Downtime Interventions:
Programming the Next Generation Airport Terminal

by

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ABSTRACT

Airports are in trouble. Passengers have always been frustrated with air travel because of poor scheduling and late aircraft, and threats of terrorism since September 11th 2001 have given travelers even less of a reason to book a flight. With very few options for activity and limited personal space, waiting for a flight in an airport terminal can be a dull if not annoying experience.

Downtime is built into the schedule of flying in the form of check-in procedures, increased security, and boarding protocols. Travelers are encountering more downtime at the airport than ever before, and the spaces they occupy while waiting for a flight are often designed without regard for their emotional and functional needs. Unless they have access to exclusive lounges, passengers must wait in their designated gate areas in vast fields of undifferentiated seating. A lack of programmatic specificity plagues the airport while passengers grow increasingly frustrated with their travel experience.

But things are changing so we can travel the way we want. Security measures are being adopted to reassure passengers that air travel is safe, and better technologies are being tested and implemented to improve the flows of passengers on the ground and in the air. Modern travelers are on the move, restless, technologically enabled, and want to spend their time in quality ways. Because the complete experience of travel has become paramount in an increasingly competitive market, comfort and convenience can longer be ignored in the design of airport terminals. Next generation airport terminals need to respond to the complexity of modern living and accommodate simultaneous public and private itineraries of an unprecedented variety.

This project investigates the impact of new technologies on the way we use public space and explores opportunities to improve our experience of travel by designing environments more responsive to the activities that occur in the airport. The design proposal incorporates software interfaces, personal equipment, and interior surfaces to form an architectural operating system to be implemented in a specific case study—Hartsfield International Airport in Atlanta, Georgia.

Thesis Advisor: Peter Testa
Title: Associate Professor of Architecture
Special thanks to Peter Testa and the Emergent Design Group at MIT for giving me exposure to a very different understanding of design practice—one that continues to inspire new possibilities and great optimism. Much appreciation also goes to my thesis committee—Bill Mitchell, Jeffrey Huang, and Neil Everette—whose input guided me throughout the design process. Many cheers to my family, friends, and everyone who contributed to and supported my work in even the smallest of ways.

The principle typefaces used in the production of this book are Swis721 and ISOPEUR BT.
interventions

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"the very essence of transportation is to connect people with places and the social and economic activities that occur in them..."*

introduction
Airports are in trouble:
too much hassle, endless delays, nothing to do, the threat of terrorism:
who wants to fly anymore?
Travelers are experiencing more downtime at the airport than ever before, and the spaces they occupy while waiting for a flight are designed without regards for the activities in which people want to engage.
but things are changing

security measures have become more comprehensive to ensure passengers that air travel is safe
biometric identification

.... so we can have more peace of mind
better technologies are being tested and implemented to improve the flow of passengers on the ground and in the air.

Airplane global positioning systems are decentralizing air traffic control and making better use of air space*, while dynamic gating promotes faster turnover rates for arriving and departing aircraft by assigning gate areas based on availability. Because gate areas are no longer fixed to a rigid schedule based on reservation, airplanes will arrive and depart more efficiently and passengers will not be anchored to predetermined gate areas.

* "Pilots will see it all." Popular Mechanics October 1999.
so we can travel easier
we have a new way of living.

Technological innovation has empowered people to invent new opportunities for collaboration and self-organization. A new lifestyle of mobility is emerging, characterized by the shifting social relationships, alternate work arrangements, and global employment structure of the network economy.
mobile + networked

This project investigates the impact of new technologies in the way we use the public space of the airport and attempts to address the needs and concerns of modern travelers in relationship to their environment, their belongings, and to other people.
atlanta | the busiest airport in the world
Initial conditions and contextual parameters are extracted from an existing airport in order to establish a specific scope of design opportunities. In its straightforward design and standard dimensions, Hartsfield represents the generic modern airport. The fixed structure and consistent exterior cladding of the terminal complex limits the scope of this project’s physical interventions to a reinvestigation of interior environmental systems. Other means of space-making and program-generation are explored through the implementation of a network of personal equipment and software systems.
80 million passengers per year
Atlanta Hartsfield International Airport consists of five domestic concourses and an international facility connected by an underground transit mall. As a major transportation hub, it handles domestic and international flights. Concessions and amenities are located throughout each concourse and concentrated at their connecting bridges. With over 80 million passengers each year and 2,400 daily flights, Hartsfield is currently the busiest airport in the world.

Although the passenger terminals cover nearly six million square feet of space, they are easy to navigate. Each terminal building is designed with consistent form, color, and a simple structural grid. Making use of standardized international symbols and uniform colors, the signage and maps in the airport facilitate ease of wayfinding.
The automated underground transit mall provides efficient and timely connections between the 6 passenger concourses and the main terminal building. Looping over 3 miles around the airport, trains arrive at each stop every 2 minutes. A moving sidewalk runs parallel to the trains and currently remains unprogrammed and largely unused.
Gate after gate, the airlines have organized their waiting areas to maximize seating capacity. Unless they have access to exclusive lounges, passengers must wait in their designated gate areas in vast fields of undifferentiated seating. The lack of amenities like comfortable resting areas, power outlets, and data connections are often a source of frustration for passengers waiting for their flights.
making better use of limited space and resources
At the airport, the occupation of spaces and flows of passengers are influenced by multiple and highly unpredictable flight timetables. Any given space may be occupied heavily at one moment and empty the next. Yet the distribution of environmental resources to these spaces remain constant.

new programmatic considerations
Travelers are engaging in new types and combinations of activities, and this will require the spaces they occupy to be more flexible to lots of different activities occurring simultaneously. Some interesting juxtapositions one might find in an airport might include online banking and shopping while eating and working while having a beer.

private work in public space
In the overwhelming amount of time spent in the airport, more travelers are choosing to do their proverbial dirty laundry in the airport. A typical gate area might look like this: angry passengers conversing over a cellphone while lovers are having a quarrel next to the tired traveler eager to get some rest beside the lawyer working on some confidential paperwork. Programmatic boundaries are unstable and unpredictable.

information distribution
Centralized announcement systems are a thing of the past. Networked technologies are allowing critical information like boarding time, gate area, and row announcements to be distributed in real time to individual nodes.
making better use of limited resources
Functional boundaries are delineated by the existing structural grid. This division of program is not flexible and does not take into account the needs of passengers or the way they spend their downtime.

**partial program diagram of hartsfield international terminal E**

**proposed program concept: do anything anywhere**

Activities and their boundaries are redistributed at a smaller scale. New activities and new associations between programs begin to form.

**new programmatic considerations**
private work in public space
access to information
The airPortal operating system tracks user locations and travel preferences in order to connect them with their immediate space and other people. It consists of three elements:

**software**
keeps track of user preferences

**personal equipment**
connects travelers with their space and other people.

**surfaces and spaces**
establish an emotional connection to the traveler
AirPortal software on the internet, on mobile devices, and in information kiosks located throughout the space provide travel services like ticket purchasing, boarding information and mapping. Users can personalize their travel experience by inputting their special needs and preferences for certain types of spaces and surfaces. Similar to instant messenger software, airPortal keeps track of your colleagues, friends, and family, or finds those with similar interests in the airport.
webgod: YO SAM! I didn’t know you were leaving the country today!
SAMBAM: that’s right! I gotta restock on my supply in the Netherlands.
webgod: 😮 WHEN IS YOUR FLIGHT?
SAMBAM: lemme check.....airPortal says i should be departing in 40 minutes.
webgod: LET’S GET TOGETHER DUDE! airPORTAL show you at GATE e19 – is that right?
SAMBAM: OK right, but i don’t really know where my flight is departing yet.
webgod: why don’t we go to that cool new bar at d12?
SAMBAM: there’s a better one right here.. the one at d12 isn’t so hot. 😞
webgod: ok man. cya in abit.
An integrated transponder device and pager in the form of a wristwatch is distributed at check-in. Besides displaying critical information like boarding gate and time, AP messenger also interacts with sensors located throughout the airport in order to determine if your colleagues are nearby. This apparatus also activates smart surfaces to present personal information or make better use of environmental systems.
Existing radio frequency (RF) technologies are capable of tracking the presence and position of a large number of individual nodes distributed within an area. The RF tags emit a periodic beacon signal that is read by readers positioned throughout the facility, enabling a database to track within a 10-foot area, any tag’s location.
AirPortal surfaces are embedded with sensing equipment that actively control lighting and temperature, and passive material qualities for acoustic comfort. The idea is that AirPortal is responsive to both individuals and groups. AirPortal assesses the flows of groups and areas of concentrated activity to intelligently distribute mechanical resources like heating, air-conditioning and lighting where they are needed. When AirPortal finds a particular area of unused space, it decreases the flow of conditioned air and lighting, and concentrates the building systems in the spaces that are more heavily used.
This plan view shows a typical arrangement of seats at an existing departure gate. In the interests of economy and maximum spatial utilization, airlines have repeated and modified this organizational pattern along the length of the passenger concourses. The implementation of such non-specific schemes shows a disregard for the variety of activities in which people engage while waiting for their flights. In order to eat, sleep, or do work, passengers have to set up ad-hoc and uncomfortable configurations of their personal carry-on items.
spatial configuration
mechanical systems area
arrivals corridor
openings for natural lighting
airPortal surface system
departures lounge
move

programmatic explorations in the underground transit mall
airPortal OS accommodates a range of multiple and simultaneous activities
scenarios
Neil has a lot of work to do.

**DELTA flight 38**
- Departs ATL **17:35** (GMT - 05:00)
- Arrives AMS **08:15** (GMT + 01:00)

Neil, a design manager in a marketing firm, is scheduled to present a new ad campaign to clients in Amsterdam tomorrow morning. Neil uses **airPortal** as an extension of the mobile technologies he already uses in order to confirm his flight, navigate through the airport's working spaces, and maximize his productivity.
jetLag
Sam and Elizabeth are on holiday from London to Buenos Aires. They have a six hour layover in Atlanta and want nothing more than to get some rest. AirPortal helps them find their connecting flight and provides a more personalized and comfortable environment for them to relax.
encounters
AirPortal electronically notifies passengers when and where they board their flights based on their proximity to the gate area and row assignment.

**queue**

- **T-30-60 MINUTES** plane arrives at dynamically assigned gate
- **T-10-15 MINUTES** general boarding preparations
- **T-0** boarding announcement
supporting flows of people and information
transforming underutilized spaces

travelers can invent their own spaces with reconfigurable furniture located throughout the airport.
CONCLUSIONS

The airport is one of the most interesting public spaces in modern culture. Reaching a broad audience, it is a place where people of different cultures, ethnicities, backgrounds, and income levels that would normally never have exposure to one another gather and interact for a limited duration. At the same time, however, the airport is under heavier surveillance than most other forms of American public space. Security and human safety have always been primary concerns for airport design, and the scripted procedures and protocols for the flow of people from ticketing to gate areas reflect this attitude.

What opportunities for improving the travel experience exist within this ordered preflight schedule? Does the airport as a building type need complete reorganization? Instead of designing an entirely new airport structure, I decided instead to work with an existing airport to find the possibilities inherent in a project of a more limited scope.

The next generation airport has a big job to do. It needs to deal with multiple and simultaneous itineraries of an unprecedented variety and find ways to allow people to negotiate the use of public space for private and personal activities. In order for a project like this to really work, details need to be examined at a human scale and take into account very specific travel needs. The technologies and materials chosen for intervention must be robust and feel natural to use. Functional, emotional, and tactile qualities must take precedence over any attempt to conceptualize the airport as merely a space of movement.
FOR FURTHER REFERENCE


"Pilots will see it all." Popular Mechanics October 1999.

RELATED STUDIO WORK

Domestic MultiTasking. Samuel Hoang and Kenneth Namkung. MIT Emergent Design Studio, Spring 2000: Peter Testa