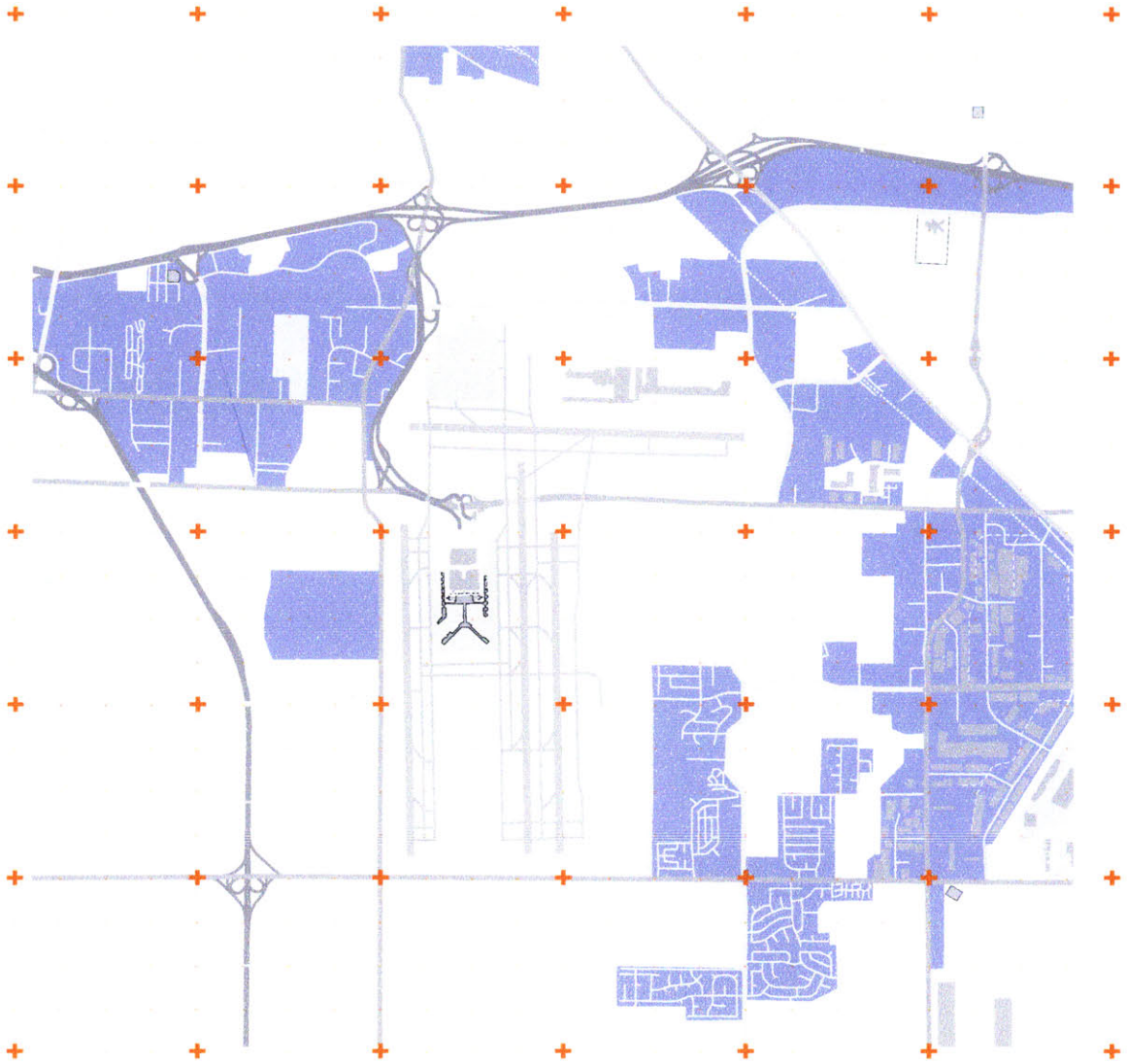


Figure 3.12 Industry
Industrial uses around the Memphis Airport.

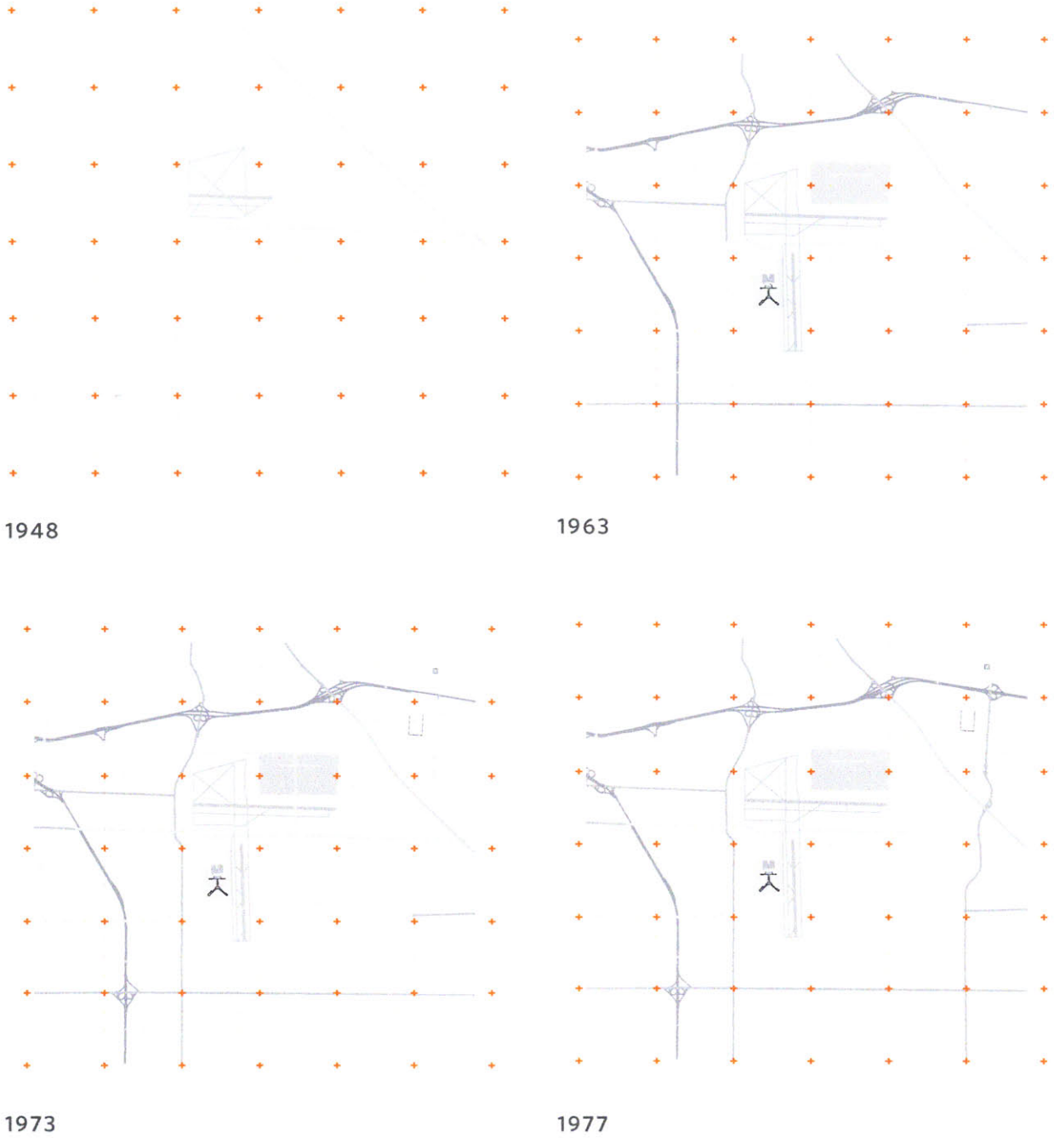


Figure 3.13 Growth of Memphis
The development of infrastructure over time.

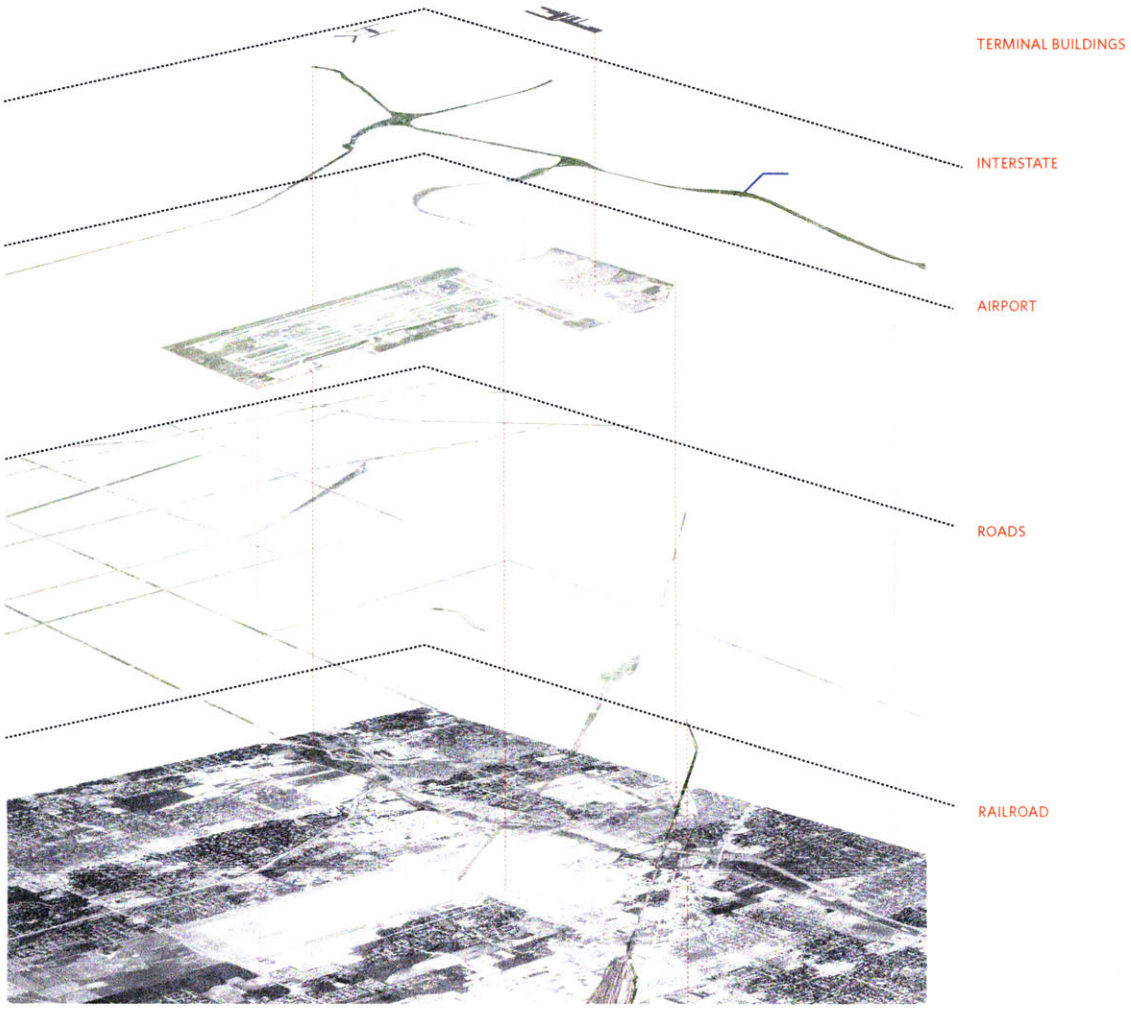
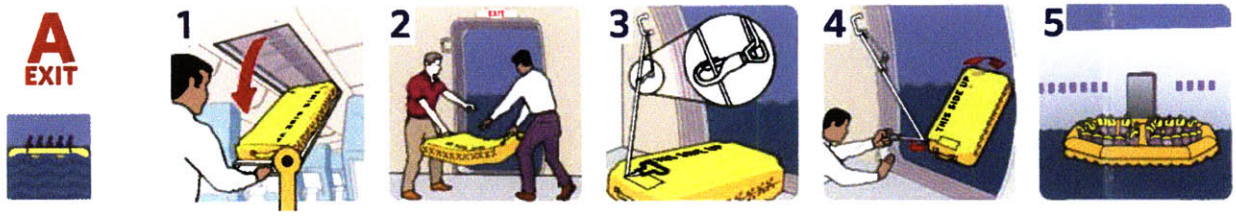


Figure 3.14 Infrastructure Exploded
The various layers of Memphis's infrastructure around the airport.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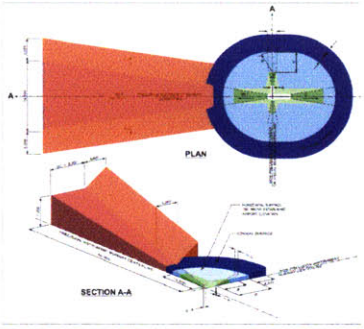
CHAPTER FOUR
PROPOSITIONS

I suspect that the airport will be the true city of the 21st century. The great airports are already the suburbs of an invisible world capital, a virtual metropolis whose faubourgs are named Heathrow, Kennedy, Charles de Gaulle, Nagoya, a centripetal city whose population forever circles its notional center, and will never need to gain access to its dark heart.

J.G. Ballard



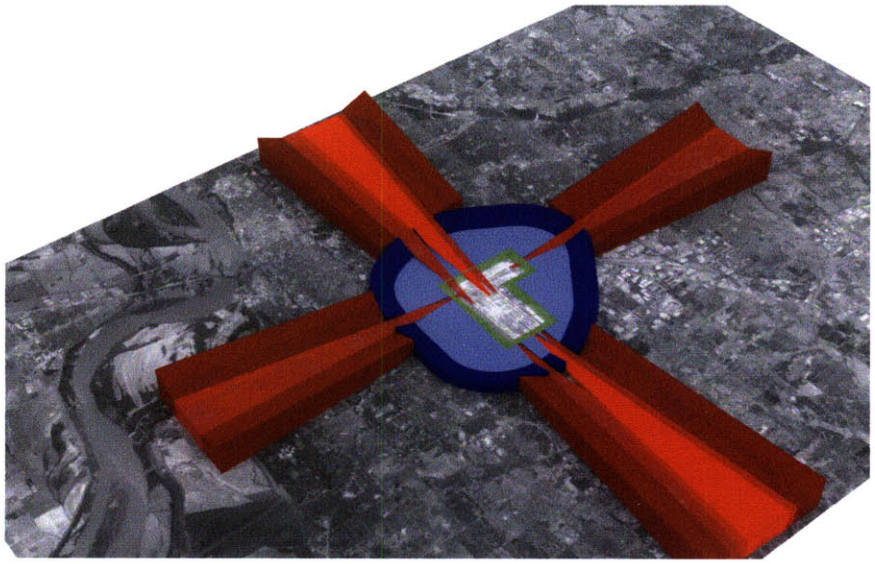


Figure 04.01 Imaginary Surfaces
The generic FAA guidelines for the restricted zones is illustrated.

Figure 04.02 Imaginary Surfaces
The imaginary surfaces around MEM severely restrict the height of development within a large area in the city.

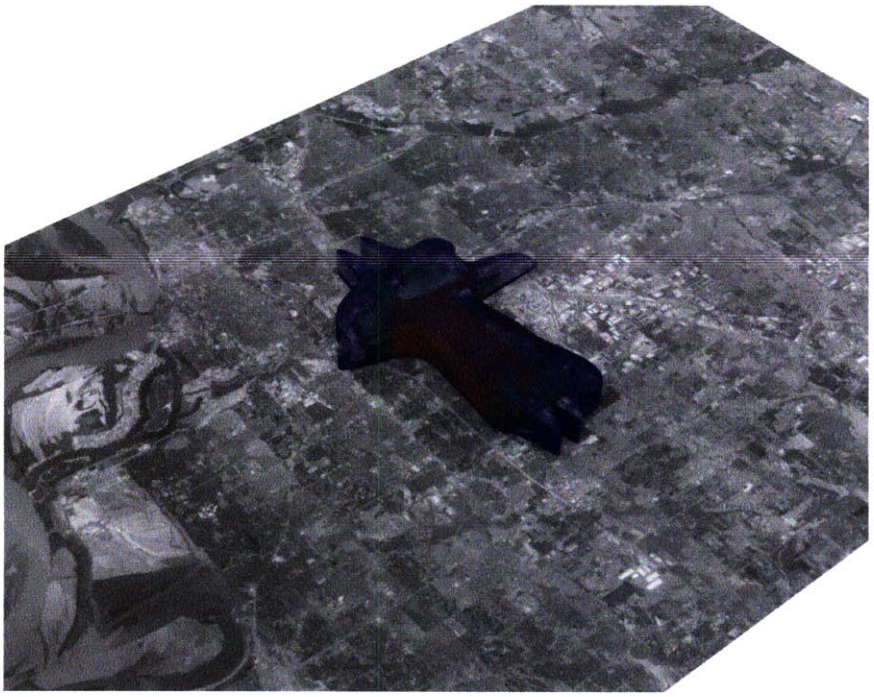
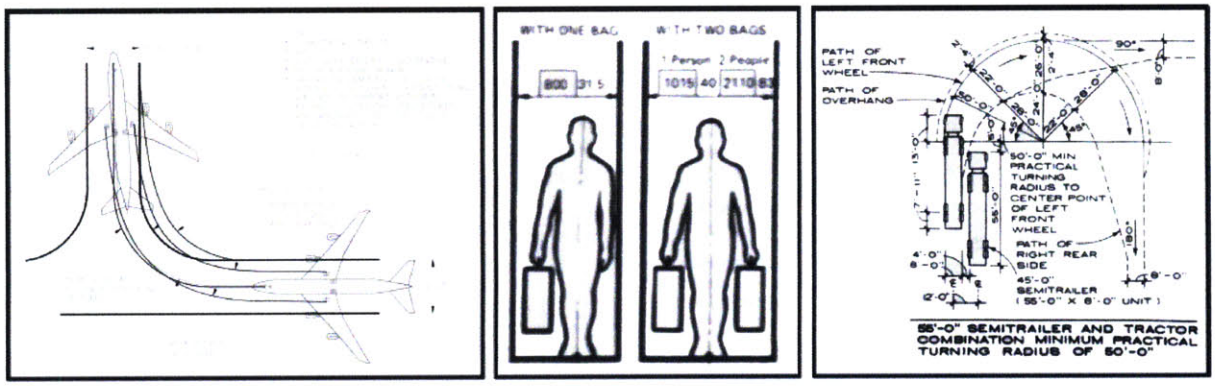


Figure 04.03 FAA Noise Regulations
Restrictions of aircraft noise to a maximum of 60-65-70 dB affect the design. The "urban wall" helps to mitigate sound.

PROGRAM DEVELOPMENT

In addition to traditional zoning rules, the Federal Aviation Authrority has created a series of policies that preserve aircraft safety while in operation as well as the welfare of the general public while in proximity to an active airport. The upper diagrams show the imaginary surfaces around the site—the maximum heights of development around the airport. The immediate airport has a height restriction of 150', rising to at a slope of 20:1 for 10,000 feet. At the approach areas over the runways, the slope is more gradual at 40:1 measured along computerized vectors to allow for aircraft to land without obstruction.

Airport noise has long been a complaint of residents near an airport. In a dramatic scene in the movie *Airport*, the director of the fictional Lincoln airport has to decide whether to make a runway available to a plane in distress, risking closure by the FAA because of noise complains over a residential neighborhood or to try to clear an runway made inaccessible due to a disabled aircraft. The zones of sound restrictions are dictated by distance from the runways, with a maximum of 70dB exposure to residential areas. With the expansion of Runway 18R-36L (the western runway), the airport had to buy three blocks of homes and demolish them because of the risk of noise exposure during take-off.



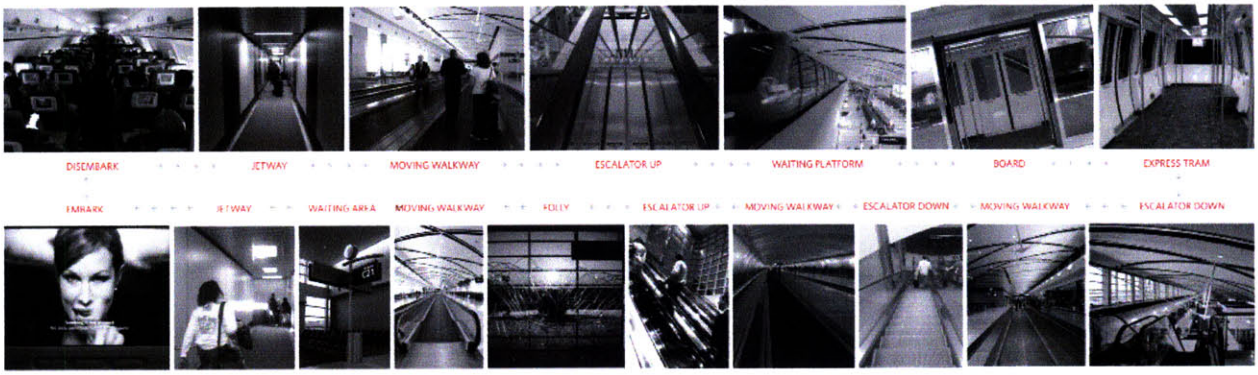


Figure 04.04 The turning radii of bodies
The dimensions required of bodies turning in space, which help dictate form.

Figure 04.05 Mechanized bodies.
Movement within the airport is mechanized, with machines moving us through space, rather than our own bodies.

MOVEMENT

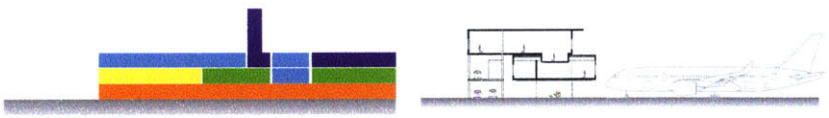
As the proposal grafts onto the infrastructure of flows—roadways, monorails, etc—the logic of moving bodies helps dictate the formal aspects of the architecture. For instance, each of the towers is angled with facetted roof structures. This is not just an aesthetic decision but is a result of the invisible surfaces and sight lights of the control tower shaving off parts of the architecture that would interfere with the movement of aircraft on the ground and in the air. Similarly, the turning radius of a truck helps dictate overhangs and architectural forms. An example is the building that is underground near the airport. It preserves an obstruction-free zone for aircraft to land as well as lanes for trucks to park and enjoy the bars and clubs within with ease.

Figure 04.06 Translation of Section
The section of the airport's program can be adapted for new uses.

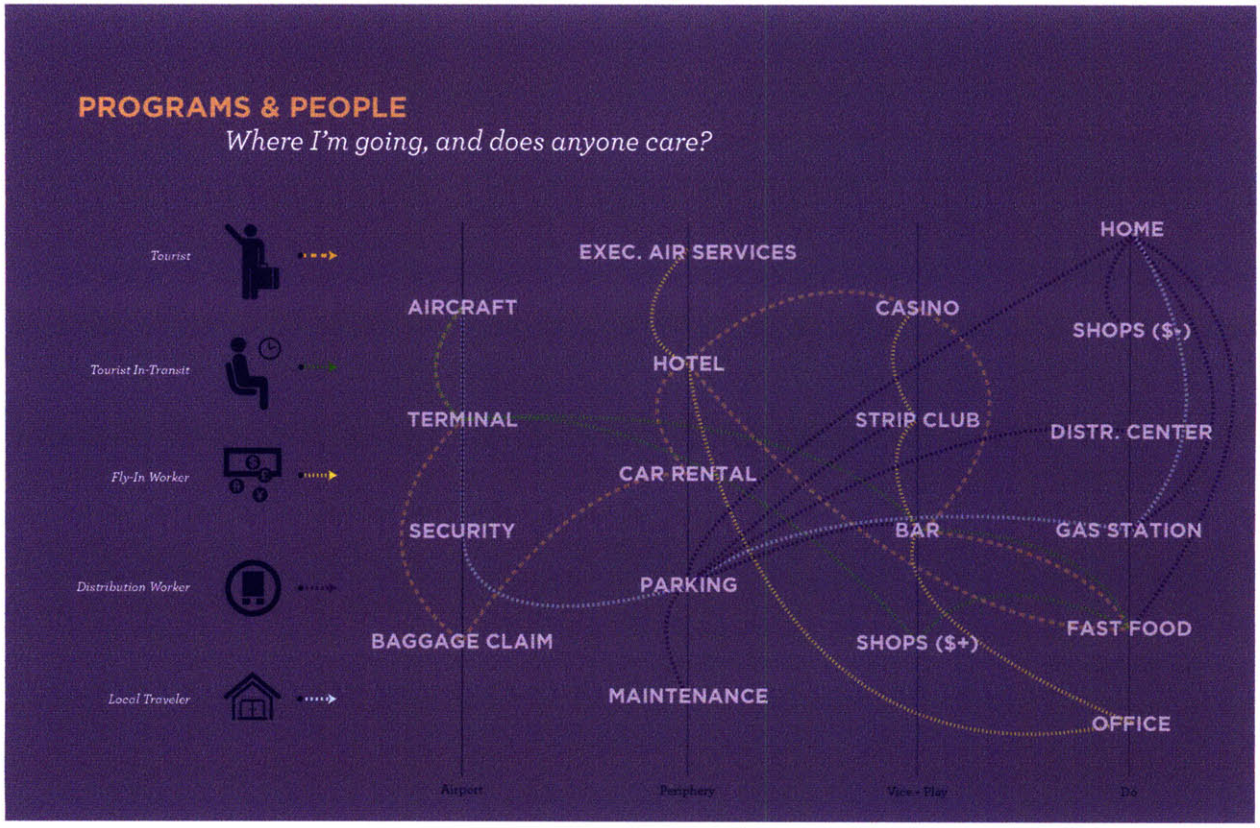
For individuals, the entire path through an airport is mechanized. From the aircraft seat to the moving walks, our space is curated and performed by moving machines—a logic that can also be transposed within the buildings of the new development.

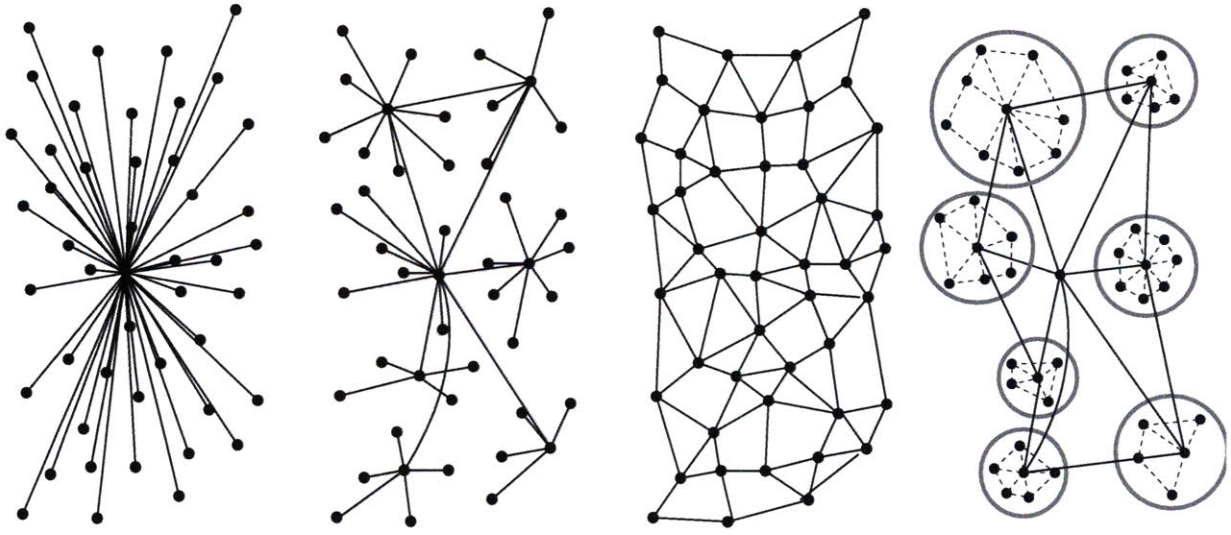
As shown in the bottommost diagram, the airport is actually removed from the ground to allow for aircraft services such as fueling trucks and baggage trolleys to move unencumbered, as are the passenger pick-up and drop-off vehicles above. This diagram is further translated into a logic of operation, to preserve the ground plane and its infrastructural eccentricities and to raise up the program of the traveler above,

EXISTING.



POTENTIAL.





Paul Baran
On Distributed Communications, Volume XI, 1964

PROGRAM DEVELOPMENT

Based on a survey of other major aerotropoli and proto-airport cities, a mesh of users and programs were created to help plan the proposal. A marked departure from other case examples, however, was the introduction of adult-oriented programs based on actual cases built upon the notion of the alter ego. Popular narratives of businessmen with second families or business deals made at a strip club have been adopted into the program mesh. Similarly, the introduction of the trucker as well as a new class of long-term resident has been included to complete the narrative of this district.

Figure 04.07 Program Mesh
The interconnections between occupant groups and various types of program.

Figure 04.08 Network Diagrams
The research by Baran informed the basic diagram for the proposal.

The organizing diagram of the proposal, based on Paul Baran's network diagrams mirror the connections found in the program. Where decentralized is similar to the hub and spoke system of aviation and distributed more like digital networks, neither properly addresses the complexities of the program matrix. The distributed network model is also efficient within the digital world but the added connections make it materially and economically impractical. Thus, the proposal is an iteration of the previous two, called distributed prime, which relies on clusters and interconnections at the nodal level, rather than every point to every point. This manifests itself within the architectural proposal as a series of infrastructural connections (escalators, moving walkways) as well as a gradient of programs through the intended flexible workspaces and conference areas.

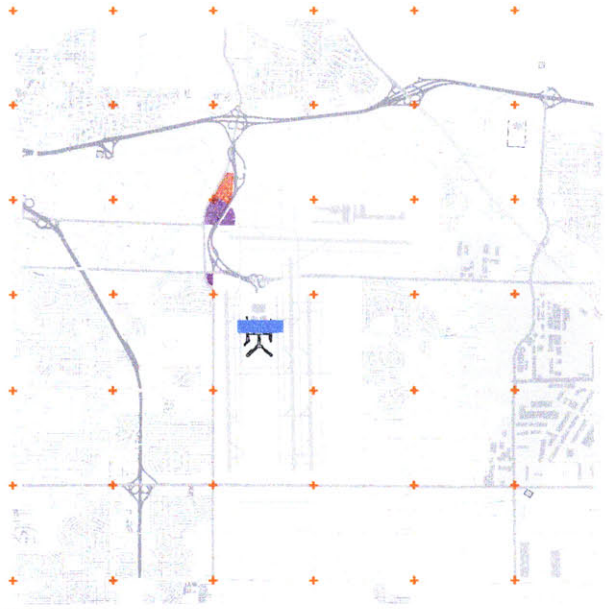
URBAN SCALE DEVELOPMENT

As individuals enter the airport and the world of aviation, they subject themselves to the security screening process. This event is the threshold between the public areas of the airport and, in aviation parlance, the sterile zone. Travelers willingly place themselves in a state of voluntary quarantine from the "unsafe" and "unsecure" world beyond. The airport city here, is conceived, in a similar way. Upon entering the aerotropolis, one is in a pseudo-isolated environment that is reinforced by the perimeter developments around the current airport.

This perimeter development grafts onto the existing roads and highways that support the airport's functions. To the north, development happens along Democrat Boulevard supporting FedEx's operations with the SuperHub and other sorting and support facilities. To the east, development grows along Swinnea Road to the south with Shelby Drive—focused on industrial and residential programs. Similarly, growth along Airlines Boulevard to the west follow the existing residential programs with the addition of some retail and commercial functions. To the northwest on the Plough Boulevard turn-off, functions link the airport service apron and the industrial and distribution services on the other side of the road.

Development, of course, happens over time and the growth happens within existing parcel lines. At first, the introduction of modest programs grow in lots that are currently vacant and do not challenge the programs currently in existence on site. As time progresses, economic needs take over the introduction of housing and retail to support employees along Democrat, which is currently a service street sans amenities for SuperHub employees. The last growth occurs within occupied residential and dense industrial areas that would naturally support the programs within while also challenging some of the neighboring programmatic relationships.

Growing concentrically, the urban scheme values proximity and the reduction of time to the site over many other parameters. In a condition where "time = money" and distance is also a function of time, development wants to hug or intersect the perimeter fence as much as it can.



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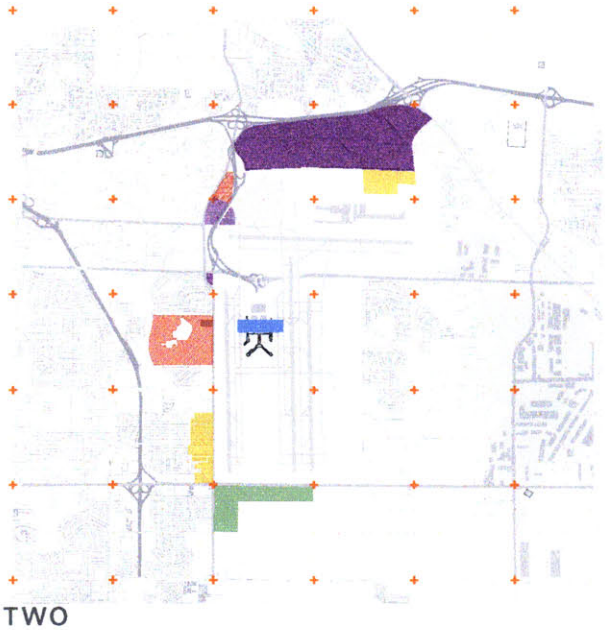

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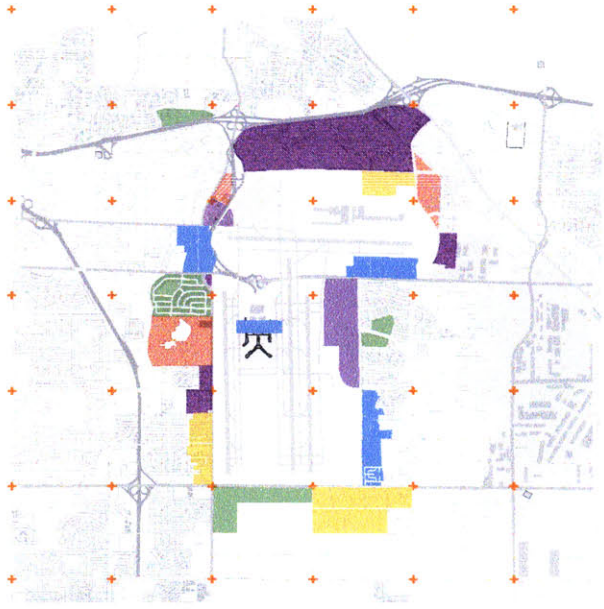


FOUR

Figure 04.09 Development over time
The growth of the "ring" grafts onto the existing infrastructure, valuing proximity over all else.

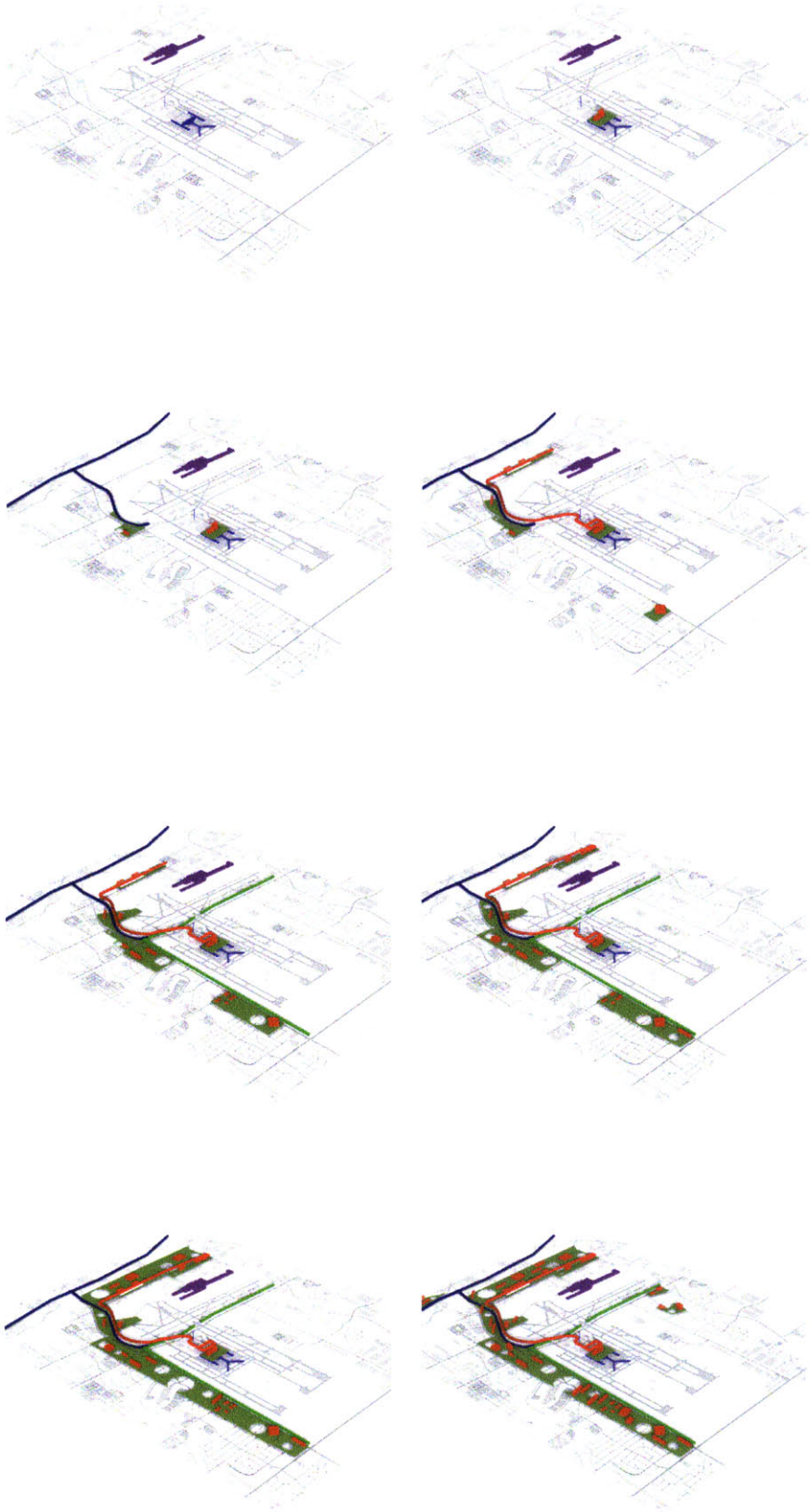


Figure 04.10 Development over time
A three-dimensional graphic showing the growth of infrastructure and built area over-time, but stopping before the completion of the ring.

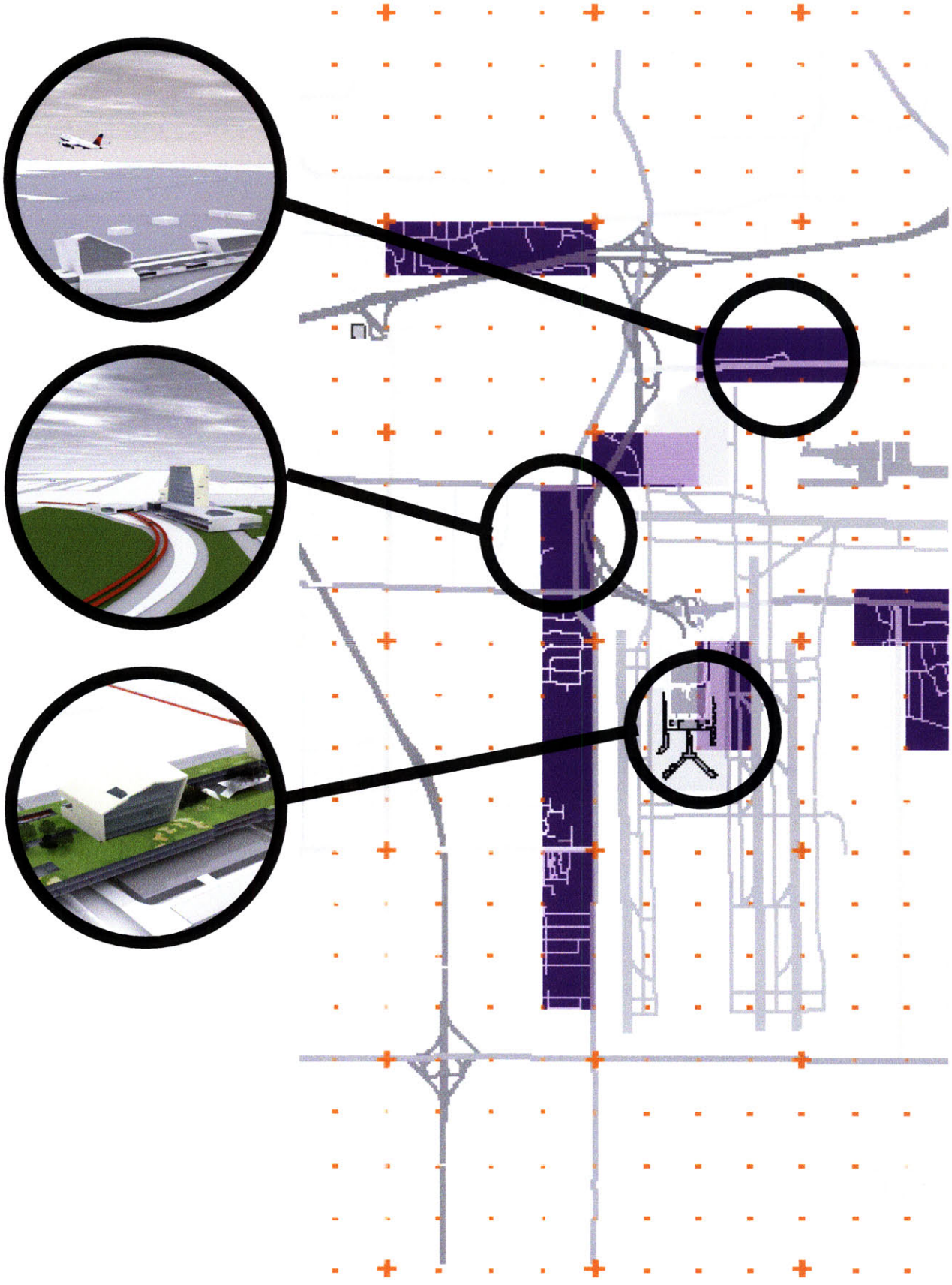
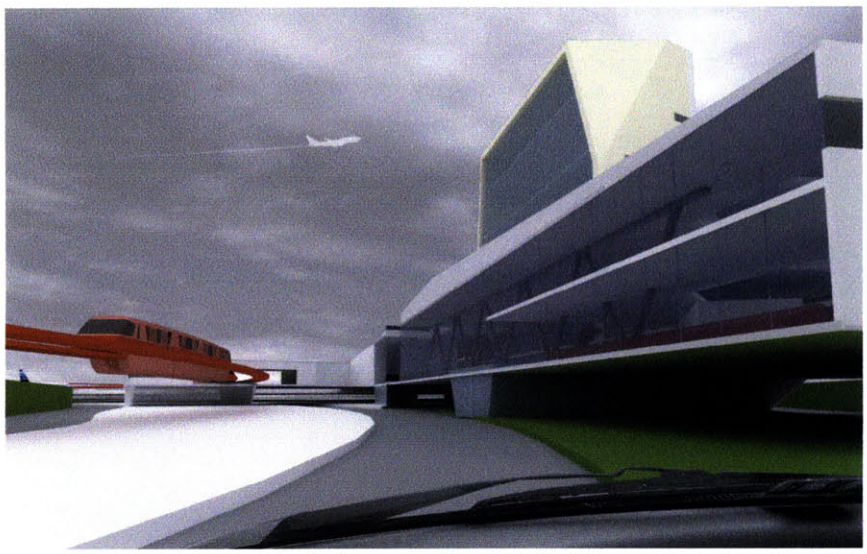
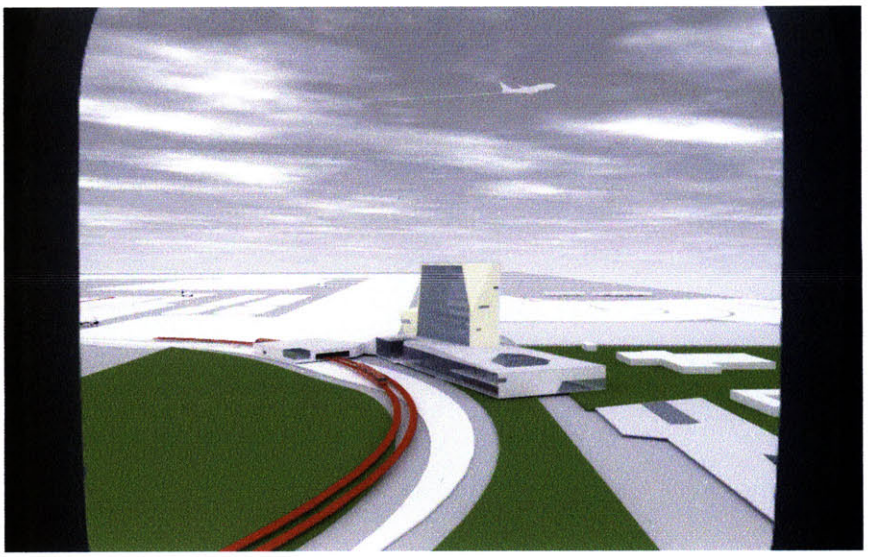


Figure 04.11 Highlighted Examples
Three sites were developed to further resoulation to explore the various architectural logics and ideas.





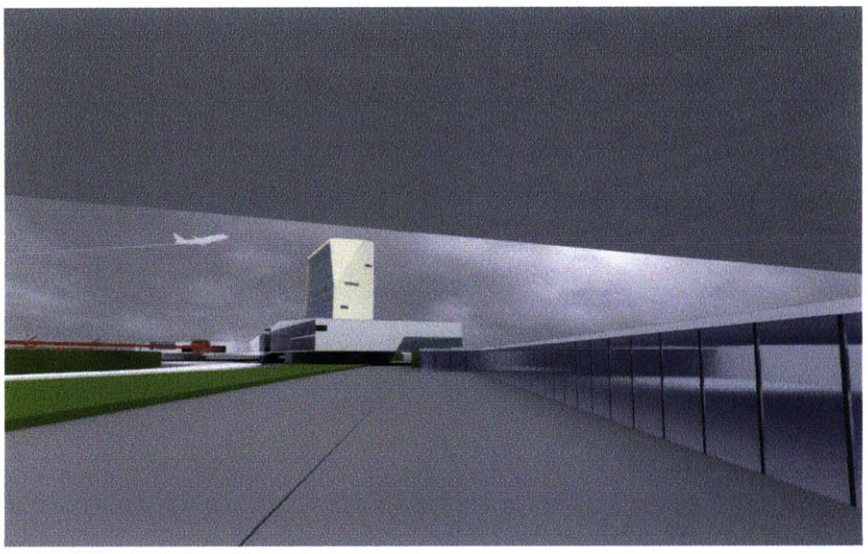
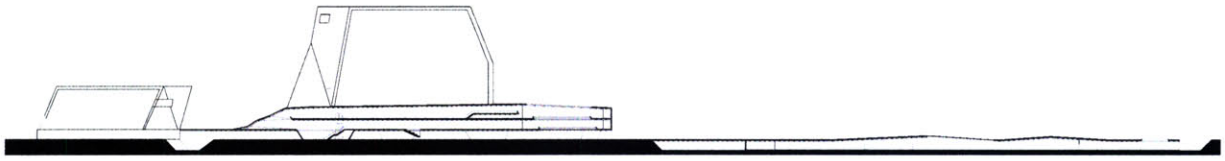
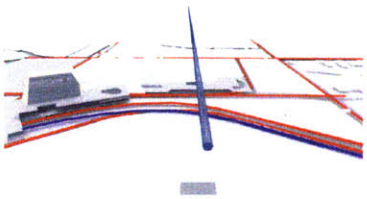


Figure 04.12 Appraoches
Perspectives from car, plane and truck.



RUNWAY



Sited along the interstate pull off as well as the runway approach for Runway 9-27, the proposal has rich opportunities and serious challenges. Adult programs, such as strip bars and prostitutes, lend themselves to the alter egos of visitors. These programs, due to FAA restrictions along the flight path of the runway are all underground with frontage along Plough Boulevard. Trucks pulling off of the Interstate approach can easily pull right in and out of this location as the building pulls back from its overhang to provide easy access.

Above ground, a convention and hotel space allows visitors to enjoy the city for a longer term while still having the amenities of

Figure 04.13 Longitudinal Section
The section reveals areas for interaction and play, much like the terminal proposal.

Figure 04.14 Flows
A diagram showwing the various flows of vehicles through the site, including the approach for jetcraft.

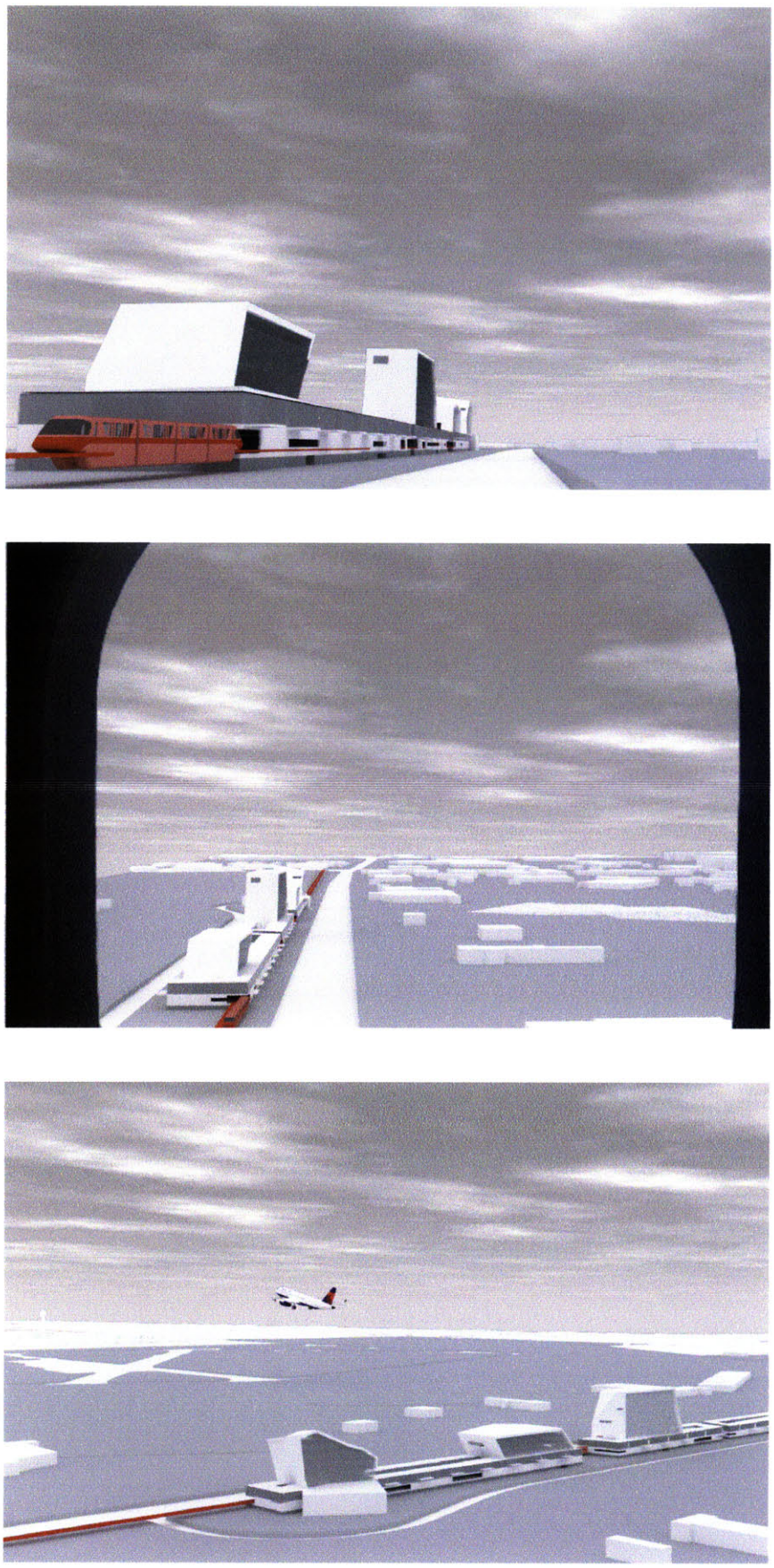
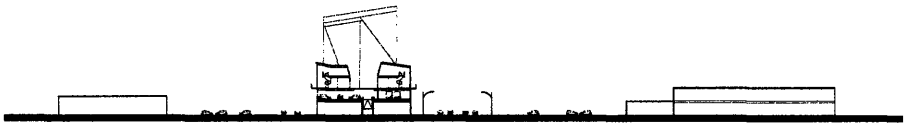


Figure 04.15 Appraoches
Perspectives from car and plane.



DEMOCRAT BOULEVARD

The proposal near the FedEx buildings along Democrat Boulevard is largely residential duplexes on the upper floors with commercial and retail at the ground floor. With 12,000 employees at the SuperHub yet no housing anywhere near the facilities, employees must drive a great distance each night and early morning while not having access to food or bars even when they are at the SuperHub. The proposal creates an environment for the employees around the clock, with monorail service beyond. The series of buildings is not located on the block, per say, but rather on the large median in between the two directions of traffic as to reduce the size of the boulevard and providing visual interest with an active street wall.

Figure 04.16 Transverse Section
The interior reveals interior parking with housing and retail capping the second floor parking deck.

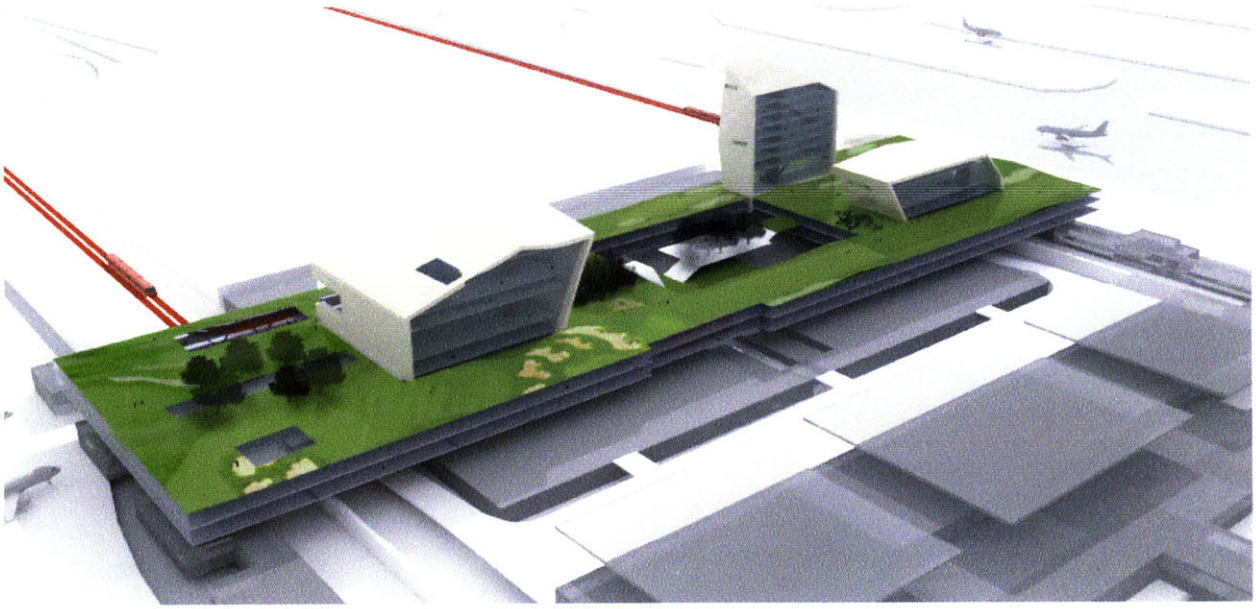


Figure 04.17 The terminal building.
Replete with cultural, commerce and comfort-oriented programs.

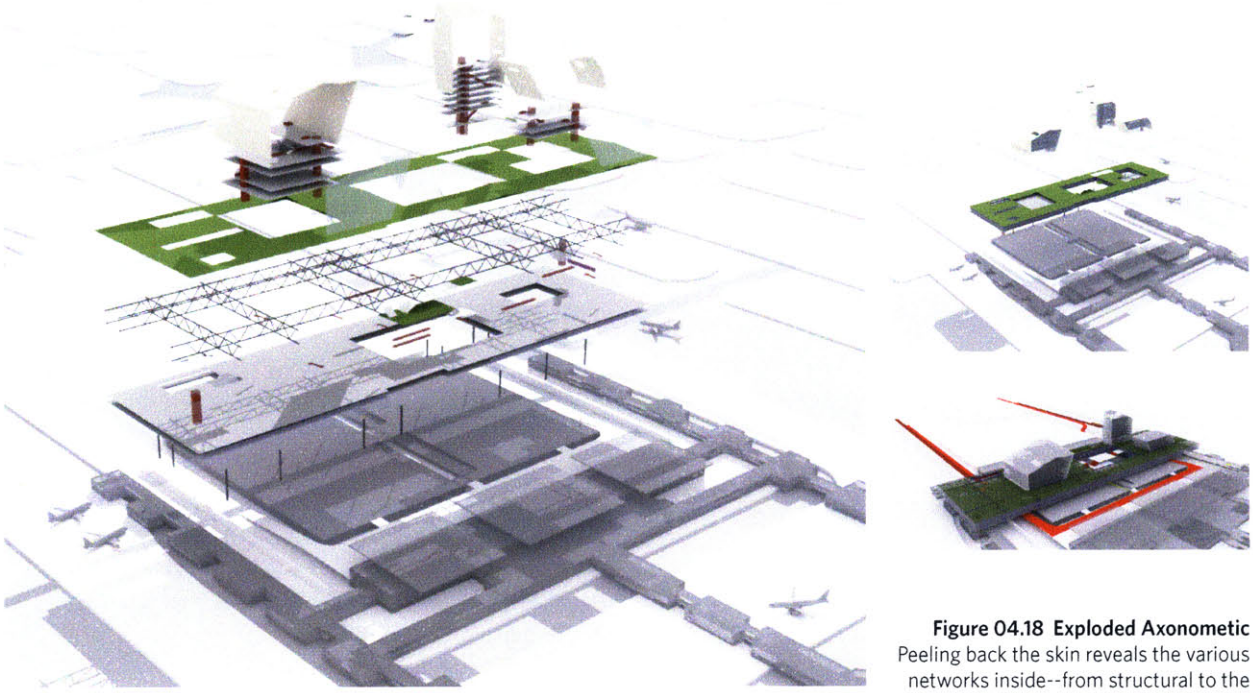


Figure 04.18 Exploded Axonometic
Peeling back the skin reveals the various networks inside--from structural to the movement of bodies.

TERMINAL BUILDING

The terminal building offers spaces and programs largely tailored to the flyer, with easy access to transit hotels, work spaces and retail options. It is built on top of the existing airport, taking the notion of grafting to its most severe iteration connecting to Terminals A and C, within the secure zone. The rooftop offers golf courses and public amenities to watch planes fly by. The structure is robust—a network of large trusses that define and create space while reducing the number of columns to the ground and within the structure to offer maximum flexibility and play within the space.

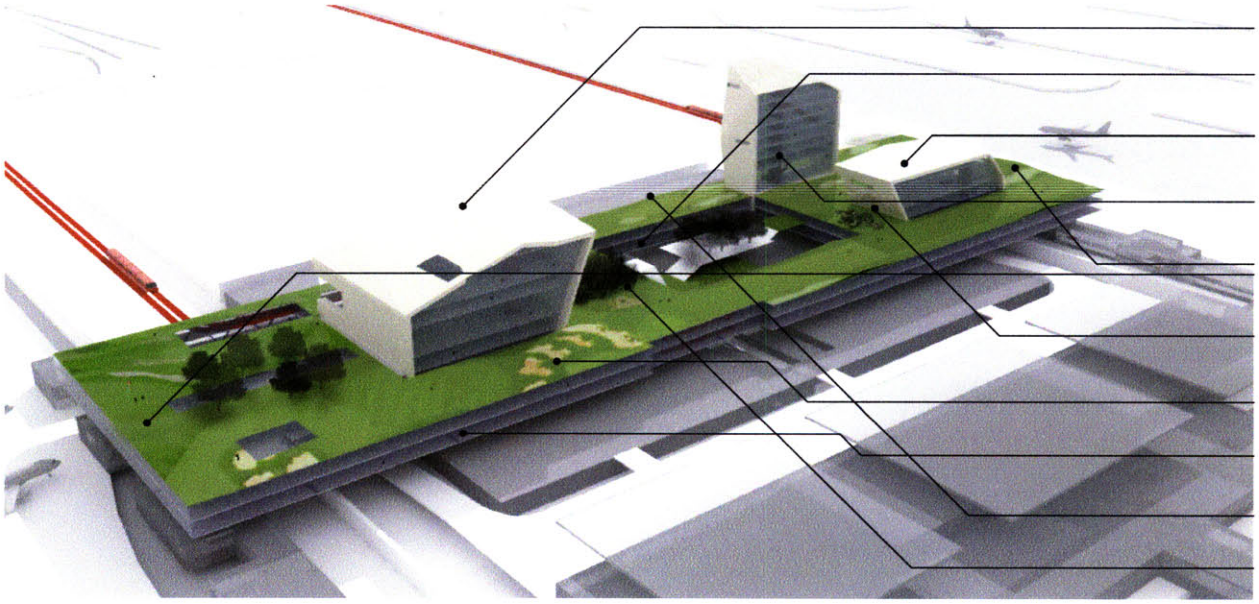
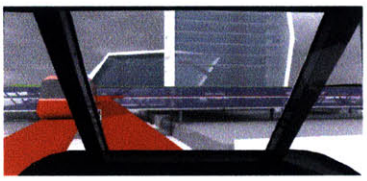


Figure 04.19 The various programs.
All for your traveling pleasure.



Collaborative Work / Confe

Stax Museum Annex

Hotel & Transit Hotel

Offices

Connection to Terminals

Outdoor Movie Screen

Golf Green

Duty-Free

Unified Car Rental Facility

Observation Park

Figure 04.20 On the move
Views from the car, the plane and the monorail.

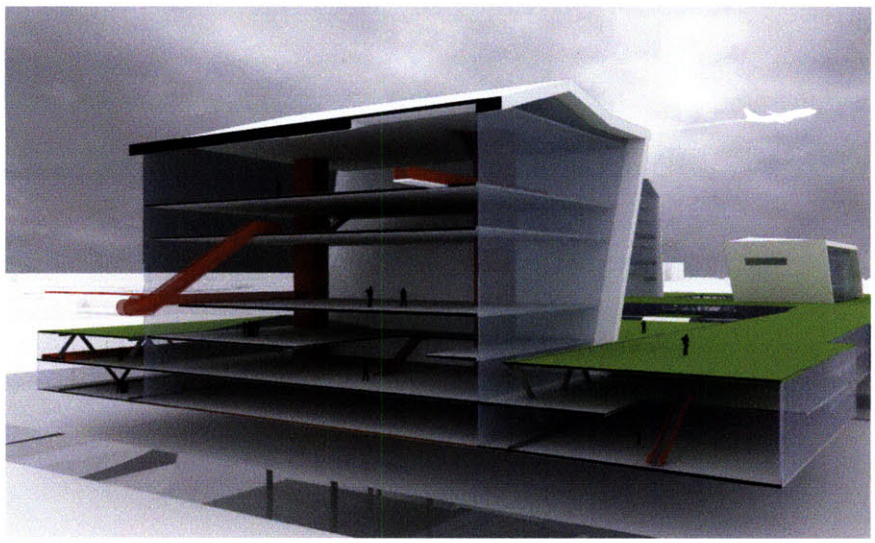
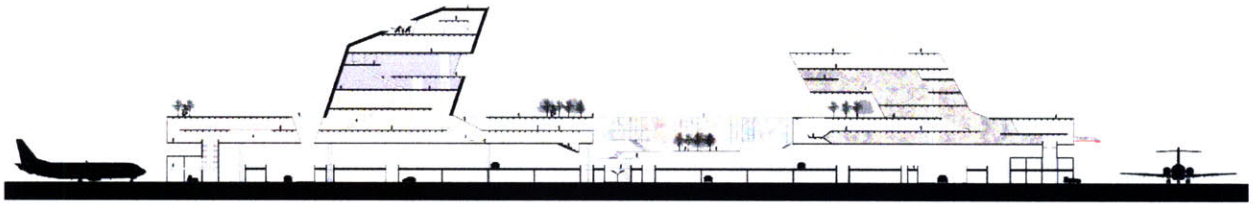


Figure 04.21 Longitudinal Section
A variety of programs intersect between the towers and the base, as well as into the space below and the terminals.

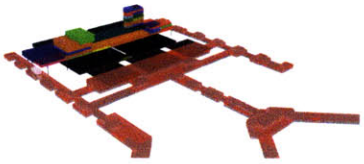
Figure 04.22 Transverse Section
An example of how the varied floor plates offer places to mingle and work together.

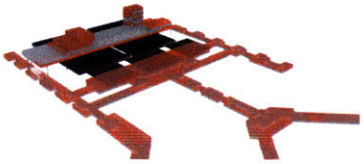
Figure 04.23 Programs in the secure zone
A diagram of how diverse program can actually fall within the secure zone of the airport, allowing greater fly-in, fly-out convenience.

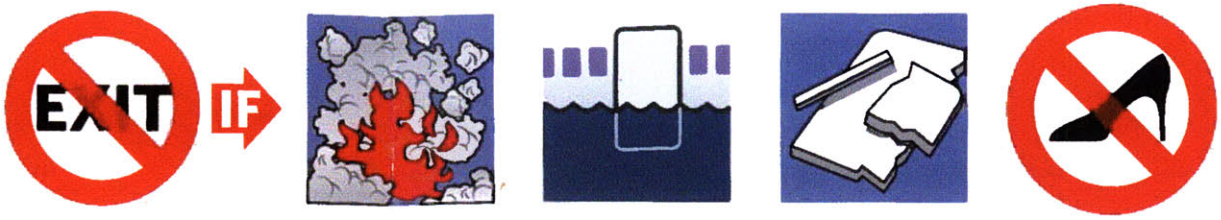


SECTION

The towers provide areas for work, meeting and conferences for the business traveler. The proximity to the airport, as well as allowing for easy arrival and departure to and from meetings makes this the ultimate location for flyers like Ryan Bingham from *Up in the Air*. The varied floor heights allows for a flexibility of program and opportunities for co-mingling. Additionally, some programs can be directly connected to the escalators and elevators in the terminal which can continue the secure zone of the terminal beyond the transit lounges and into a space of production, not just consumption.






EXIT
IF

CHAPTER FIVE
CONCLUDING THOUGHTS

A city made for speed is made for success.

Le Corbusier

As this conclusion is being written, millions of packages are flying above or are being sorted around the world en route to their final destination. Thousands of Americans are above 30,000 feet asleep, reading a book, ruing the crying child or wishing they had driven instead. This is, after all, these are the take-off-your-shoes-no-liquids-route-cancellations days of travel. This thesis, perhaps more than other travelers and even my peers, appreciated this context. I have, after all, a shiny plastic card courtesy of Delta verifying my irrational attachment to flying.

At the same time, Memphis is emerging from its worse flooding in nearly a century. The discussions of the aerotropolis and the future of Memphis as it rebuilds form the Mississippi River floods are bound to be lively, with every decision with its own rewards and opportunity costs.

How does Memphis move forward as a city? What has this thesis actually accomplished?

Certainly, as a pedagogical tool, this thesis has many questions remaining--of Memphis, of airport cities, of the design. With concerns of fuel costs and the limited demand for mega-air logistics centers, the aerotropolis model certainly comes to question, and perhaps is not a panacea for communities across the globe. For Memphis, it makes sense because of the presence of Federal Express who have taken root in the city that are hard to remove (both spiritually and with its assets). As goes FedEx, so goes Memphis. And while it's great to market Beale Street and Elvis's Graceland on business brochues, the real economic strength comes form a real investment and development of the airport district as a location for business and aviation travelers. The cheap land and labor make this area the prime location to be America's Aerotropolis.

Considering the old snarky phrase from studio of "where is the there there?" it is difficult to reconcile the tension of proposing multiple "semi-nodes" within close proximity of the main airport itself. While the argument has been made for a distributed system, one can question the efficacy of having multiple centers to the proposal as a disaggregated model of urbanization as it, in a way, accepts the fractured nature of urbanism that is the status quo. As noted before, the logic of FedEx is to superimpose logic over the illegible and this proposal sought to do that through visual connections across the district as well as the introduction of new physical infrastructure such as the monorail system.

To return to the initial point of inquiry about digital cities, what future does this logistics-based urbanism have in light of an increasingly electronic world? Is there even a relevance of this urban form, and this thesis in the coming

decades? As such, the question of ownership, vis a vis the developers, and the owners as the user comes into question as well. While there was always an attempt to reveal the otherwise hidden FedEx workers to the otherwise hidden flying business person, and vice versa, does the proposal properly share focus with each of these groups?

At the architectural scale, how much "mixing" can occur before space loses all resolution. While a conscious decision was made to keep my hand at the level of the "forest", I cannot help but to question if the argument for informal space both at the urban scale and the architectural scale needed greater clarity. I am reminded of the early experiments at the Chiat-Day offices in Santa Monica where no employee was allocated a desk permanently, but was given a laptop and free reign of the office space. Within a few months of the building's new opening, new desks were ordered so that everyone could have their picture frames and coffee mugs. While the nature of the worker is different (how much does one need for a picture frame when one is in the air 300+ days a year), does one still require a home base in the same way the employees at Chiat - Day sought?

As another point of inquiry, could the project have completely dissolved, become finer grained and more viral within the airport district, requiring the logic of FedEx (versus merely appreciating it) been more apropos to the conception of a new urban form within the momentum of the present conditions?

The difficulty in answering the initial question is that it begets more questions as it lacks a clear tradition of what its precedents are. Is it indeed like the Ford Rouge plant, which FedEx has adopted as its model with the SuperHub, or more like the modern monuments of Sant'Elia or LeCorbusier? It may have been more appropriate, as a new urban model, to find new means of genesis altogether. As a contemporary "factory town" that eschews the pastoral corporate park, it attempted to seek a new logic for organization yet there was a schizophrenia was admittedly with this thesis throughout the process that also imbued it with potential.

In the current race to be more "global" with greater glass icons and bigger airports, is the objective to get on Sassen's list of alpha cities?

Memphis already has shared dominance over the global air cargo market, and has more goods entering customs in Memphis than many other American cities many times its size. Certainly, this is a core area for which Memphis can invest and reap great economic rewards as well as to develop into a world-class city in its own right. This thesis has investigated and proposed a truer

sense of urbanism than what is proposed by the city's and authorities policy makers. Certainly, in light of its Asian competitors, visions for Memphis's aerotropolis need to be more visionary if it is to earn its trademark of "America's Aerotropolis". Even if just as a discursive tool, it is my sincere hope that this thesis takes the ambitions for Memphis to a much higher level.

Figure 5.01 America's Aerotropolis
A sign welcomes you to Memphis's future.

APPENDIX ONE
INSTALLATION

Let's fly way up to the clouds
Away from the maddening crowds
We can sing in the glow of a star that I know of
Where lovers enjoy peace of mind
Let us leave the confusion and all disillusion behind
Just like bird of a feather, a rainbow together we'll find

***Volare*, Dean Martin.**

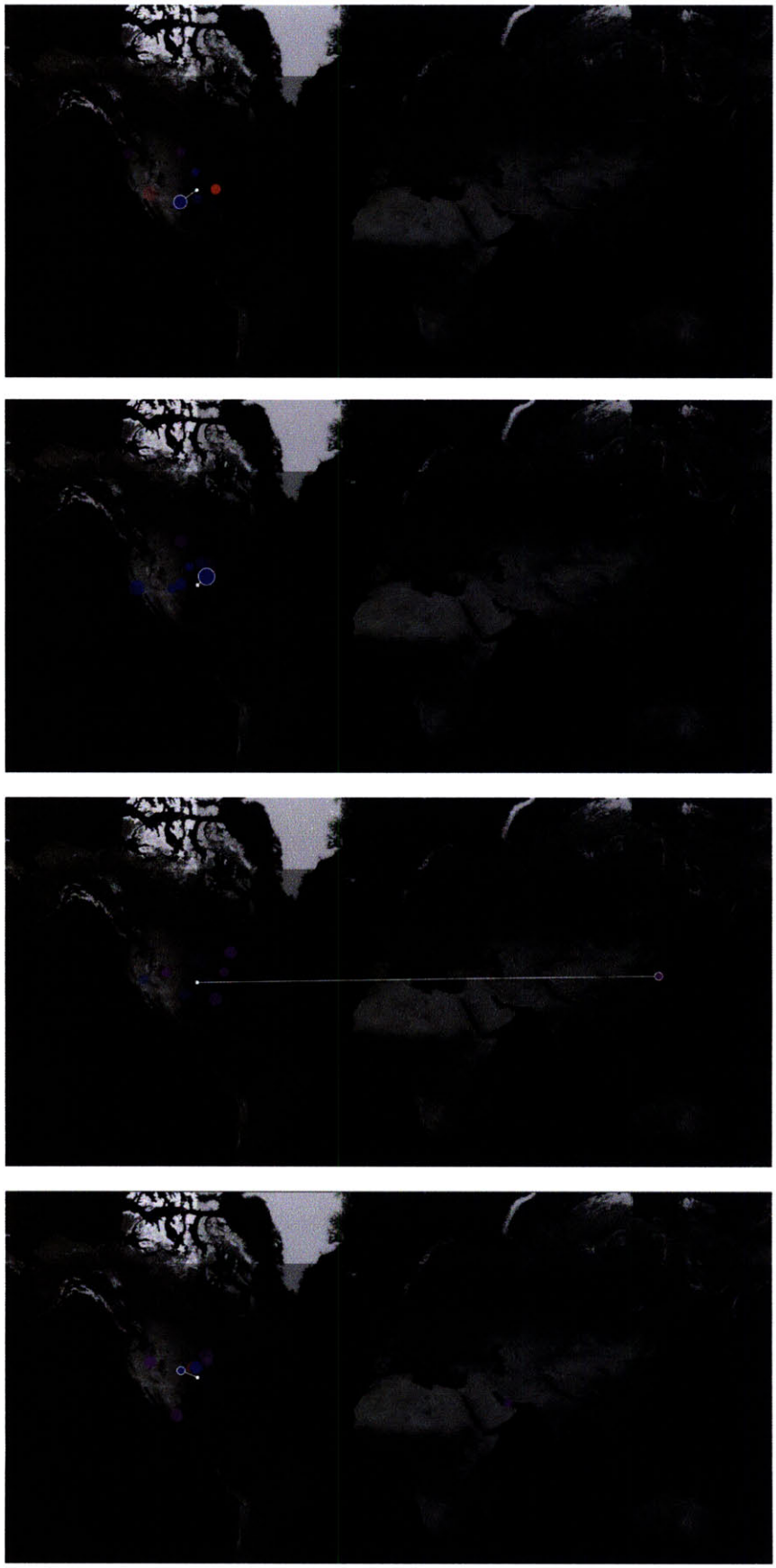


Figure A1.01 Visualization Stills
Various stills of the data visualization of flights departing from Memphis, accounting for airline and frequency of departure city.

INTRODUCTION

This installation was done separate from, but informed by, and parallel to the thesis investigation and was briefly installed at Gund Hall of the Harvard Graduate School of Design in May, 2011. The advisor for this project was Nashid Nabian and the project was part of the explorations of the Sentient City with support from the MIT Senseable City Lab.

Project Information

Nashid Nabian, Advisor

with the support of the MIT Sentient City Lab

and the Harvard Graduate School of Design

Installed in Gund Hall, May 2011

Aviation has, in its history, invoked an image of optimism and technological triumph—it is a symbolic instrument of man's technological prowess. Flight represents our collective promise for a brighter, buoyant future over the natural confines of the earth. Even as air travel has become ubiquitous and utilitarian, the introduction of the Airbus A380 shows air travels power to capture the imagination of the general public, and captivate them with images of shared cultures, and the promise of an interconnected, global community. Adequately reflecting the popular excitement of flying, in Andy Warhol's words, "I just can't get over the crazy feeling I get when I look out and see the clouds and know I'm really up-there."

Yet, even with the knowledge of flights coming and going frequently above our heads bring people and goods from every corner of the world, the network is otherwise hidden—no real sense of the logics, rhythms and patterns of what is moving above us. It is without doubt that this invisible infrastructure is vital to the global economy, yet we are otherwise ignorant of it beyond the confines of the airport terminal. Additionally, the increased security demands after the events of September 11, 2001 has made understanding this network more difficult for the casual observer, though there is still a popular demand to watch and participate in the atmosphere of aviation as exampled by air shows and "plane spotting" by enthusiasts.

This project seeks to make evident this network in architectural space, allowing for one to observe the aviation system in real time. Focused on Memphis, Tennessee, an otherwise unremarkable city except for that its airport accounts for one-third of the jobs in the region and serves as the world's busiest cargo airport, this installation seeks to reveal the national and global connectivity of this city within the deep interior of the United States.

Further, this prototype installation attempts to do allow the observer to understand this space both visually, through cartography, and audibly the connections of this place to the rest of the world.

THE ISSUE OF DATA

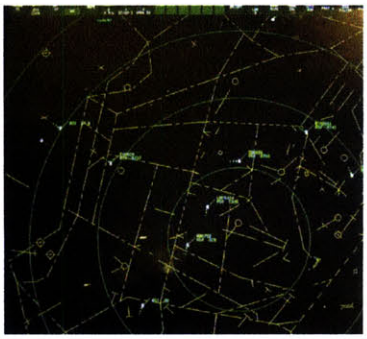


Figure A1.02 ATC Display
Flight data is most often visualized through an air traffic control display, but is hard to understand by the general public.[1]

The ambition of this project was to use data from a live, real-time commercial XML stream of FAA flight information from FlightAware, made available via the agency's Aircraft Situation Data to Industry (ASDI) program, which is collected as part of the normal air traffic control system of the United States. Within the data is much of the same information a controller would have access to—arrival and destination airport, aircraft type, airline, location coordinates, flight status, etc—as well as statistical information on the flight's historic performance as aggregated by both the FAA and FlightAware. As such, the data is being created immediately, though made available to the public with varying delays in the interest of aviation security. The data feed service is originally intended for enterprise and commercial use, especially related aviation and planning, but has also been a resource for enthusiasts and travelers alike.

The entirety of data being created by all of these flights in real time is enormous. Only when we begin to filter the data is it relevant, such as Aaron Koblin's Flight Patterns. Even then, the visualization looked at flight paths within a certain period. Other visualizations within this project looked at a certain aspect at a time, such as altitude or aircraft type. To collapse all of these metrics into one image would be overwhelming. Yet, the data does begin to reveal aspects that happen within the ground space and in the urban habitat below. As a whole, one can see the density of flights within the whole of US air space, with information on each flight to great resolution. Thus, one can begin to see cities emerge, environmental issues, time of day purely on the visualized map of aircraft as individual points within space. Interestingly, as one zooms in, one can find similar trends of a specific region. A widely circulated video of FedEx's nightly influx of planes showed how aircraft moved to avoid a storm around its main hub in Memphis. Even without the storm shown, one can begin to infer some type of abnormality within Memphis airspace.

Yet in reality, a pure visualization in real time is boring. While the peak frequency of departures would be enormously exciting to see, the fact remains that for most of the day, only a few flights departs within an amount of time an occupant wants to stand in the installation. Perhaps, if one is lucky, two flights will depart within two minutes of the other. Should an observer be in the installation at night, or during a storm, no flights may be taking off at all.

The added functionality of moving forward and backward in time (and especially at a highly accelerated rate) adds both dynamism, but for the observer to have the ability to see patterns and trends within the data that real time, or normal time, would not allow. This was made possible by creating a

dataset of over 11,000 flights spanning three weeks into the future and three weeks into the past, culled from the same sources as the original real-time proposal. This allows for a similarly detailed view as the real time information, but greater control of the data through time. Of particular fun is seeing the swaths of FedEx violet during the evenings as the company's coordinated distribution sends packages out to the world for delivery. This ability would not have been possible if a viewer were only able to view a handful of flights at a time due to the constraints of the project. The viewer also has the ability with the slider to replay certain trends s/he thought was interesting adding a level of dynamism and learning as part of the visualization.

INSTALLATION AND INTERFACE

Figure A1.03 Time Machine
The interface, as imagined in the film "The Time Machine", 1960.[2]

The ambitions project can be conceived in two parts, the visual and the auditory. Both work in tandem to immerse the viewer into the larger connections of Memphis Airport. The visual is a projection of the airspace around and beyond Memphis, with the city at the center. It reveals the real time birds-eye view (no pun intended) of aircraft departing from and arriving at Memphis. The trajectories of these flights to destinations around the world are visualized departing from Memphis. Ambitiously, one can also "fast-forward" through a week, month or year of the data to see larger patterns and trends of the data projected at the viewer's feet.

The user's primary physical interface is a slider, reminiscent of the slider in H.G. Well's The Time Machine. When one slides the plunger forward slightly, time moves forward slowly. Pushed to the extreme, time marches forward quickly. The same happens in reverse. The tactile interface is thus intuitive and plays to a romantic notion of a human interface, latent with meaning from lore and popular fiction.

All the while, surrounding the visualization is a series of hidden speakers representing a 360-degrees around the user to destinations around the world. One can begin to recall the imagery of the President's Situation Room, a corporate boardroom, or the airport terminal, the clocks play a role as physical marker of these destination or globally-connected cities from around the world as made possible by commercial and cargo flights. Yet, these speakers are hidden, existing only in audio space, as they play a bigger role with audio traces of the flight operations at the viewer's feet. As a flight takes off for or arrives from a destination, the sound of taking off or landing (as appropriate) can be heard coming from that city's direction vis-a-vis the speaker. One can understand the real-time actions abstractly, even without a visual reference as one can ascertain directionality from where around you the sound is coming, as well as take-off, through a sound with rising tone and loud to soft volume, and landing, through the opposite pattern.

Together, one can observe the actions from a "street view" look at the forefront of their attention through the visual projections. They can also participate at the background or peripherally of their attention through the audio cues providing action and direction.

PROCESS AND RESOLUTION

Behind the scenes, there were many design decisions and actions that brought the project to the current point of resolution. It is worth reminding that this project serves as a prototype for a greater ambition of "show", where the dynamics of interaction are more robust, with fewer abstractions, and with a greater depth of information, detail and control. The original ambition, as previously noted, was to read real-time information being provided by commercial services receiving information from the FAA directly. However, this immediately proved itself to be a great programming challenge. Instead, the data was culled from these sources and banked into a 6-week deep dataset. Additionally, the ambitions of using sounds of planes taking off would have required expensive hardware for each speaker making it prohibitive in this prototype. Instead, buzzers are used in lieu of wav sound files.

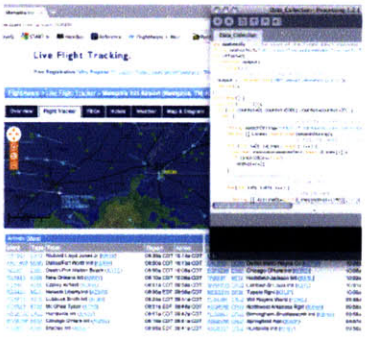


Figure A1.04 Data Collection
A script was written to aggregate the script when the RSS feed attempt failed.

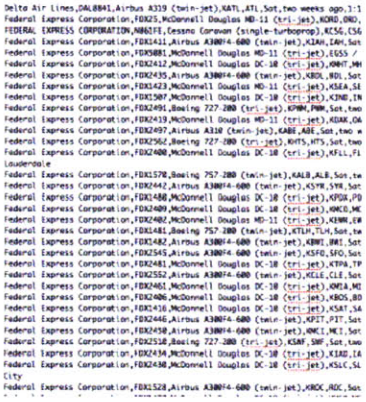


Figure A1.05 Dataset
A screenshot of the created dataset.

The original proposal sought to have fans that oriented the observer to the directionality of flight in an attempt in using an ambient, sensory interface of moving air. The limitations, and overly abstract nature of that proposal yielded to an aural and visual proposition.

The physical prototype installation posed interesting problems. The sensory space was imagined as a 12-foot diameter space, but the overall wiring requirements would have exceeded 600 feet. Instead, the circle was reduced to 10-foot diameter space, but still required in excess of 500 feet of wiring. This project required the entire 22-gauge wire supply of Cambridge's RadioShacks. The amount required also posed two further problems—a potential voltage drop (unconfirmed at the time of writing) and handling so much material around the decorative lattice of the room available added a level of difficulty in suspending the wiring and buzzers. As the room is a regularly use classroom, the wiring was hung in advance but out of the way of students who use the classroom during the course of the week. The wires were suspended over the decorative lattice, whose height and hidden infrastructural features required creativity during its suspension.

Unanticipated, issues of mathematics created hurdles in the programming. Early in the experimentation in visualization, it was learned that as some destinations are more frequently flown to by a significant factor, the discs representing frequency grew enormously. Atlanta, for instance, quickly grew to cover most of North America within days of the visualization. The solution would be to use a natural logarithm to smooth the growth relative to other destination discs. Similarly, creating a bounding formula of how to move forward and backward through time during the "fast forward" and "fast backward" functions continues to be a source of frustration at the time

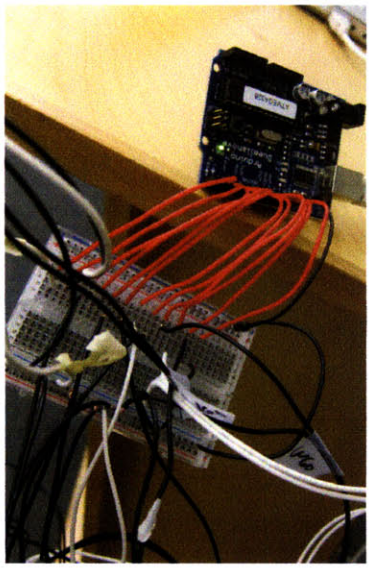


Figure A1.07 Wiring
A close-up photograph of the wiring and hardware of the installation. The microcontroller was connected to piezoelectric speakers and the computer.

Figure A1.08 Wiring
Wiring being installed in Gund Hall.

of writing. Current iterations cause the program to go out of bounds of the dataset array, thus trying to find information that doesn't exist rather than looping back around in the data.

Using real time data by using a commercially available XML feed proved to be a bigger problem than previously thought. In the end, a script was created to scrape data from online sources creating a dataset that included approximately 5,500 flights three weeks into the future using scheduled flights and actual flight records going back the same number into the past. This information was collated with a dataset provided from the Senseable City Lab that recorded the latitude and longitude of airports around the world. The unintended consequence was that we were granted more flexibility with having a banked set of flights in that we could scroll both forward and backward through time allowing for the previously mentioned opportunities.

With the inclusion of flight information in addition to just the trajectory and destination required decisions toward the visual aesthetic. A conscious decision was made to "code" the destination with the color of the primary airline—FedEx Purple, Delta Blue and red for all others. Similarly, with the "echo" of previous destinations, a fade was added so that one could see through to discs that may be covered below. As for the physical aesthetic, it was decided that the space should be darkened so that an observer could be immersed in the soundscape versus being concerned by the device itself. Theatrical glow tape is used to help guide the individual into the room, but beyond that, a screen and slider are the two objects one can see.

The project was presented not as a final, resolved, project but a proof of concept of the interaction and visualization in engaging flight data. The truest ambition of this current project is to scan much further backward in time, as I also have aggregated flight data going back to 2000 though not as fine-grained as the information shown. The aural ambition was to use sounds of planes taking off instead of the obtrusive, and abrasive, piezoelectric buzzer. To use wav sounds would have required expensive hardware for each speaker making it prohibitive in this prototype, but would offer a richer environment in the exhibit.

One can also use the design decisions of this project as a platform to engage other information. Where many visualization projects are just that, visual, the added dimension of spatially specific sound can grant an added layer to the learning and processing of information. Of course, one can simply choose any other airport without much difficulty or change, but understanding global information relative to a specific place can be mapped. The flow of stocks and capital globally, or the movement of shipping vessels by sea can be visualized

and sensed audibly. The crucial dimensions are that there is a flow from a single place through space and time (with directionality of both). From there, coding tweaks can accommodate a multitude of opportunities.

Figure A1.09 Speakers
Prototype piezoelectric speakers were fabricated from laser cur acrylic and paper.

Figure A1.10 Installation
Maxwell Behrens assists in the installation in Gund Hall.

Figure A1.11-12 Final Installation
11. A photograph of the visualization aspect of the installation.

12. Tarryn Chun examples the prototypical control a user has in controlling the tempo of the visualization, with the lights on.

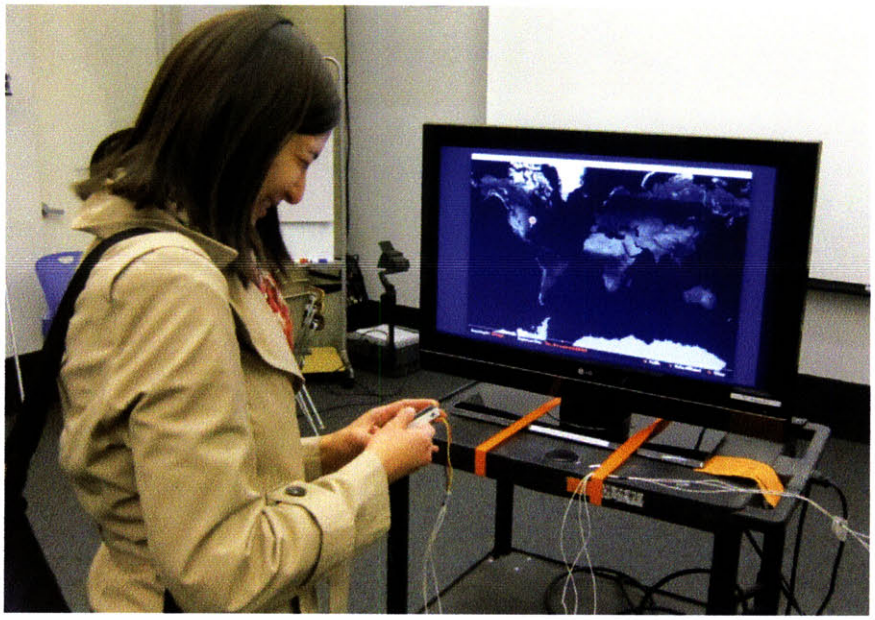


Figure A1.13 Installation
The final installation, seen as an HDR composite. The speakers would be normally hidden from view from the darkness of the room.

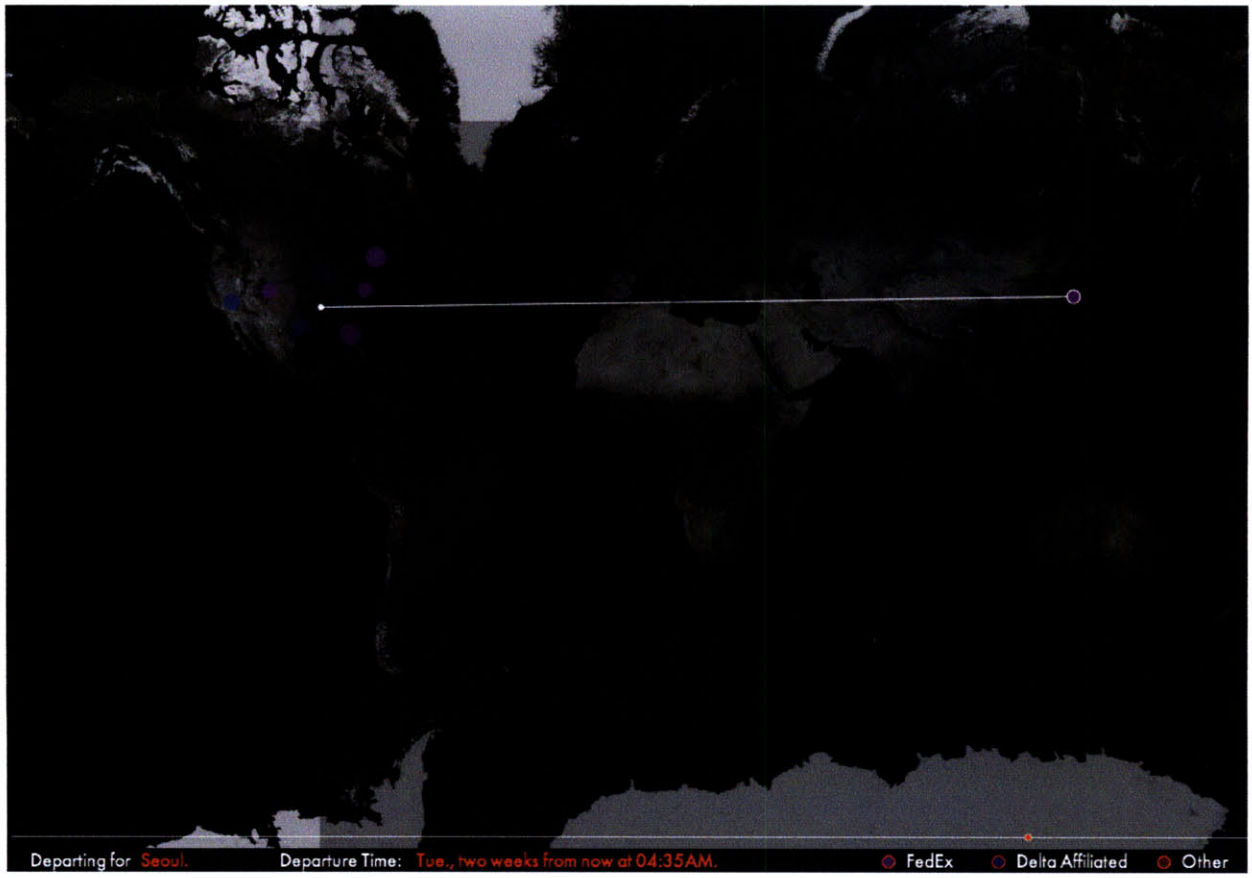


Figure A1.14 Data Visualization
A full video still of a flight, departing in the early morning bound for Asia, with other FedEx and Delta flight "echoes" visualized.

FLIGHT ATTENTIVE (CODE)

The following was programmed in Processing and Arduino in four parts:

DATA COLLECTION (Processing)

```
int marker=0; // The start of the flight table indicator
String markerText="<th class=\"secondaryHeader\"><a href=\"http://
flightaware.com/live/airport/KMEM/departures?;offset=0;sort=DESC;ord
er=actualarrivaltime\">Arrival<br />Time</a></th>";
int offset=0;
PrintWriter output;
void setup() {
// Create a new file in the sketch directory
output = createWriter("MEM_depart_descending.txt");
noLoop(); }

void draw() {
println(millis());
for(int counter=0; counter<6301; counter=counter+20) {//6300
try {
//|||||||||||||||||||||||| RETRIEVING FLIGHTS 20 AT A TIME DESC
String searchString="http://flightaware.com/live/airport/KMEM/departur
es?;offset="+counter+";order=actualdeparturetime;sort=DESC";
String [] Lines=loadStrings(searchString);

//|||||||||||||||||||||||| GETTING THE MARKER POSITION
for (int i=0; i<Lines.length; i++) {
boolean indicator=markerText.equals(Lines[i]);
if (indicator==true)
marker=i+2;}
//output.println(marker);

//|||||||||||||||||||||||| GETTING DATA
for(int i=0; i<19; i++) {
//|||||||||||||||||||||||| AIRLINE NAME
String [] Airline01=split(Lines[marker+(i*8)],">");
String [] Airline02=split(Airline01[1],"\"");
String [] Airline03=split(Airline02[1],"&");
String Airline=trim(Airline03[0]);
output.print(Airline+",");

//|||||||||||||||||||||||| FLIGHT CODE
String [] AirID01=split(Lines[marker+(i*8)],">");
String [] AirID02=split(AirID01[3],"/");
String [] AirID03=split(AirID02[0],"<");
String AirID=trim(AirID03[0]);
output.print(AirID+",");

//|||||||||||||||||||||||| AIRCRAFT TYPE
String [] Aircraft01=split(Lines[marker+1+(i*8)], ">");
String [] Aircraft02=split(Aircraft01[1],"\"");
String Aircraft=trim(Aircraft02[1]);
```

```
output.print(Aircraft+",");

//|||||||||||||||||||||||| DESTINATION
String [] destination01=split(Lines[marker+2+(i*8)],">");
String [] destination02=split(destination01[4],"<");
String destination =trim(destination02[0]);
output.print(destination+",");

//|||||||||||||||||||||||| DEPARTURE TIME
String [] depDay01=split(Lines[marker+3+(i*8)],">");
String [] depDay02=split(depDay01[1],"&");
String depDay =trim(depDay02[0]);
output.print(depDay+",");
String [] depTime01=split(depDay02[1],";");
String depTime =trim(depTime01[1]);
output.println (depTime);}
println (counter); }

catch( Throwable e) {
println("Error at Line ...."+ counter); }}
println("Data Collection is done!");
println(millis()); }

void keyPressed() {
output.flush(); // Writes the remaining data to the file
output.close(); // Finishes the file
exit(); // Stops the program}
```

SLIDER CONTROL (Arduino)

```
int PIN=-1;
void setup(){
 Serial.begin(9600);
 for(int i=2; i<14; i++){
 pinMode(i, OUTPUT); }}

void loop(){
   int temp=Serial.read();
   if(temp>-1 && temp<12){
    PIN=temp;}
   if(PIN!=-1){
    digitalWrite(PIN+2,HIGH);
    delayMicroseconds(850);
    digitalWrite(PIN+2,LOW);
    delayMicroseconds(850);  }}
```

ARDUINO CONTROL (Arduino)

```
int PIN=-1;
void setup(){
 Serial.begin(9600);
```

```
 for(int i=2; i<14; i++){
  pinMode(i, OUTPUT); }}

void loop(){
 int temp=Serial.read();
 if(temp>-1 && temp<12){
  PIN=temp;}
 if(PIN!=-1){
  digitalWrite(PIN+2,HIGH);
  delayMicroseconds(850);
  digitalWrite(PIN+2,LOW);
  delayMicroseconds(850); }}
```

VISUALIZATION (Processing)

```
int delayFactor=1500;
int maxStep=500;
import processing.serial.*;
Serial myPort;
Serial sliderPort;
String buff = "";
int NEWLINE = 10;
String dataString;
int SliderValue=0;
int StepMagnitude=1;

int PortCode=2;
int sliderPortCode=0;
int state=-1;
long baseTime;
long diffTime;
float AirportLat,AirportLong;
// Memphis Airport Lat/Long 35.044702,-89.981659
float MemphisLat=35.044702;
float MemphisLong=-89.981659;
Location locMemphis;
Point2f pointTMemphis;
int pointXMemphis;
int pointYMemphis;
String[] Lines;
int counter;
int time;
int ArduinoState=13;
String [] Airports= {
 "Airports"
};
String FedEx = "Federal Express Corporation";
String Delta = "Delta Air Lines";
String Delta1 = "Atlantic Southeast Airlines";
String Delta2 = "Comair";
String Delta3 = "Mesaba Airlines";
String Delta4 = "Pinnacle Airlines";
String Delta5 = "SkyWest Airlines";
String Delta6 = "Chautauqua Airlines";
```

```
int red1;
int green1;
int blue1;
int opacity;
int [] AirportHits= {0};
int radius=1;

void setup() {

 println(Serial.list());    ////// WILL HELP FIND PORT FOR ABOVE
 myPort = new Serial(this, Serial.list()[PortCode], 9600);  //The Index of
the port should be updated based on which port arduino is communicating
with processing
 sliderPort=new Serial(this, Serial.list()[sliderPortCode], 9600);

 //||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
 setupInterface();
 // Map Mode Options would be "new Microsoft.HybridProvider()" or
"new Microsoft.AerialProvider()" or "new Microsoft.RoadProvider()"
 map = new InteractiveMap(this, new Microsoft.AerialProvider());
 map.setCenterZoom(new Location(0,0), 2);// zoom 0 is the whole
world, 19 is street level
 //Adding Time Stamp
 Date now = new Date();
 baseTime=now.getTime();
 //noLoop();
 locMemphis = new Location(MemphisLat, MemphisLong);
 pointTMemphis = map.locationPoint(locMemphis);
 pointXMemphis=int(pointTMemphis.x);
 pointYMemphis=int(pointTMemphis.y);
 Lines=loadStrings("AirportDepartureWithCoordinatesAPR12.csv");
 delay(1000);}

void draw() {
 background(0);
 while (sliderPort.available() > 0) {
  serialEvent(sliderPort.read()); //look for data}
 if(dataString!=null)
  SliderValue=int(dataString);
 StepMagnitude=int(map(SliderValue,0,1023,-maxStep,maxStep));
 if(StepMagnitude%2==1)StepMagnitude=StepMagnitude-1;
 //println(StepMagnitude);
 tint(255,100);
 map.draw();
 filter(GRAY);

 //|||||||||||||||||||||| TIMER SECTION ||||||||||||||||||||||||||||||||||
 println(millis()%1000);
 if(StepMagnitude>0 ) {
  counter= (counter+StepMagnitude)%Lines.length;
  delay(delayFactor);}
 else if(StepMagnitude<0) {
  counter= counter+StepMagnitude;
  if(counter<0) counter=counter+Lines.length;
```

```
  delay(delayFactor);}
 print(counter);
 print(".....");
 println(StepMagnitude);
 if(counter==0) {
  Airports=subset(Airports,0,1);
  AirportHits=subset(AirportHits,0,1);}
 for(int k=min(10*StepMagnitude,counter);k>0;k=k-StepMagnitude) {
  plotInformation(counter-k,color(200,0,0,255-(k/StepMagni-
tude)*25),0);}
 plotInformation(counter,color(200,0,0,255),1);

 delay(1);

 //||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
 drawTimeSlider();}

void controlMapVisuals() {
 filter(GRAY);}

void changeMapColor() {
 for(int y=0; y<height; y++) //for all pixels in the y direction
 {
  for(int x=0; x<width; x++) { //for all pixels in the x direction
   color myPixel = get(x,y); //get a pixel's color
   int r = int(red(myPixel)); //extract the red value
   int g = int(green(myPixel)); //extract the green value
   int b = int(blue(myPixel)); //extract the blue value
   r=255-r;//Specify how red factor is changed
   g=255-g;//Specify how green factor is changed
   b=b;//Specify how blue factor is changed
   color newColor = color(r,g,b);
   set(x,y,newColor);//Set the pixel's color in the image}}}

//|||||||||||||||||||| RECOUNTING VISITS ||||||||||||||||||||||||||||||||
void plotInformation(int i, color c, int indicator) {
 String tempRecord=Lines[i];
 String [] tempFields=split(Lines[i],",");
 String Airport=tempFields[4];
 int radiusUpdateState=0;
 for(int j=0; j<Airports.length;j++) {
  if (Airport.equals(Airports[j]) ) {
   AirportHits[j]=AirportHits[j]+1;
   radius=AirportHits[j];
   radiusUpdateState=1;}}

 ////////////////// ELSE, FIRST COUNT IS 1. //////////////////
 if (radiusUpdateState==0) {
  Airports=append(Airports, Airport);
  AirportHits=append(AirportHits,1);
  radius=1;}
 String City=tempFields[10];
 String Day=tempFields[5];
 String Week=tempFields[6];
```

```
String Time=tempFields[7];
String Latitude=tempFields[8];
String Longitude=tempFields[9];
AirportLat=float(Latitude);
AirportLong=float(Longitude);
//Grab the X/Y of a point on the map from known Lat/Long
Location locTemp = new Location(AirportLat, AirportLong);
Point2f pointTemp = map.locationPoint(locTemp);

//|||||||||||||||||||| DRAW LINE ||||||||||||||||||||||||||||||||||
noStroke();
fill(#ffffff, 50);
ellipse(pointXMemphis,pointYMemphis,5,5);
int pointX=int(pointTemp.x);
int pointY=int(pointTemp.y);
if(indicator==1) {
 stroke(255);
 line(pointXMemphis,pointYMemphis,pointX,pointY);}

String AirCarrier=tempFields[0];
//println(AirCarrier);
if(AirCarrier.equals(FedEx) == true) {
 //print("FEDEX .....");
 red1 = #500079;}
else if (AirCarrier.equals(Delta)||AirCarrier.equals(Delta1)||AirCarrier.
equals(Delta2)||AirCarrier.equals(Delta3)||
  AirCarrier.equals(Delta4)||AirCarrier.equals(Delta5)||AirCarrier.
equals(Delta6) == true) {
  //print("DELTA .....");
  red1 = #003366;}
else {
 //print("AIR .....");
 red1 = #991933;}

int Opasity=int(alpha(c));
fill(red1,Opasity); //!!!!!!!!!!!!!
ellipse(pointX,pointY,10+log(1+(radius/15.0))*10,10+log(1+(radi
us/15.0))*10);

//|||||||||||||||||||| TEXT BAR ||||||||||||||||||||||||||||||||||
fill(0,0,0,220);
noStroke();
rect(15,700,1024,-20);
fill(255,255,255);
text("Departing for ",20,695);
fill(255,0,0);
text(City+".",110,695);
fill(255,255,255);
text(" Departure Time:",220,695);
fill(255,0,0);
text(Day+"., "+Week+" at "+Time+".",335,695);
stroke(#FF0000);
fill(#500079, 225);
ellipse(720,690,10,10);
```

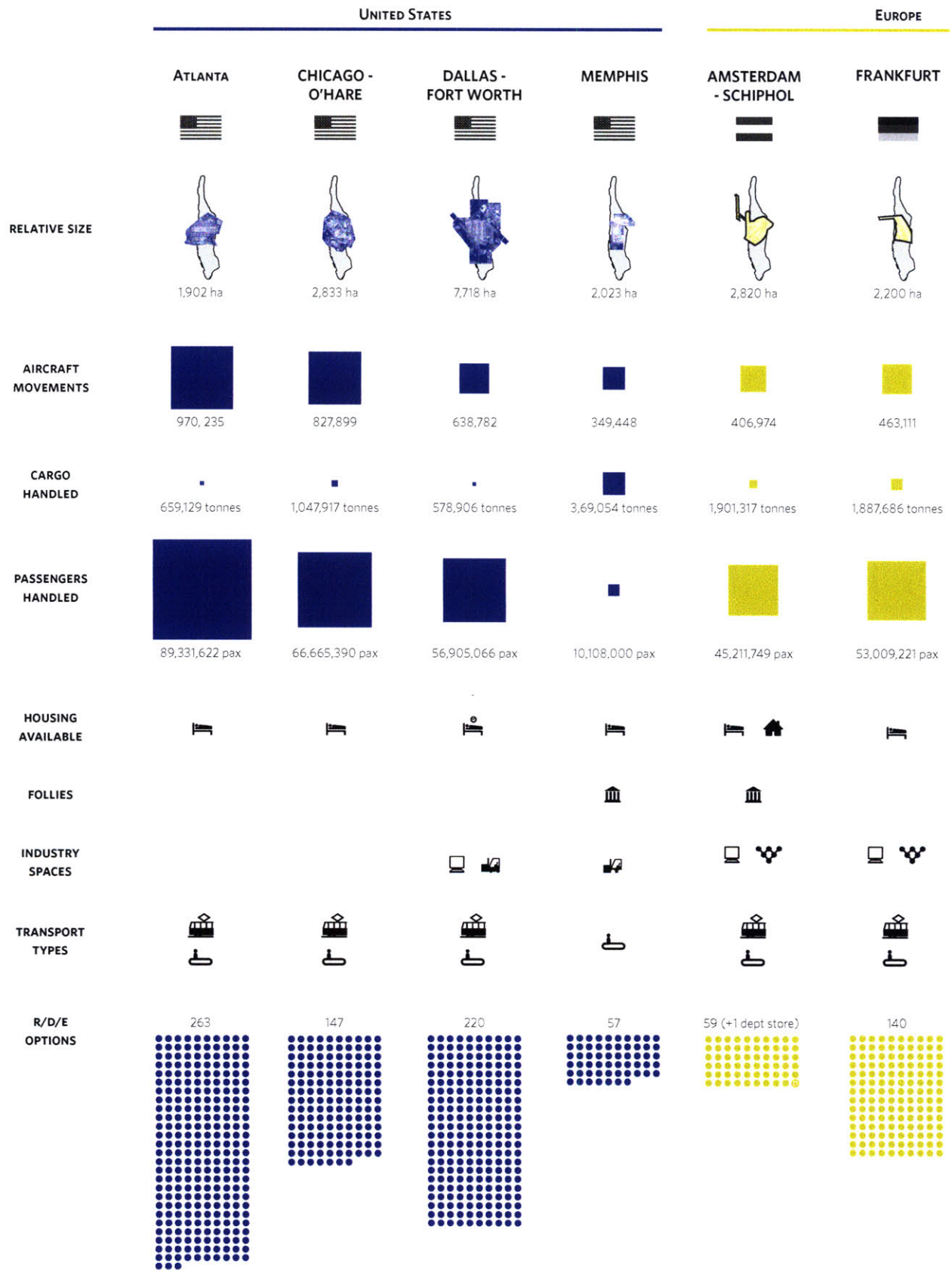
```
  noStroke();
  fill(#FFFFFF);
  text("FedEx",735,695);
  stroke(#FF0000);
  fill(#003366, 200);
  ellipse(810,690,10,10);
  noStroke();
  fill(#FFFFFF);
  text("Delta Affiliated",825,695);
  stroke(#FF0000);
  fill(#991933, 90);
  ellipse(945,690,10,10);
  noStroke();
  fill(#FFFFFF);
  text("Other",960,695);

  //||||||||||||||||||CALCULATE WHICH ARDUINO BUZZER ||||||||||||||||||||||||||
  float tempDeltaX=abs(pointX-pointXMemphis);
  float tempDeltaY=abs(pointY-pointYMemphis);
  float tempAngle=degrees (atan(tempDeltaY/tempDeltaX));
  if(pointX>pointXMemphis && pointY<height/2)tempAngle=tempAngle;
  else if(pointX<pointXMemphis && pointY<pointYMemphis)
tempAngle=180-tempAngle;
  else if(pointX<pointXMemphis && pointY>pointYMemphis)
tempAngle=180+tempAngle;
  else if(pointX>pointXMemphis && pointY>pointYMemphis)
tempAngle=360-tempAngle;
  ArduinoState=int(round(map(tempAngle,0,360,0,12)));
  if (ArduinoState==12) ArduinoState=0;
    myPort.write(ArduinoState);  }

void serialEvent(int serial) {
  // If the variable "serial" is not equal to the value for
  // a new line, add the value to the variable "buff". If the
  // value "serial" is equal to the value for a new line,
  // save the value of the buffer into the variable "val".
  if(serial != NEWLINE) {
    buff += char(serial);}
  else {
    if(buff.length()>0) {
      buff = buff.substring(0, buff.length()-1);
      // Parse the String into an integer
      dataString=buff;
      // Clear the value of "buff"
      buff = "";}}}

void drawTimeSlider() {
  stroke(255,255,255, 150);
  line(5,height-30, width-5, height-30);
  fill(255,0,0);
  int timerLocation=int(map(counter,0,Lines.length, 5,width-5));
  ellipse(timerLocation,height-30,5,5);}
```

APPENDIX TWO
COMPARATIVE STUDY

Airport Worker:
Hey! You're not just impersonating a pilot so you can drink here, are you?

Homer:
Yeah. That's exactly why I'm here.

***Fear of Flying*, The Simpsons**


UNITED STATES
EUROPE
ATLANTA
CHICAGO - O'HARE
DALLAS - FORT WORTH
MEMPHIS
AMSTERDAM - SCHIPHOL
FRANKFURT
RELATIVE SIZE
1,902 ha
2,833 ha
7,718 ha
2,023 ha
2,820 ha
2,200 ha
AIRCRAFT MOVEMENTS
970, 235
827,899
638,782
349,448
406,974
463,111
CARGO HANDLED
659,129 tonnes
1,047,917 tonnes
578,906 tonnes
3,69,054 tonnes
1,901,317 tonnes
1,887,686 tonnes
PASSENGERS HANDLED
89,331,622 pax
66,665,390 pax
56,905,066 pax
10,108,000 pax
45,211,749 pax
53,009,221 pax
HOUSING AVAILABLE
FOLLIES
INDUSTRY SPACES
TRANSPORT TYPES
R/D/E OPTIONS
263
147
220
57
59 (+1 dept store)
140

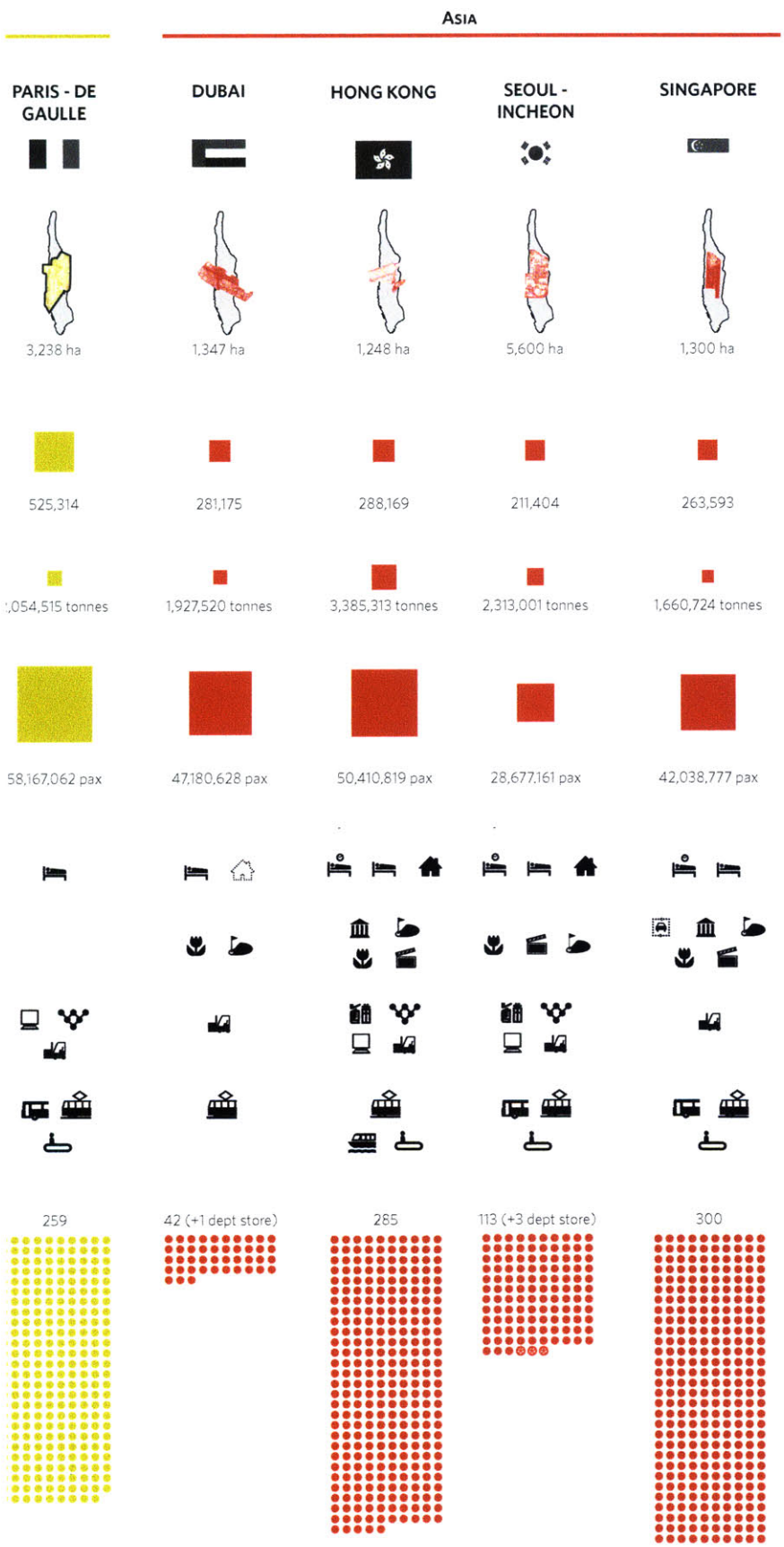
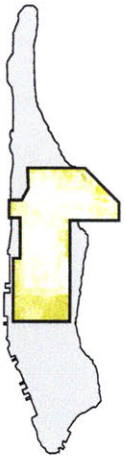
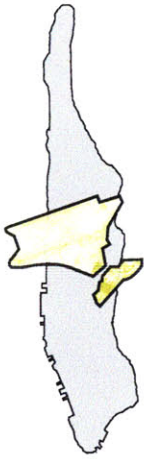


Figure A2.01 Comparative Study

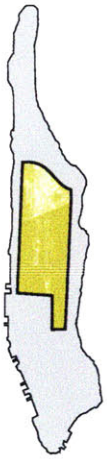


MEM
Memphis, TN

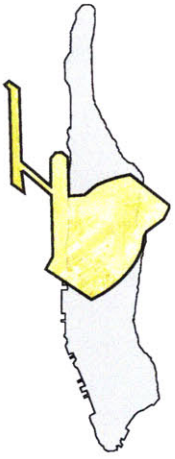
BOS
Boston, MA



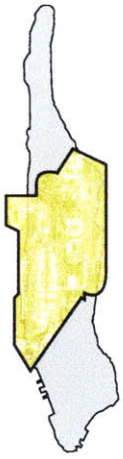
HKG
Hong Kong



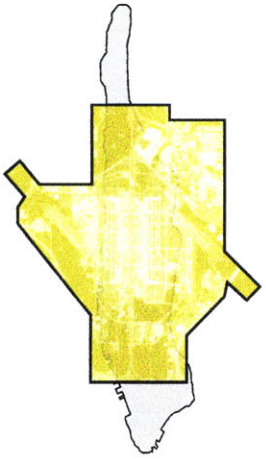
SIN
Singapore - Changi



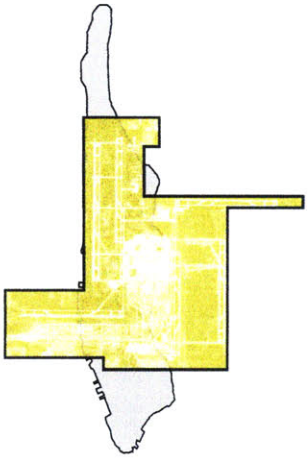
AMS
Amsterdam - Schiphol



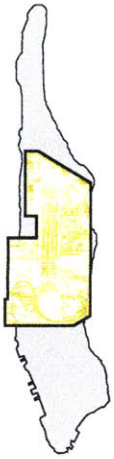
CDG
Paris - Charles de Gaulle



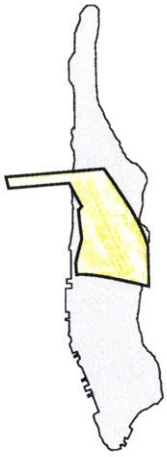
DFW
Dallas/Fort Worth, TX



DEN
Denver, CO

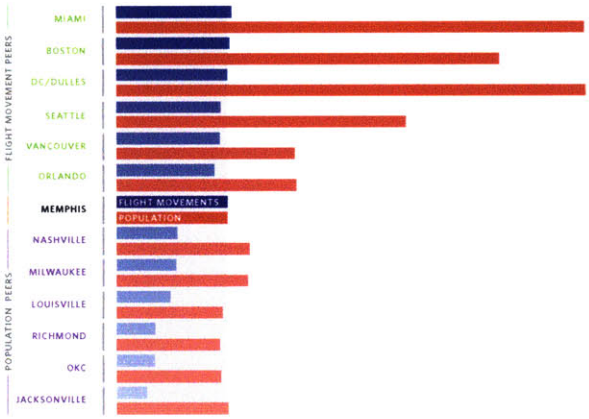


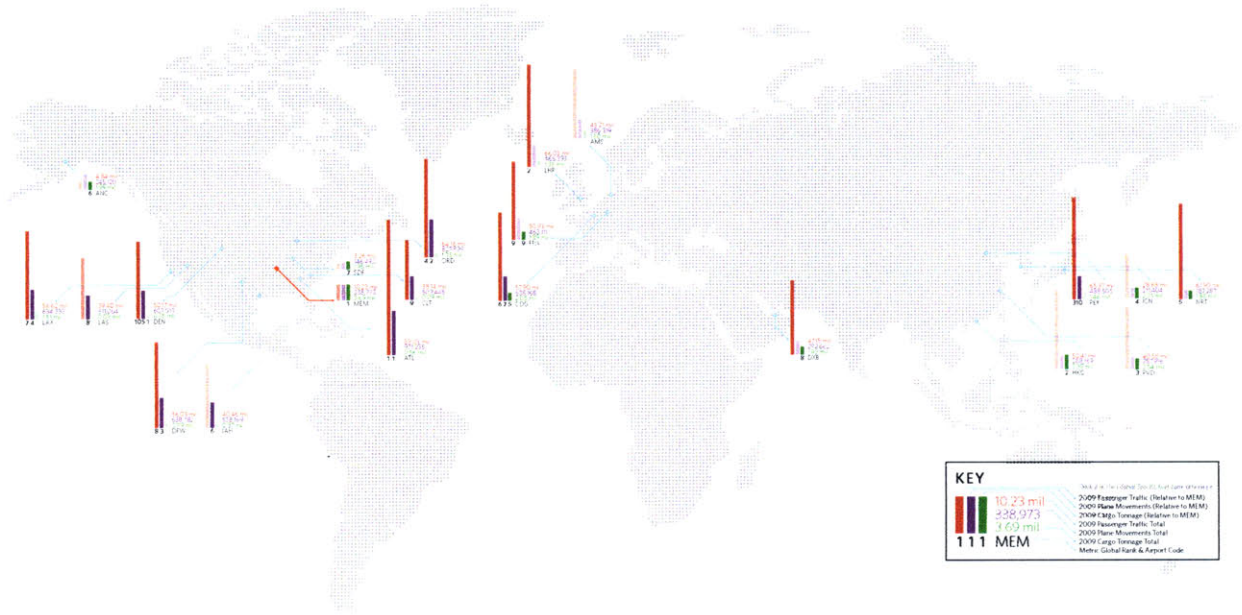
ICN
Seoul - Incheon



FRA
Frankfurt am Main

Ile


FLIGHT MOVEMENT PEERS
POPULATION PEERS
MIAMI
BOSTON
DC/DULLES
SEATTLE
VANCOUVER
ORLANDO
MEMPHIS
NASHVILLE
MILWAUKEE
LOUISVILLE
RICHMOND
OKC
JACKSONVILLE
FLIGHT MOVEMENTS
POPULATION


KEY
10.23 mil
338,973
3.69 mil
111 MEM

APPENDIX THREE
SIMULATED UTOPIAS

The airplane stays up because it doesn't have the time to fall.

Orville Wright


EXXON
CITGO
ATM
MAPCO
ATM


KFC
Wendy's

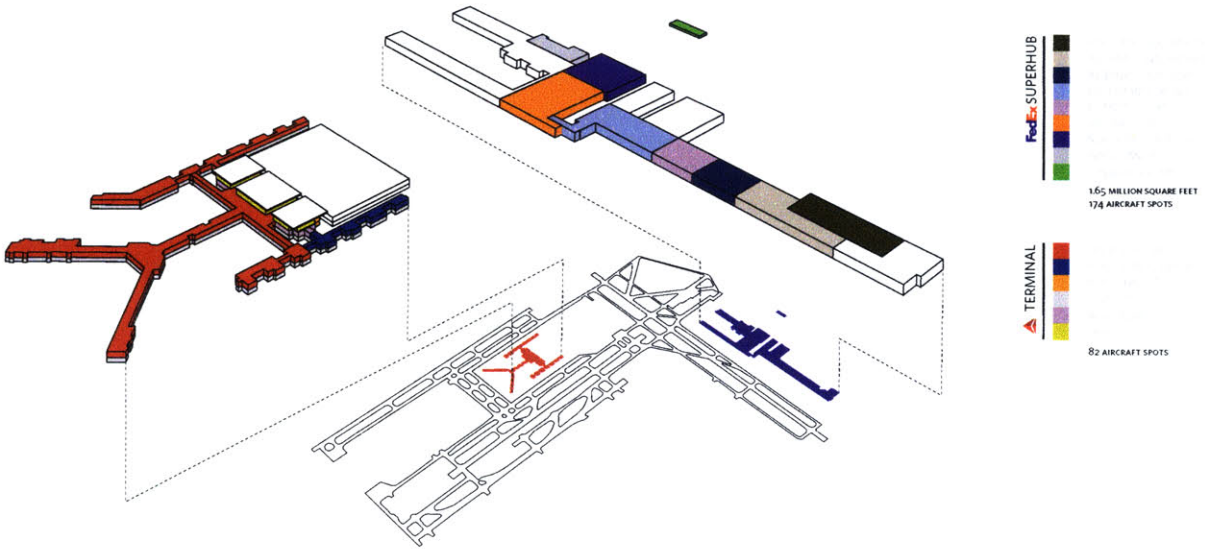
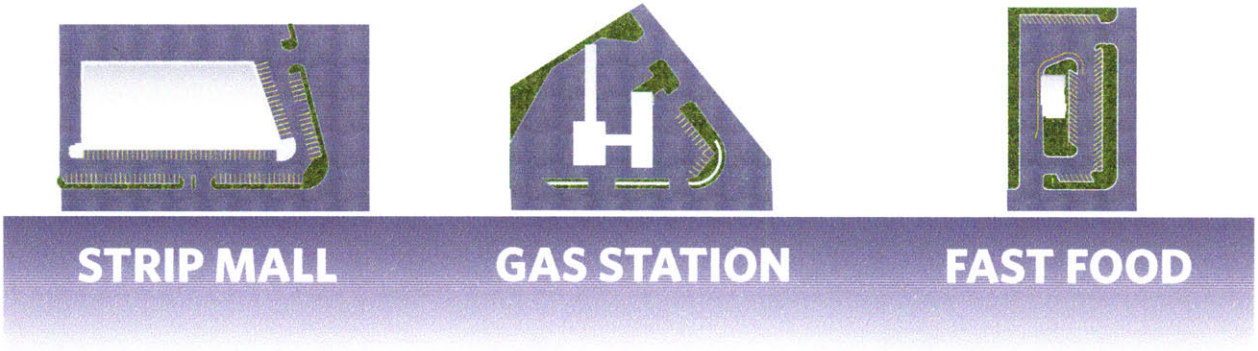
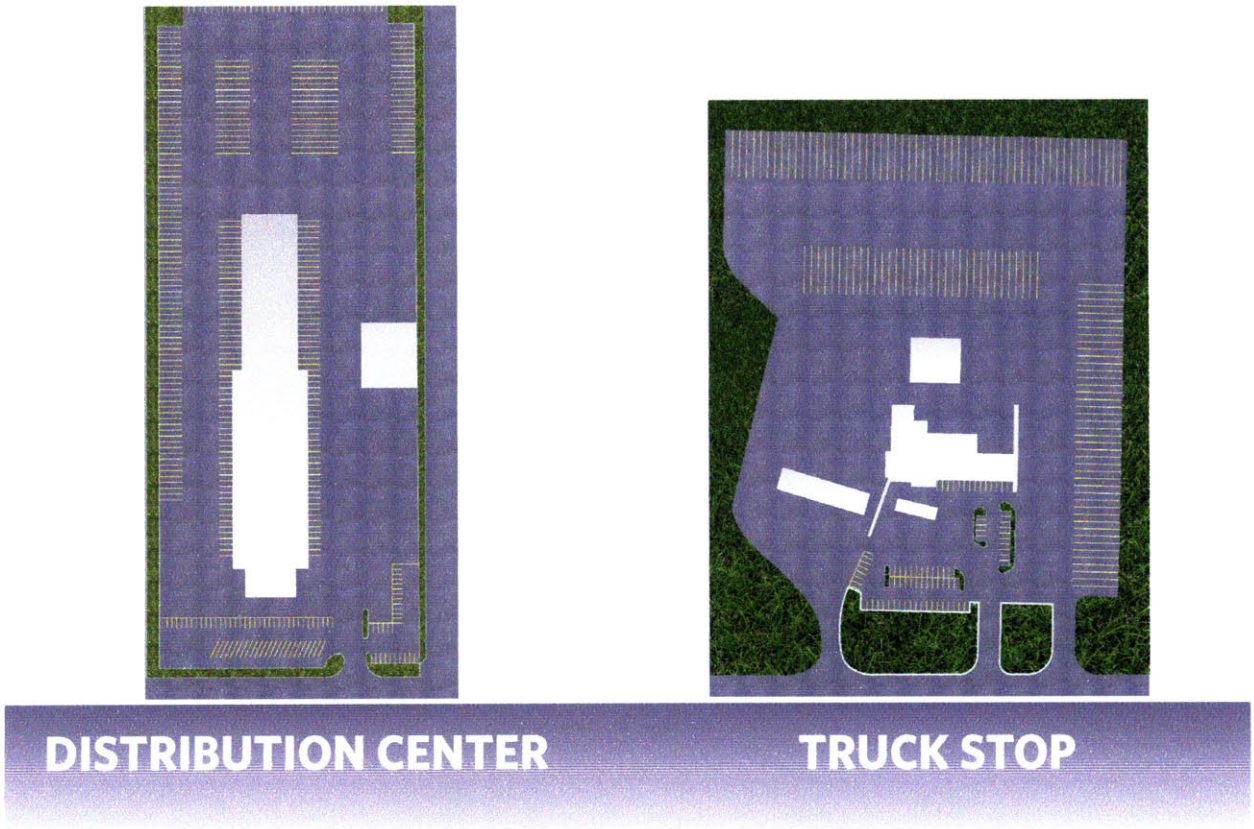

FedEx SUPERHUB
1.65 MILLION SQUARE FEET
174 AIRCRAFT SPOTS
TERMINAL
82 AIRCRAFT SPOTS

Figure A1.14 Data Visualization
A full video still of a flight, departing in the early morning bound for Asia, with other FedEx and Delta flight "echoes" visualized.




DISTRIBUTION CENTER
TRUCK STOP
REST STOP

NOTES

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The air up there in the clouds is very pure and fine, bracing and delicious. And why shouldn't it be? - it is the same the angels breathe.

Mark Twain, *Roughing It*

NOTES

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2 Hiss, Tony. In motion: the experience of travel. New York: Alfred A. Knopf, 2010, 106

3 Griffiths, 201.

4 While "Ballardian" writings tend to treat technology and mechanization as a means of destroying humanity, one can also argue that Chronopolis has ambivalence to the time itself, but is a critique of draconian social measures tied to time.

5 Ballard, J. G.. Chronopolis, and other stories,. New York: Putnam, 1971, 171.

6 Hiss, 138.

7 M-Time's opposite is "P-Time" or "Polychromic Time" (again, Hall's terms) which is more common in southern Europe and South America. Their consciences tell them to finish what is happening in the current moment which is more important than abandoning these companions for an event that has not yet started.

8 Ballard. p. 189.

9 Matthew White, "The Economics of Time Zones" (Wharton School of Business, University of Pennsylvania, 2005), 3.

10 Hildebrand, Grant. Designing for Industry: the Architecture of Albert Kahn, Cambridge, Mass, MIT Press 1974, 91.

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12 Hildebrand, 120.

13 Bucci, 45.

14 Bucci, 45.

15 Hildebrand, 117. Ford, when commenting on the location of a new unit said, "well, push it over plenty far, we don't know what we're going to put around it" which reveals this thinking about expansion, and even connection with future programs.

16 Bucci, 52.

17 Bucci, 53.

18 ibid., 52.

19 The use of the term "Memphis Time" is common by FedEx as a common point of reference with regard to time.

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24 Hiss, 107.
25 Hiss, 144
26 ibid, 147.
27 Brophy, 23. "I am on my way yet free to stray—if only my coffee will cool to drinkable."
28 Brophy, 24.
29 ibid, 24.
30 ibid, 24.
31 Marc Auge, introduction to an anthropology of supermodernity, trans. John Howe, Verso: London, 1995.
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35 Muschamp, Herbert. "ARCHITECTURE VIEW; Stay of Execution for a Dazzling Airline Terminal." The New York Times. http://www.nytimes.com/1994/11/06/arts/architecture-view-stay-of-execution-for-a-dazzling-airline-terminal.html (accessed May 9, 2011).
36 Photographs of attendants serving drinks in the mobile lounges blurs whether the vehicle was an extension of the plane or the terminal, further blurring the line between destination and departure point within the site of the airport. With the advent of the jet bridge, these structures would serve as inter-terminal shuttles before the inauguration of the AeroTrain rail system.
37 The shrine is can be both authentic and a simulation of authenticity. The Thai people are largely devout, yet contemporary spaces, like Bangkok's Paragon megamall, have built shrines that serve as an icon anchoring the development and a place to pay homage. In other cases, such as the Erawan Shrine, the company has taken responsibility for the care for the shrine.
38 "Shopping, Dining & Entertainment ." Hong Kong International Airport. http://www.hongkongairport.com/eng/shopping/entertainment/t2/aviat/avia.html .
39 Auge 86
40 Auge, 84.

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3 Meyer, The Work of Antonio Sant`Elia, 128.

4 Meyer, The Work of Antonio Sant`Elia, 126.

5 It is often argued that King's Dream of New York is plagiarized from Lamb's work decades earlier.

6 "Dirigible to Try Mooring With Skyscraper Mast." Popular Mechanics, May 1931.

7 If calculated using the relative share of GDP as a means of calculation, the equivalent value in 2011 is $20,300,000.

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12 The condition of carrying out air operations in tall and dense locations would indeed happen. The approach into Hong Kong's now-closed Kowloon airport is a prime exemplar. The approach into Washington National (DCA) is an extraordinarily difficult approach due to restricted airspace to either side of the approach over the narrow path defined by the width the Potomac River.

13 Kasarda, 20.

14 Kasarda is by no means the only cheerleader for this model of urban and economic development. McKinley Conway promoted the airport city model in 1970 with businesses and industry sited in proximity to an airport. The main difference is that there was not a concentration of "global airports" and many examples cited by Conway would be considered regional or local airports versus international airports in the truest sense.

15 Jet fuel prices, at the time of the thesis submission was priced at $129.50/barrel, a 30% premium over crude oil. This difference is due to the high-grade refining process required of jet fuel. In the past ten years, the price of jet fuel has risen from about $0.75/gallon to a high of $4.00/gallon.

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