Tomorrow's Airport Today

A Holistic Approach to Modern Terminal Design

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract Modern airport terminal design approaches the needs of passengers on a primarily logistical level. Over time, genuine interest in passenger comfort and satisfaction has become diluted in the face of an increasingly efficiency and money-driven aviation industry. The airport experience has been reduced to getting in and out of the terminal as quickly as possible, simply because there is little incentive to slow down or even go in the first place. Uninspiring interior designs, crumbling infrastructure, claustrophobic spaces, security hassles, and a lack of access to food, shops, services, and entertainment are just a few of the issues that must be dealt with in order to restore a certain level of appeal and comfort.

This thesis suggests that a more sensitive and responsive approach to airport design can change an ingrained mentality that characterizes airports as places to be dreaded rather than be inspired by. Over time, stress has become an inherent part of travelling, due largely to incremental increases in security checks and measures. This is an unfortunate by-product of the era we live in and is not likely be changed entirely, as public safety must remain a paramount goal in any airport design. At the same time, architects must feel compelled to design in a way that reduces passenger stress at every point along their terminal experience. Only then can passengers feel free to truly take in the architecture of their surroundings -- an architecture that should aim to satisfy functional and efficiency-related standards, as well as symbolize gateways to new places and embody the essence of flight.

The design of tomorrow's airport must anticipate and respond holistically to passenger needs, on both a practical and an aesthetic level, so as to create an experience that manifests in quality rather than quantity. The degree of that response at various airports around the world is what this thesis measures, deconstructs, and reimagines as a foundation for the final design proposal.

Acknowledgements

First and foremost, I would like to thank my supervisor Professor Terri Meyer Boake for her consistent guidance, support, and enthusiasm throughout this thesis endeavour. I would also like to express my heartfelt thanks and appreciation to my committee members, Professors Lloyd Hunt and Tammy Gaber, for their ideas, encouragement, and belief in me and my ambitions. Without them, this thesis could not have become what it is today, and for that, I will be forever grateful.

Dedication

To those who wish to change the world for the better and believe that human ambition is, and should remain, boundless.

To my loving parents and their unwavering support for wherever my life journey takes me.

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Prologue

You're taking a trip today. As you step out of the car and onto the narrow curbside, you bump into someone, sending both of your bags flying. At check-in, you can't see your airline counter over the masses of people standing around so you try to find a seat to gather your thoughts. Sadly, all are taken because there are so few. After finally getting your boarding pass, you move toward where you think the security area should be, only to discover that you've gone the wrong way. Standing in the right security line with the others, like a cow to the slaughter, your trepidation increases. After surviving an unnecessarily thorough patdown and almost leaving your passport on the x-ray belt, you look for clues to see where you need to go next. The only sign you spot is partially obscured by the burger symbol from the Burger King sign, so you take a few steps forward to get a closer look. The sign reads *GATE 15 - 32 ->* because of the burned-out LED's, but at least you know you're on the right track. As you move toward your gate, you trip over the edge of a floor tile that has been improperly laid, falling gracelessly to the floor. Your bruised knee and ego require a short rest, so you scurry to one of the waiting areas nearby. Sitting on the incredibly uncomfortable plastic seat, you stare up at the ceiling, cursing life itself. Not for long though, as the bright fluorescent T-bar ceiling lights seem powerful enough to blind your retinas. After 10 minutes of a stress-induced haze, you realize that you don't have much time left to get to your gate. In a panic, you start speed walking down the concourse and get on one of those helpful moving walkways -- helpful if it were moving, that is. Now in a state of full-fledged anxiety, you run the last 100 metres to your gate. Through one of the few windows, you happily note that your plane is still there. As the boarding agent scans your documents, you jokingly recount what a nightmare it was to get there. She then proceeds to tell you that they announced a gate change a few minutes ago over the antiquated PA system that you clearly didn't hear. In other words, she says apologetically, you're at the wrong gate and your plane has already left.

We choose to go to the moon in this decade and do the other things,

not because they are easy, ***but because they are hard,***

because that goal will serve to organize and measure the best of our energies and skills,

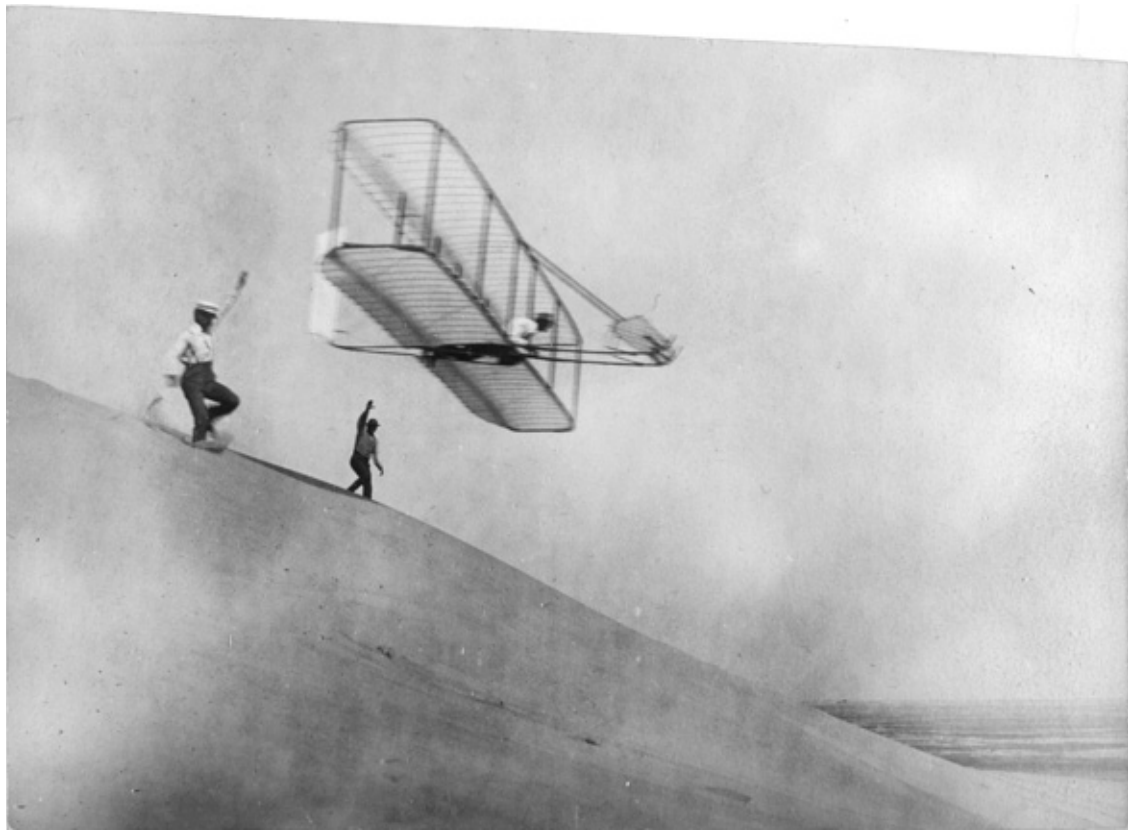
because that challenge is one that we are willing to accept,

one we are unwilling to postpone,

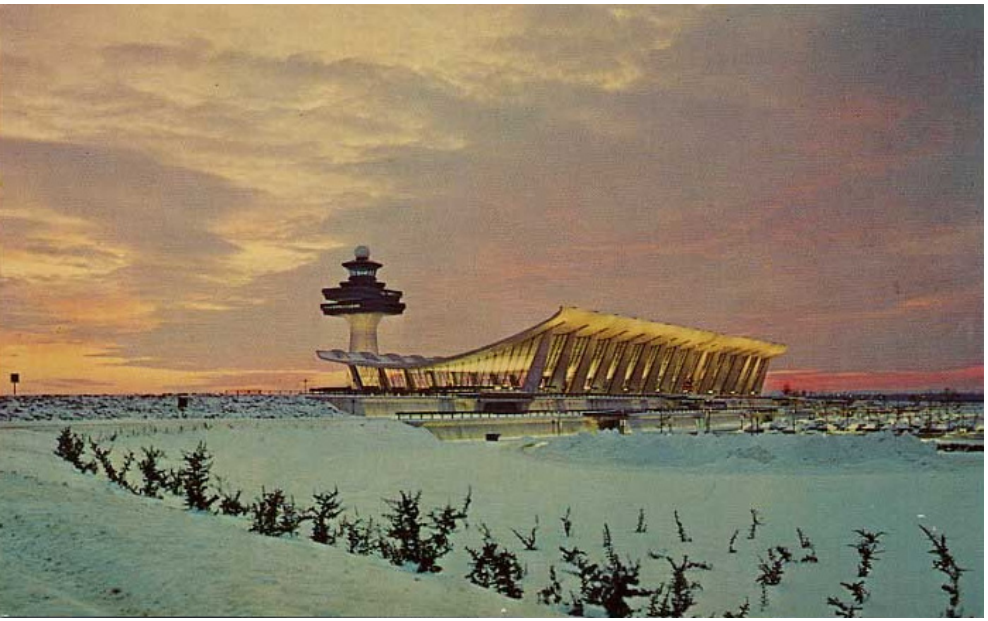
and one which we intend to win.[1]

~ John F. Kennedy

Speech at Rice Stadium (Sept. 12, 1962)



[0.1] *The Wright Flyer takes off at Kitty Hawk for the first time in 1903.*



[1.1] *Postcard of Washington Dulles Airport, c. 1960.*

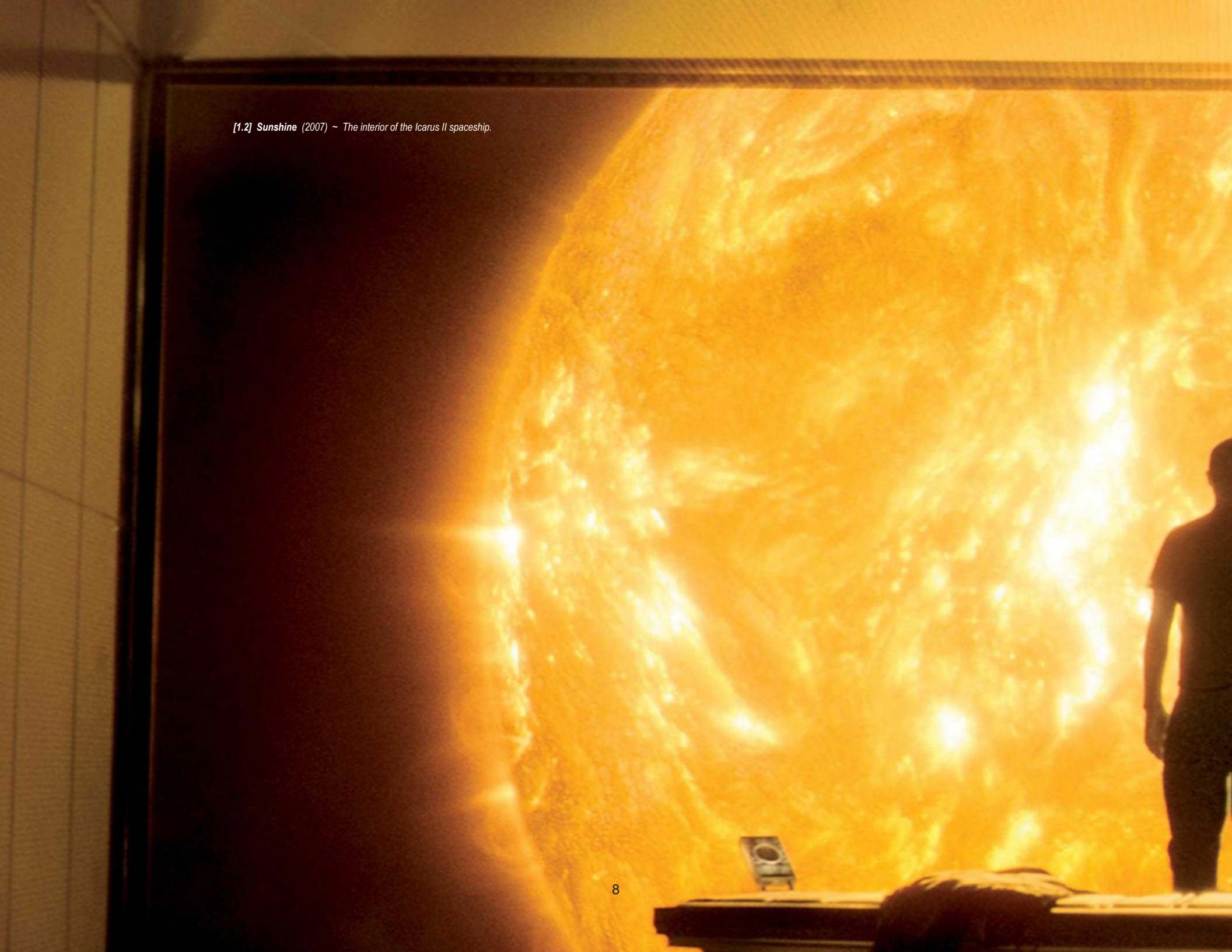
Preface

There used to be a time, not so long ago, when flying was still a novel idea, when the nature of its magnitude could simply not be ignored. The chance to fly wasn't something one took lightly, nor was it something one took for granted. There used to be a time when all people looked in awe as airplanes took off. It was an admiration that extended far beyond mere appreciation for the extraordinary physical and scientific advances that had been made. It was rather a powerful reminder of not only how far we had come, but of how far we had yet to go.

In the same way that the Industrial Revolution sparked dramatic changes in how people lived their lives, and what they believed to be the extents of their abilities, the move toward air travel engendered a renewed sense of ambition, drive, and determination to discover the things and places that had, until then, remained out of reach. The airplane came to symbolize unbounded human potential -- a potential for which the airport became a springboard.

Architects, from the early days of their involvement, have always tried to depict airports as symbolic gateways to new worlds. They've drawn parallels between the passenger terminal and the train station, correlating the two in a way that extends beyond just physical resemblance and logistical purpose, in an effort to convey the notion that the architecture of travel and human identity are intrinsically linked.

What do train stations, bus terminals, seaports, and airports all have in common aside from the role they play in transporting masses of people to and from destinations? They are the last places one sees before he or she sees someplace new. And, the significance of that cannot be lost on the architect.



[1.2] Sunshine *(2007) ~ The interior of the Icarus II spaceship.*

I. A Brief History of Flight

400 BC

The Kite

Pegasus

The Pigeon

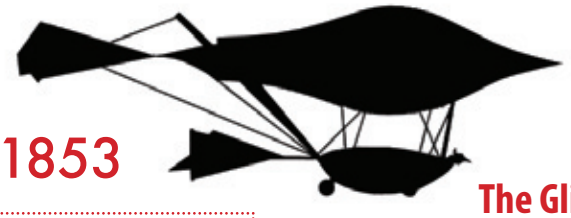
The Ornithopter

1783

The Hot Air Balloon

1903

The Wright Flyer



1853

The Glider

The Dream

The Architecture

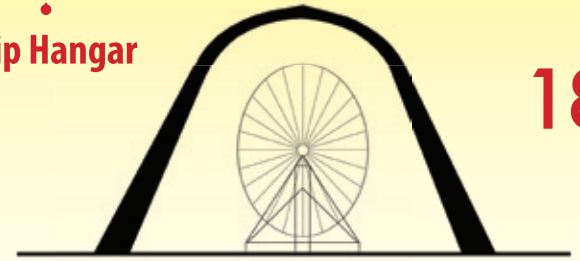
1500s

1600s

1700s

1800s

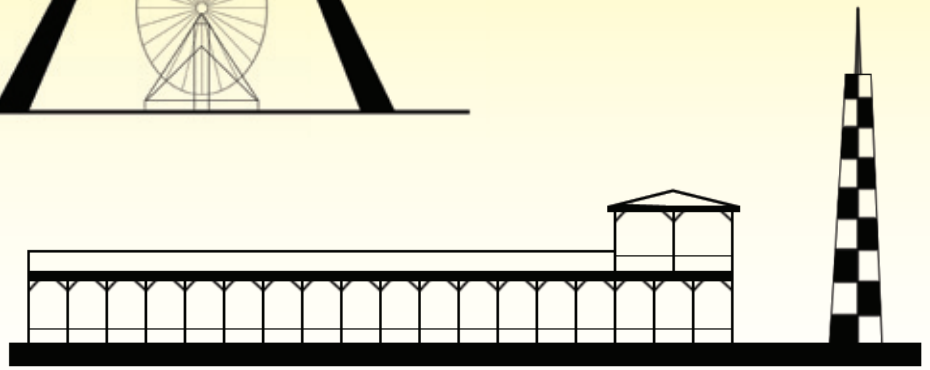
The Airship Hangar



1885

Feathers shall raise men even as they do birds, toward heaven; that is by letters written with their quills.[2]

~ Leonardo da Vinci



The Aerodrome

1909

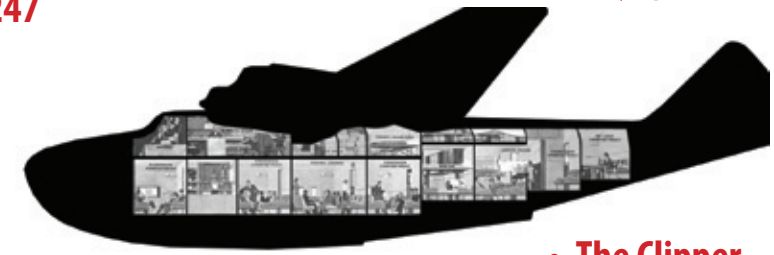
1969

The Concorde

1933

The Boeing 247

1952



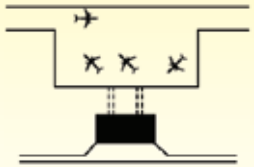
The Clipper

2009

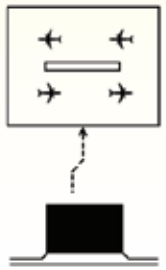
The Dreamliner

1920s 1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s

The Hangar



The Open Apron



The Transporter

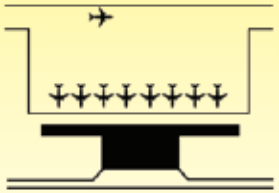
The Pier Finger

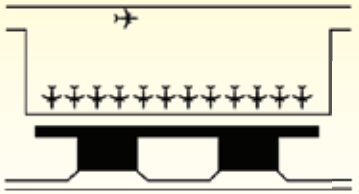
The Theme Building

1961

Pan Am Worldport

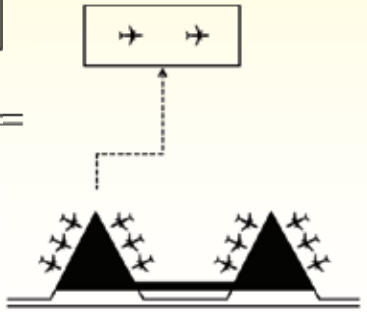
1960





The Linear Terminal

The Satellite



The Hybrid

[1.3] The Fall of Icarus ~
Peter Paul Rubens (1636)

[1.4] Bellerophon on Pegasus *~ Giovanni Battista Tiepolo (1747)*

[1.5] Kai Kaus Attempts to Fly to Heaven *(1588) ~ A scene from a manuscript of the Shahnamab.*

[1.6] *A miniature showing Alexander the Great being carried aloft by griffins.*

Mythology

The urge to fly has been ingrained in our DNA from time immemorial. Depicted in mythology and legend -- in fact and in fiction -- the aspiration remains strong in times of peace, as well is in times of war. We wish to fly in order to push beyond our perceived boundaries and limitations, to see and understand our world with fresh eyes. We look to birds for inspiration and toward the skies for motivation, and we do this because the longing for something more is an unwavering and infallible aspect of the human condition.

We fly with whatever means we can. Icarus flew with wings made of wax.[3] Bellerophon flew on a winged horse named Pegasus.[4] The Persian King Kai Kaus flew with eagles strapped to his throne.[5] Alexander the Great flew with griffins (hybrid lion-eagle creatures) chained to his chariot.[6] The notion of taming flying animals in order to take advantage of their innate abilities is a recurring theme in mythology. It is only when the physics of this impossibility are made apparent that man begins to shift his focus toward emulating those attributes that make flying a reality.

A different theme, with more ominous consequences, reveals itself in the myths of Icarus and Phaëton. Hubris, or arrogance, oftentimes leads to failure. This failure results from a lack of understanding of the mechanisms at work in any given situation and is a direct by-product of impatience and greed. Ambition does not equate to ignorant determination just as hope and wishful thinking does not equate to dogmatic certainty. Man, through a process of trial and error, will succeed and fail innumerable times in his attempts to master air travel. And when he does, it will come as a result of lessons learned throughout his roughly two millennia of trying.

Flying Machines

Sometime around the year 400 BC, a Greek mathematician, astronomer, and philosopher, fittingly named Archytas, designed and built a bird-like, steam-powered mechanism that is said to have flown roughly 200 metres during one particular round of testing. The wooden contraption, known as the *Pigeon*, mystified the citizens of his town of Tarentum, who until then had yet to witness anything even remotely akin to a man-made object in flight. In writing of the event, the Roman author Aulus Gellius described Archytas' *Pigeon* as seemingly having been powered by some "concealed aura or spirit",[7] for no other explanation could have been feasible given the limited amount of scientific knowledge held at the time. To give even further context to this ahead-of-its-time innovation, the action-reaction principle demonstrated by the flying wooden bird was not officially recognized into scientific law until the 17th century.[8]

The kite, invented in China around roughly the same time, used the lighter-than-air approach to flying and became a precursor for the hot air balloon. One possible theory on its genesis is described in the legend of a man who ties a string to his hat to keep it from blowing away in strong winds. While children delighted in playing with kites, they also served as tools for measuring distances and advertising messages to the community.[9] The kite, like the airport, was borne of necessity and quickly adapted functions that were both utilitarian and playful.

The *Pigeon* flew but, being heavier than air and having no ability to manipulate its trajectory, could not sustain that flight. The kite flew but, being lighter than air and having no propelling motion to generate speed and direction, could not do so without leaving itself at the mercy of the elements. And, more importantly, man could fly on neither. Though the principles demonstrated certainly advanced the science behind flight, many years would pass before man truly mastered it.

[1.7] *An unknown artist's rendering of Archytas' steam-powered 'Pigeon' in flight.*

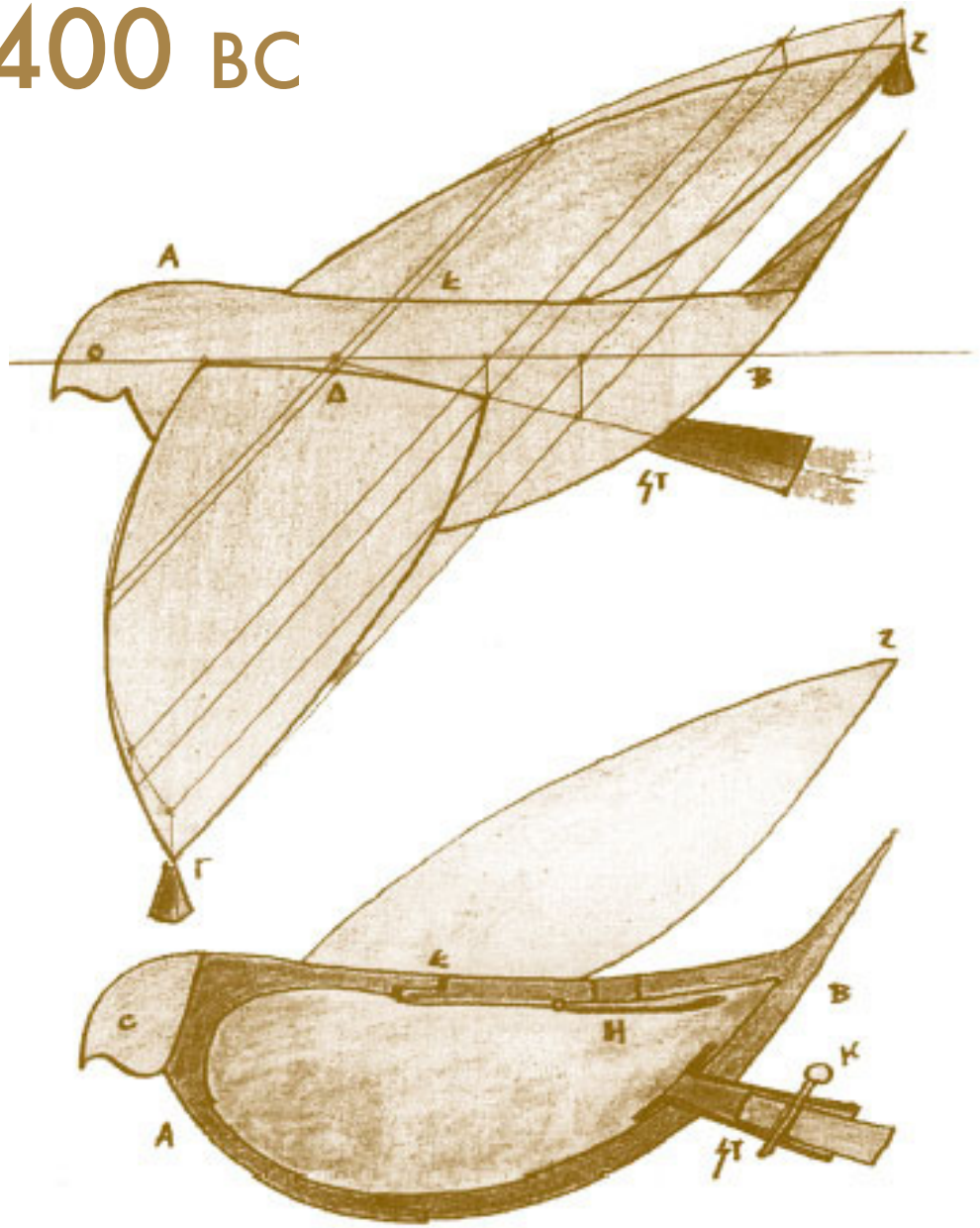
[1.8] Kite Flying at Hae-Kwan *(1847) ~ An engraving by Thomas Allom.*

c 400 BC

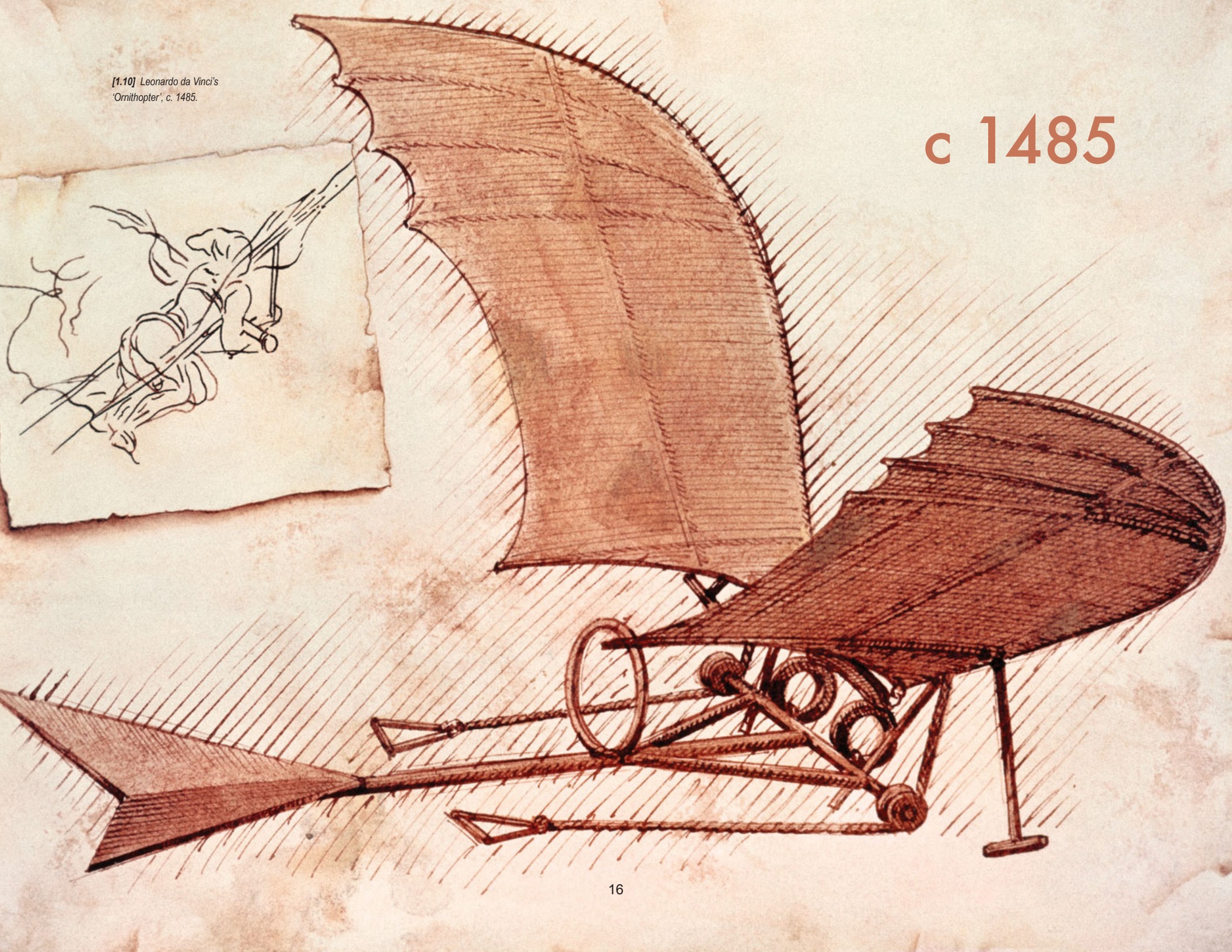
(n.) ***a·vi·a·tion***

the design, development, production, operation, or use of aircraft, esp. heavier-than-air aircraft[10]

derived from the Latin "avis", meaning ***bird***[11]



[1.9] *Archytas' sketches of his 'Pigeon' flying machine, c. 400 BC.*



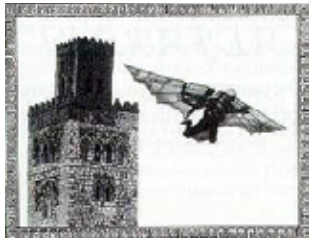
[1.10] *Leonardo da Vinci's 'Ornithopter', c. 1485.*

c 1485

[1.11] *Stained glass window in Malmesbury Abbey showing Eilmer 'the flying monk', c. 14th century.*

Flying Men

Human flight, in any form, did not become a real possibility until the 9th century, when the Arabian polymath Abbas Ibn Firnas is said to have made a briefly successful attempt by means of a rudimentary glider.[12] Though hurt as a result of a poor landing, Ibn Firnas had proven that, in observing the nuances of the natural world and the flying creatures that inhabit it, humans could find ways to imitate and substitute for the physical abilities they inherently lack.



[1.12] *An unknown artist's impression of Ibn Firnas in flight, c. 875.*

Although unconfirmed, some sources suggest that Ibn Firnas' glider flight inspired the Benedictine monk Eilmer of Malmesbury to follow suit with his own attempt a century and some later, circa 1010.[13] In 1125, an account of the event was recorded in the work of the historian William of Malmesbury, of which he wrote the following:

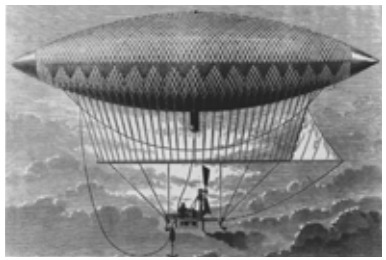
> *He had by some means, I scarcely know what, fastened wings to his hands and feet so that, mistaking fable for truth, he might fly like Daedalus, and, collecting the breeze upon the summit of a tower, flew for more than a furlong [201 metres].*[14]

What the two visionaries had failed to realize was that it would take more than simply strapping immovable wings to their bodies, and then jumping, in order to fly successfully. Leonardo da Vinci, in designing his *Ornithopter*, had made sure to create a system of not just membranous wings, but levers, pedals, and pulleys as well.[15] He understood the basics of aerodynamics, despite his knowledge being far ahead of its time, and proposed a machine that could be controlled by man almost as effortlessly as it takes for birds to fly. It became clear that despite the fact that man could never physically fly himself, he could design and build machines that could do the flying for him.

Airships

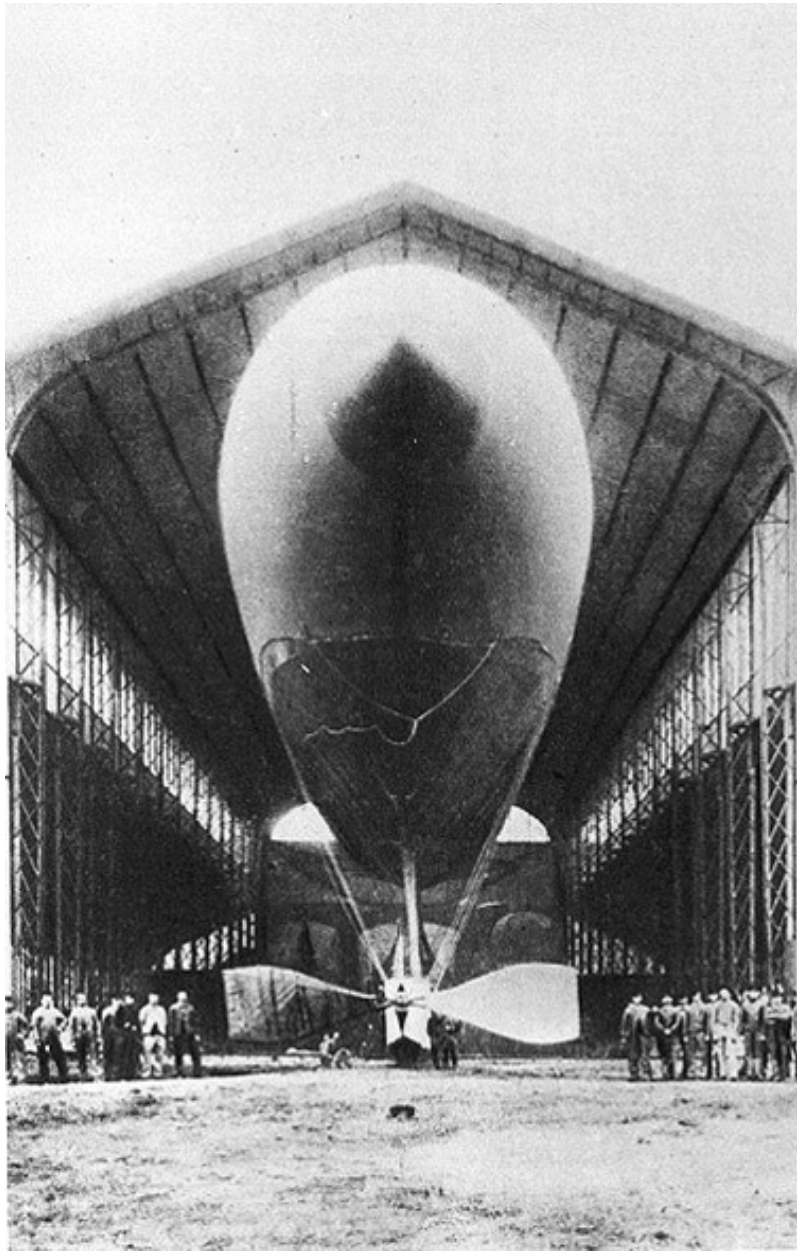
In 1783, the Mongolfier brothers of France successfully launched a hot air balloon in front of a large and enthusiastic crowd in the town of Annonay.[16] The purpose of the unmanned demonstration was simply to prove and establish the brothers as the creators of this first-of-its-kind invention. Later that same year, one of the brothers, Etienne, officially became the first human in recorded history to lift off of the earth in a hot air balloon.

Almost 70 years later, in 1852, Henry Giffard flew the first powered, controlled, and sustained lighter-than-air craft. Giffard succeeded in flying it a distance of 27 kilometres with the use of steam power and steerability mechanisms.[17] This dirigible balloon was an entirely new and promising innovation in the relatively short history of human flight up to that point and led to the design of the modern-day 'airship', or blimp.



[1.13] *The first flight of Henri Giffard's steam-powered 'airship', c. 1852.*

The French Army developed the first electric-powered, fully controllable airship in the late 19th century. The airship could fly a distance of 8 kilometres in 23 minutes and became the first aircraft to perform 'round-trip' flights, which it succeeded in doing on 5 separate occasions between the years 1884 and 1885.[18] What makes the story of the La France airship, as it was known, especially unique for architects is the fact that it was the first aircraft of any kind to be constructed and housed in a hangar. It was indeed the first instance of architecture playing a significant role in harbouring flying machines, as well as the humans that fly on them.



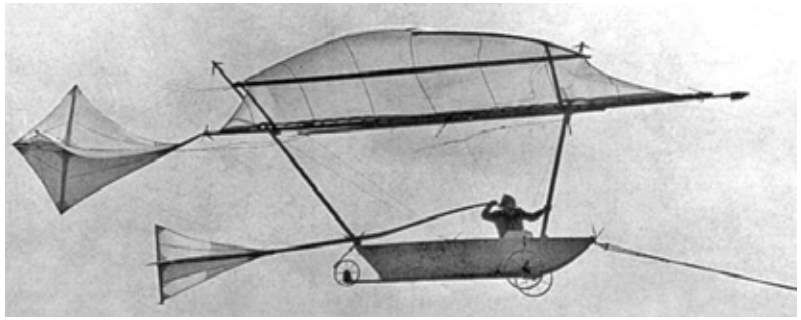
[1.14] *La France airship shown docked in its hangar bay, 1885.*

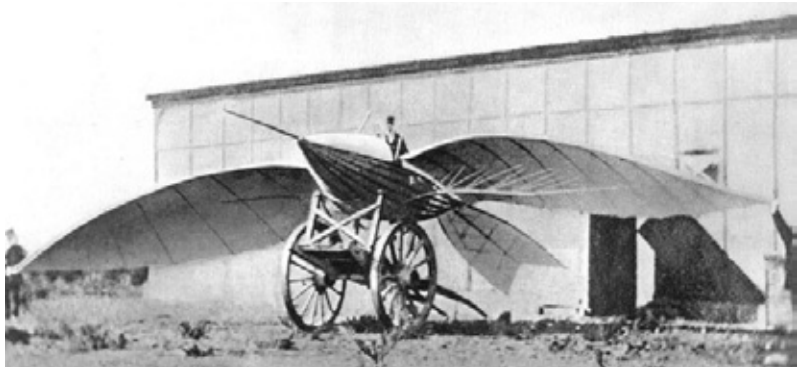
[1.15] First Test Flight with an Aerostat at Annonay, 1783 *(c. 1890 - 1900) ~ Romanet & cie.*

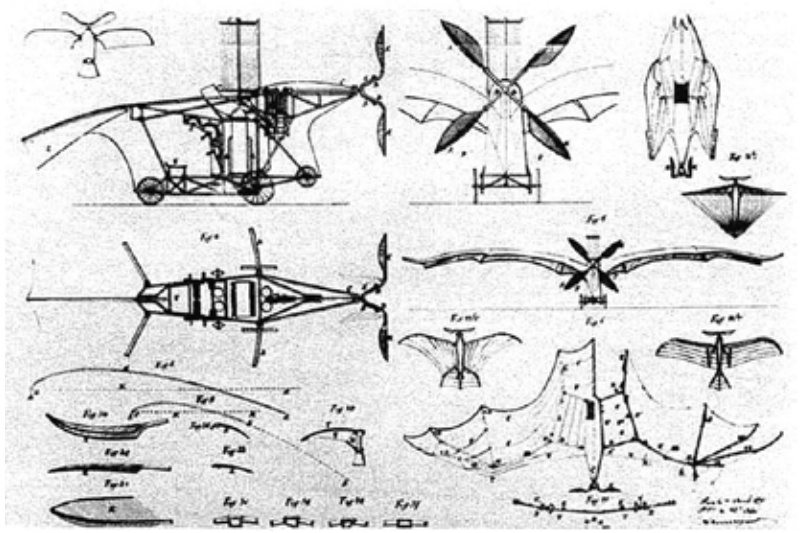
[1.16] *Lilienthal prior to take off with his 'small wing flapping apparatus', 1894.*

1891

[1.17] *Replica of Cayley's 'governable parachute' being flown by Derek Piggot, 1973.*



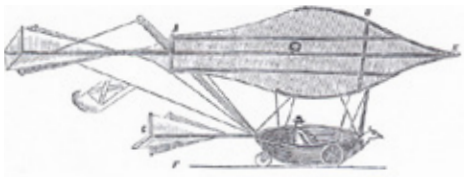




[1.18] *Jean-Marie Le Bris and his flying machine, Albatros II, 1868.*
[1.19] *Sketches of Clément Ader's 'Eole' glider, 1890.*

Gliders

Despite having successfully flown lighter-than-air balloons and blimps, it wasn't until the 18th century that inventors and engineers began to explore the potential benefits of a heavier-than-air approach to flight. One such inventor, by the name of Sir George Cayley, proposed the design of a fixed-wing aircraft that could be operated via systems of lift, propulsion, and control. This made feasible the idea that in addition to flying a machine in a controlled manner, one could fly it much faster and farther than ever before. One of his very first designs, which he called the *Governable Parachute*,[19] was essentially a rudimentary version of the modern airplane in its appearance and mastery of aerodynamic forces.



[1.20] *A sketch of Sir George Cayley's 'governable parachute', 1852.*

A few years after Cayley's prototype, the Frenchman Jean-Marie Le Bris accomplished a first for heavier-than-air flying machines: he flew higher than the level of his departure.[20] Reportedly, Le Bris reached a height of 100 metres on his glider, aptly named the *Artificial Albatross* for its bird-like characteristics.

The first steam-powered aircraft came in the form of Clement Ader's *Eole* glider in 1890.[21] Its 50-metre flight near Paris is considered to be one of the first examples of a 'long-distance' self-propelled, or mechanically induced, flight in history. The *Eole*'s almost bat-like shape is yet another instance of inspiration being drawn from the attributes of flying animals, a theme that exists in aviation even today.

One of the most determined pioneers of glider flight was Otto Lilienthal who, throughout his career, made over 2,000 glider flights in all, translating into roughly 5 hours of total flying time.[22] Ironically, he died in a gliding crash in 1896.

The First Airplane

The very first fully controlled, sustained, and powered heavier-than-air flight was made in 1903 at Kitty Hawk by Orville Wright, one of the two now infamous Wright brothers.[23] Pictured here, the *Wright Flyer* flew a distance of 37 metres in 12 seconds and was witnessed by a number of local bystanders, making it one of the first public and well-documented airplane flights in history. Shortly thereafter, Orville's brother Wilbur managed to fly the aircraft a distance of 260 metres in approximately 1 minute, shattering his brother's newly-established record.

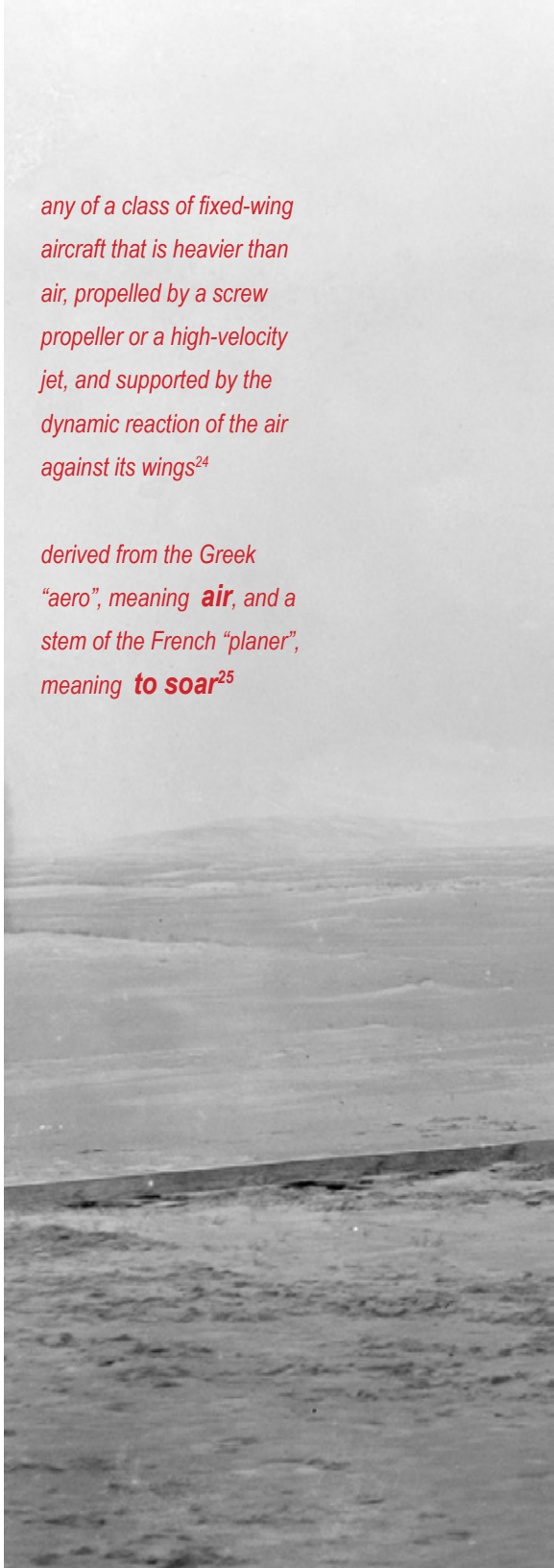
There used to be a time when staring at the sky was our only option. We lived our lives entirely aware of the fact that no matter how much we may have wanted to know, see, and do more, we remained rooted to the Earth both physically and psychologically. Held captive, in a sense, by the limited extent of our knowledge, we lowered our expectations and lived our lives in the ways we knew best.

However, in 1903, the fantasy of human flight suddenly became a very tangible reality. The Wright brothers opened the door to new and exciting possibilities in human aviation and made the notion of routine air travel by the masses seem like a real possibility. The world started to change. Cities started to thrive. Industrialization started to boom. People began realizing that they could achieve things as individuals that their ancestors could only have dreamed of. The airplane had arrived, and with it came our ticket to the sky.

(n.) ***air·plane***

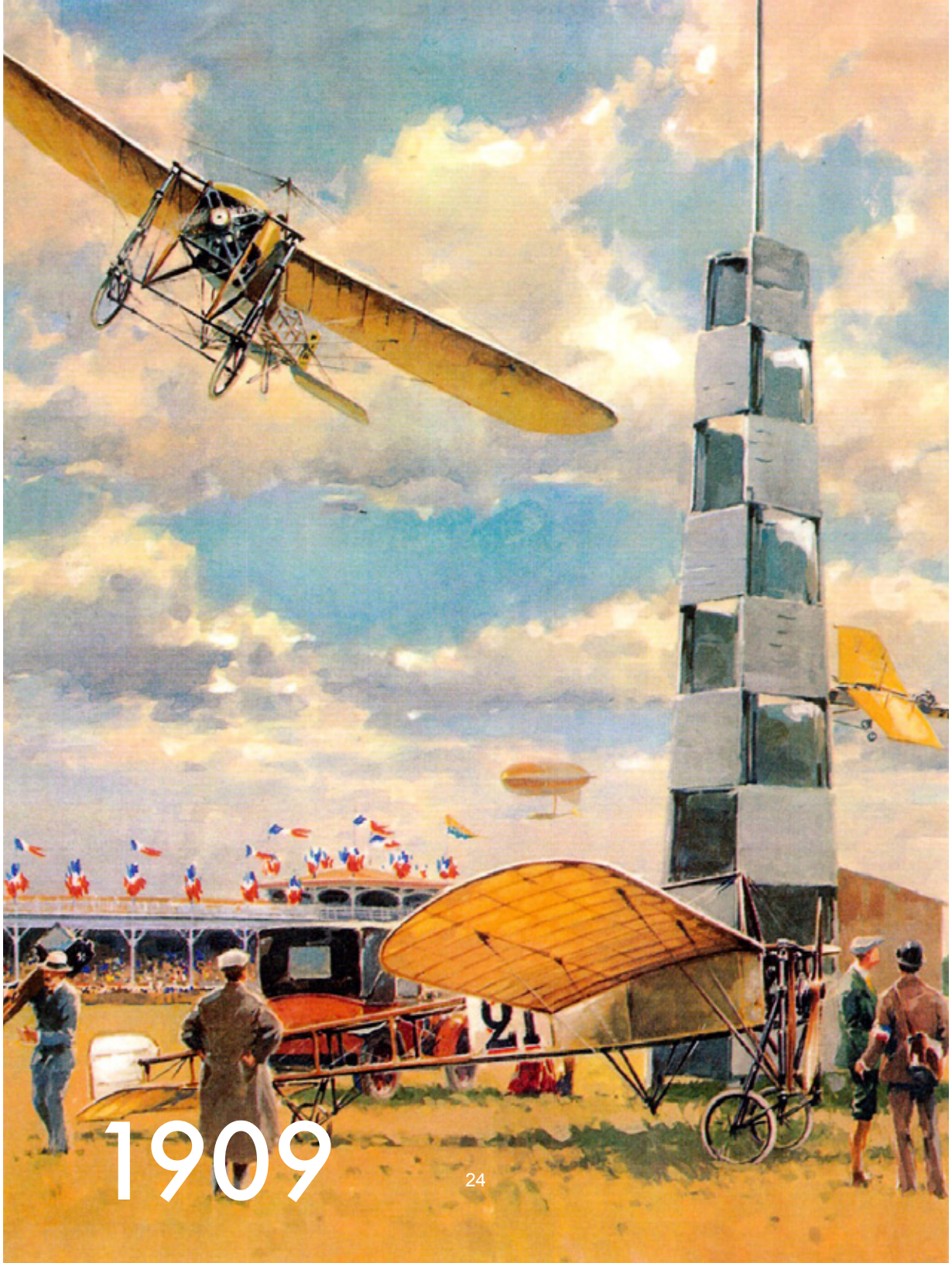
any of a class of fixed-wing aircraft that is heavier than air, propelled by a screw propeller or a high-velocity jet, and supported by the dynamic reaction of the air against its wings[24]

derived from the Greek "aero", meaning ***air****, and a stem of the French "planer", meaning* ***to soar***[25]



[1.21] *The Wright Flyer at Kitty Hawk, 1903.*


1903



[1.22] *A painting showing the reference tower and observation building at the Reims Airfield, 1909.*

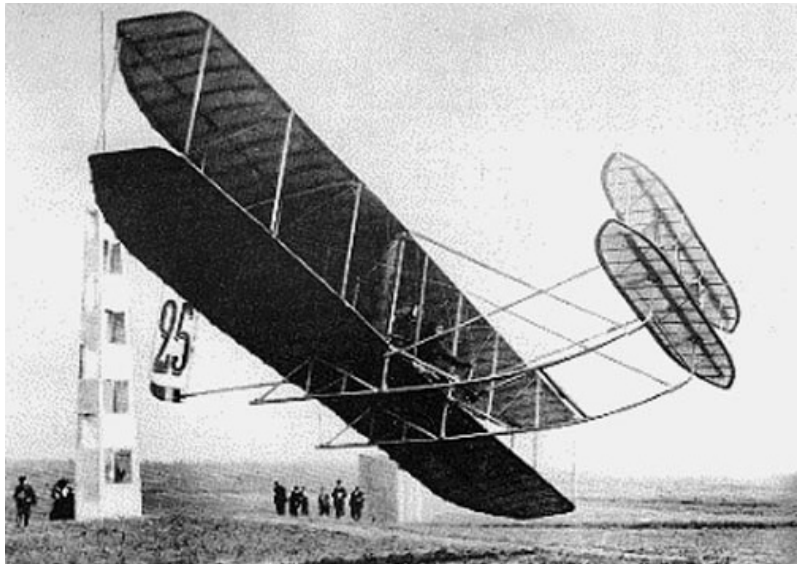
1909

(n.) ***aer·o·drome***

an airfield equipped with control tower and hangars as well as accommodations for passengers and cargo[26]

derived from the Greek "aero", meaning ***air****, and "dromos", meaning* ***course***[27]

[1.23] *Eugène Lefebvre performing an aerial stunt at the Reims Aerodrome, 1909.*



[1.24] *A view of the interior of the observation building showing passengers dining and watching the airshow.*
[1.25] *The observation building was one of the first instances of architecture playing a role alongside airplanes, 1909.*

The Aerodrome

The most obvious precursor to the airport is the aerodrome, a grassy field that airplanes used for landing and taking-off during air shows, particularly those that were held in the early 20th century. The initial architecture of the aerodrome generally only consisted of an observation building,[28] which served to shelter the audience and provide unobstructed views out onto the airfield. They occasionally also included space for hangars, restaurants, and secondary observation decks -- programs that have evolved and been incorporated into many of today's airports.

One of the earliest aerodromes in history was built in Reims, France, a few years after the turn of the century.[29] The Reims Air Meet that took place there in 1909 brought together the world's leading aviators to compete for various prestigious titles including best flights of distance, altitude, and speed. The aerodrome not only created a space for public entertainment in the form of plane watching, but also became a venue for displaying the rapid advancements that were being made in airplane design at that time.

[1.26] ***Grande Semaine d'Aviation*** *~ Ernest Montaut (1909)*

Though initially designed solely to promote air shows and flight training, it wasn't long before a military application for the aerodrome was conceived. However, its circular layout, along with the idea of the aerodrome itself, quickly became obsolete with the introduction of much more efficient L-shaped fields.[30]

Military Airfields

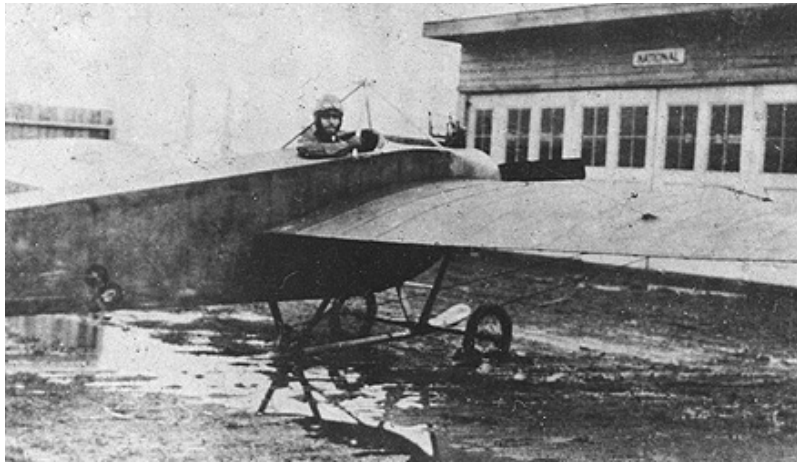
In his book *The Art of War*, Sun Tzu writes, "The treacherous and underhand nature of war necessitates the use of guile and stratagem suited to the occasion."[31] In other words, war necessitates ingenuity and innovation, and requires always being a step ahead of one's opponent so as to capitalize on the very crucial element of surprise.

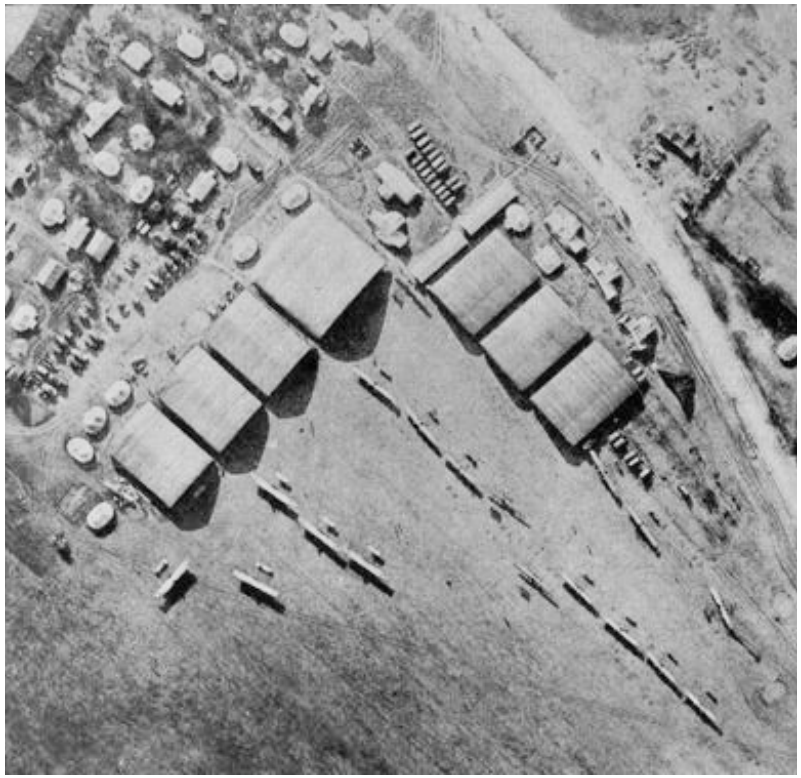
[1.27] *Planes flying over Serny Airfield.*

How does this relate to the history of the airport? It does so simply in that the military airfield is what existed between the aerodrome and the airport itself. One of the biggest motivators for technological advancement often seems to be based on the premise of strengthening national or regional security. It should then come as no surprise that what was once solely a venue for air shows, quickly transformed into a launching pad for weaponized aircraft during WWI.

The military airfield, as an extension of the early 19th century aerodrome, made provisions for large grassy landing areas and a number of makeshift airplane hangars. The hangars were generally fairly rudimentary tent-like structures due to the temporary nature of the bases. However, with more and more permanent military bases being built, as well as a shift toward commercial aviation, architecture would slowly begin to play a larger role in hangar design, and eventually terminal design.[28] A new emphasis on the passenger experience would soon become the catalyst for more interesting and sensitive spatial responses in airport architecture.

[1.28] *A photograph of a Morane 'Parasol' Monoplane at Cicero Airfield, with its hangar shown in the background.*





[1.29] *An aerial view of the French Aviation camp near Verdun, during World War I, 1916.*

[1.30] *A photograph of a German World War I campement, showing military airplanes and temporary hangars, 1918.*

1920

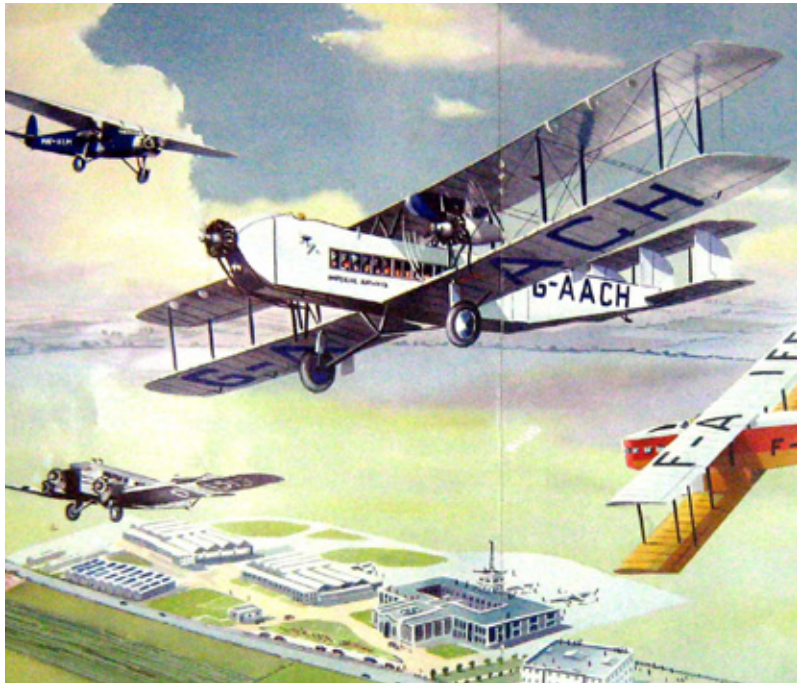
(n.) ***air·port***

a facility for the landing, takeoff, shelter, supply, and repair of aircraft, esp. one used for transporting passengers and cargo at regularly scheduled times[32]

derived from the Greek "aero", meaning ***air****, and the Latin "porta", meaning* ***gate***[33]

[1.31] Night Mail to Paris
~ Michael Turner (2005)

[1.32] Arrivals and departures at Croydon Airport as depicted in The Graphic newspaper, 1930.



[1.33] An aerial view of Croydon Airport, 1936.

The First Airport

Croydon Airport, which became fully operational to the public shortly after the First World War,[34] was a direct precursor to the modern-day airport. Situated eleven miles south of London on a site that had previously been used by the Royal Air Force and the National Aircraft Factory, Croydon initially only operated flights to Paris, Amsterdam, and Rotterdam. In 1928, a new two-storey administration building was opened[28] and later came to be recognized as one of the world's first quasi-terminals. Shortly thereafter, the very first air traffic control tower was built on site.

Although open for commercial use, Croydon Airport still operated as a military base in times of need. This hybrid use, reflective of the unstable political circumstances of the time, was once again abandoned in September of 1939 upon the declaration of the Second World War. Croydon immediately closed to civil aviation and embraced its original function as a purely military air base. The end of WWII saw the gradual re-introduction of commercial applications for the airport.[34]

[1.34] A view of Croydon control tower and terminal building, 1959.

Apart from its purely functional aspects, Croydon also demonstrated a more aesthetically minded approach to airport design. Specifically, its main terminal building and control tower mimicked the layout and visual features of a traditional train station. This would become a common theme in many early airports and reflected a direct attempt on the designer's part to create familiar atmospheres for passengers in order to diminish the anxieties brought on by partaking in this fairly new form of transportation. The inclusion of an interior courtyard also made reference to existing typologies, likely for the same reasons.

The First Terminal

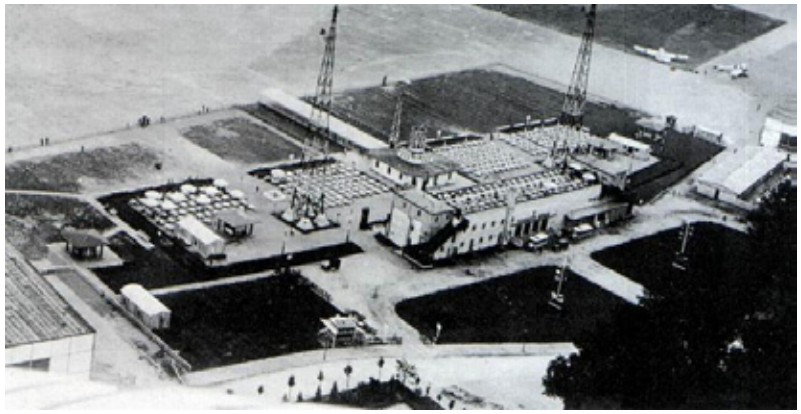
Berlin's Tempelhof Airport was built and opened in 1923 and originally consisted of a grass airfield, two hangars, and a small office structure. Setting a precedent for airports to come, a continuous paved surface, or 'apron', was built for airplane parking in front of the terminal.[28] Tempelhof was also the first airport to install lights on the building as well as the runway, allowing for night flying. The airport, in its original form, reached its maximum capacity only one year after being built, prompting the undertaking of massive upgrades.

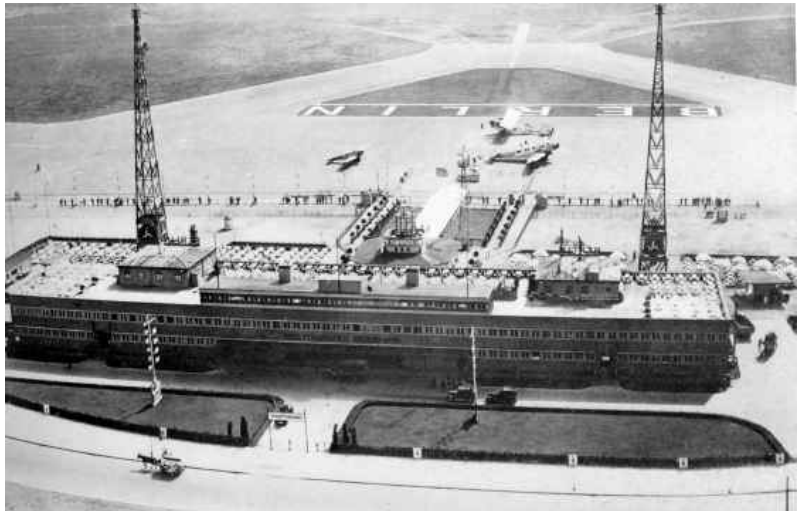
[1.35] *The first building on site was a small hut for construction workers, 1923.*

By 1928, five new hangars, a number of administration buildings, and a large three-storey terminal building had been built. The concrete apron was also increased in size and a lighthouse, with beacon lights to lead airplane traffic, was installed. The terminal remained unmodified and fully operational until the mid-1930's, at which point Hitler himself became involved in the design of its future master plan.

Albert Speer, a well-known architect at the time, was commissioned to design a 'World Airport' fit for a 'World Capital Germania'.[35] This meant embarking on an architectural undertaking of enormous complexity, the likes of which had never been seen before. Fully completed in 1941, the new Berlin Tempelhof Airport was massive in size and sported an inwardly curving terminal shape. Though still employing its initial open apron concept, the roof of the gates concourse cantilevered substantially, making boarding and loading possible in all weather conditions. Even today, the sheer size of Speer's Tempelhof makes it the second largest connected building on Earth, after the Pentagon.[36]

[1.36] *An early view of Tempelhof Airport, 1924.*





[1.37] *The new three-storey terminal building at Tempelhof upon completion, c. 1928.*

[1.38] *A model for the new Tempelhof, or 'World Airport', as envisioned by Hitler and his architect Albert Speer, 1933.*

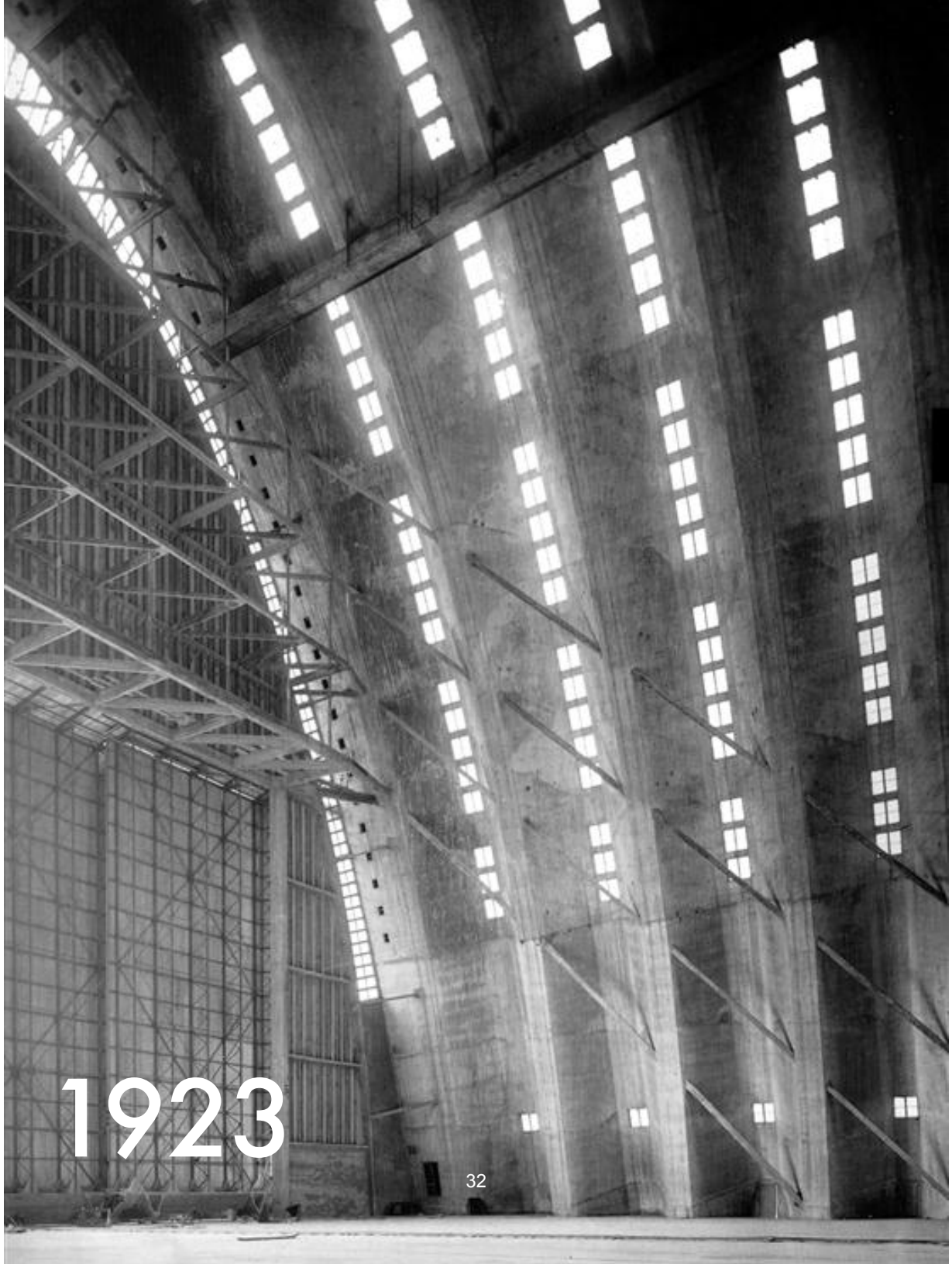
(n.) ***ter·mi·nal***

a building in an airport where passengers transfer from ground transportation to the facilities that allow them to board airplanes[37]

derived from the Latin "terminus", meaning ***a boundary*** *or* ***an end***[38]

1923

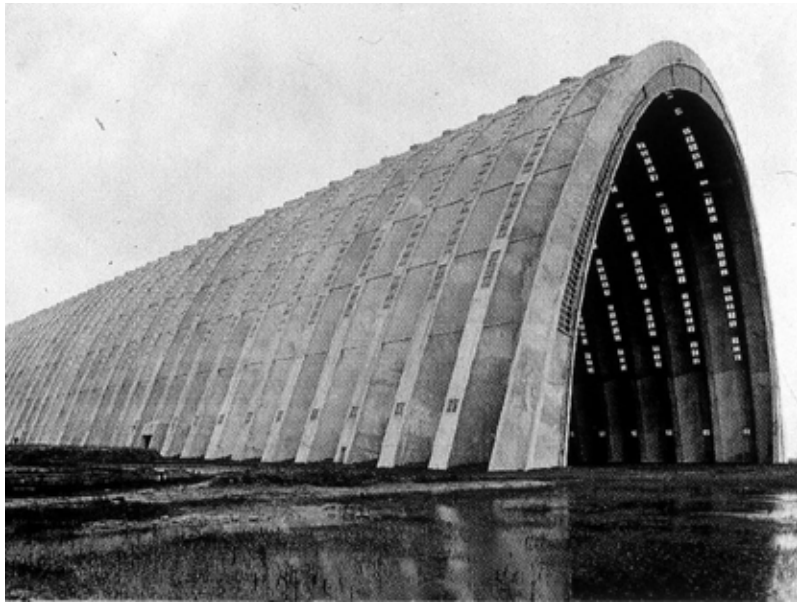
[1.39] *A view of the original Tempelhof airport building and it's 'open apron' design concept, c. 1923.*



1923

[1.40] An interior view of the Orly Aircraft Hangar, 1923.

*[1.41] **Orly Aircraft Hangar** ~ Eugene Freyssinet (1923)*



*[1.42] **Orvieto Aircraft Hangar** ~ Pier Luigi Nervi (1935)*

Aircraft Hangars

Modern airplane hangar design is based off of the early 19th century airship hangar typology, as well as post-WWI converted military-to-civilian hangar designs. Today, aircraft hangars at most airports are used for three purposes: to construct, maintain, and house commercial airliners. No longer central to one's airport experience, hangar architecture has generally become less important, and thus more generic.

The aircraft hangars of the 1920's were anything but generic. Freyssinet's Airship Hangar at Orly, built in 1923, was designed as a ribbed, parabolic shell made of reinforced concrete.[39] The sculptural qualities of the building, with its curved concrete form and multiple strip openings, were revolutionary not only in hangar design, but also in most building design at the time. The Aircraft Hangar at Orvieto, designed and built by Pier Luigi Nervi in 1935, showcased a beautifully intricate curved wooden roof structure that fluidly connected back into the ground.[40] This emphasis on a nuanced and interesting aesthetic was new when it came to airport design, and meant that concern for the passenger experience was starting to factor into the equation far more predominantly.

Although the era of the passenger terminal was just getting underway, designers were beginning to expand their understanding of what sorts of environments would best fulfil basic functional needs and also gesturally convey the metaphor of flight. A tendency toward spectacularization was starting to form, and with it came a broader understanding of the sheer complexity involved in designing for successful airport architecture.

Air Stations

The influence of the train station typology on modern airport terminal design cannot be overstated. As thrilling as the thought of flight may have been to many, the fear of embarking on such an entirely novel method of transportation could be enough to deter even the bravest from doing so. As was the case at Berlin's Tempelhof Airport, the architecture of the 1930's terminal building began to fulfil more than just a purely functional role -- it began to display an aesthetic that could easily be classified as familiar in the minds of most passengers.[41] Through an infusion of this familiarity into the formal and functional aspects of the terminal, architects were able to quell the lingering fears of potential travellers and create environments that allowed a sense of wonder to trump thoughts of worry.

The Pan American Airways Terminal Building in Miami succinctly showcased this concept. One of the first terminals in the United States, and indeed the world, to be built entirely for commercial purposes, it housed a restaurant and cocktail lounge, waiting rooms, an international mail room, customs and immigration counters, and public health offices.[42] A promenade located on the second floor allowed both passengers and visitors to view takeoffs and landings on the nearby airstrip. The intricate details on the walls, beams, and ceiling, as well as a three-and-a-half ton revolving globe in the centre of the check-in hall, attracted thousands of visitors each year. The notion of airport architecture as spectacle and as a place of destination in and of itself was clearly applied here, and quite deliberately. If not to try and convey the magnificence of flight, why else display murals depicting the history of it, or even da Vinci's designs for the mastering of it?

[1.43] Grand Central Station *~ Reed and Stem, Warren and Wetmore (1934)*

[1.44] *Passengers waiting on the tarmac, by train shed-like structures, at Le Bourget Airport, 1955.*

[1.45] *The check-in hall at the Pan American Terminal Building in Miami, Florida, c. 1940.*

1934

[1.46] *An article in Mechanix Illustrated magazine showing the proposal for a Land and Sea Plane Base, later renamed LaGuardia Airport, in New York Harbour, 1938.*

[1.47] The 'Landplane Base' at LaGuardia Airport. Integration with infrastructure is starting to be considered.
[1.48] A photograph of the 'Seaplane Base' at LaGuardia, 1940. Its form and aesthetic remains largely unchanged.

[1.49] A 'flying boat' or Clipper airplane docks by the boarding platform at LaGuardia's Seaplane Base.
[1.50] The observation deck at LaGuardia Airport was one of the first of its kind.

Air'Ports'

We build based on what we know to be true. Even when visionaries, like da Vinci, come along, very rarely are they able to imagine something entirely alien to the accepted perceptions of this world. We seem to be programmed to think within the box, rather than outside of it. We evolve through processes of trial and error and deep reflection, always building upon strategies that have been proven to lead to accomplishment. And ultimately, unless spontaneous creation is stifled entirely, learning from and improving upon past successes, as well as failures, may not be a bad thing at all.

Therefore, it should come as no surprise that adapting elements of past or existing typologies, like the train station or seaport, became a common practice amongst airport designers of the 1930's. The Marine Air Terminal in New York, designed and opened in 1939, is a clear example of the seaport typology being reimagined for an airport terminal design.[28] Not only did the building showcase thematic elements typically found in a traditional seaport, like the aquatic decorations that define the building's aesthetic, it also mimicked the setting and functional aspects of the seaport very literally.

To board their 'seaplanes', passengers were required to walk on a floating dock that extended from the edge of the terminal out onto New York Harbour. The Clipper airplanes that operated out of this terminal were large and luxurious, with two-deck interiors that featured dining rooms, private compartments, and sleeping rooms.[43] The era of glamorous travel, as manifested in both airplane and airport design and servicing, had begun.

Transport Design

Air travel only truly became a viable option for the public after the end of the Second World War. Though still primarily a means of transportation limited to wealthy elites, the 1940's brought a number of changes along, including a gradual shift from the creation of airports that combined civil and military functions toward airports that dealt solely with commercial aviation.

Airports, their terminals, and their runways started to become proportionally larger to accommodate for increased capacity. As airplanes also increased in size, they had to park farther away from the terminal, forcing passengers to walk longer and longer distances on the tarmac to reach them. In some cases, cars and shuttle busses were introduced to transport passengers from the waiting areas of the terminal directly to the boarding stairs of their planes.[28]

This layout, called a 'transport' or 'connection' design, was really no different than the original open apron concept seen previously at Croydon, except for its much grander size. Some airports today, though primarily regional and local ones, still operate using the principles of 'transport' design. At Doha International for instance, direct access to planes via jetways or piers is nonexistent. Though the airport is currently undergoing a process of demolition and reconstruction,[44] Doha's older terminal will continue to exclusively use shuttle buses for passenger transport.

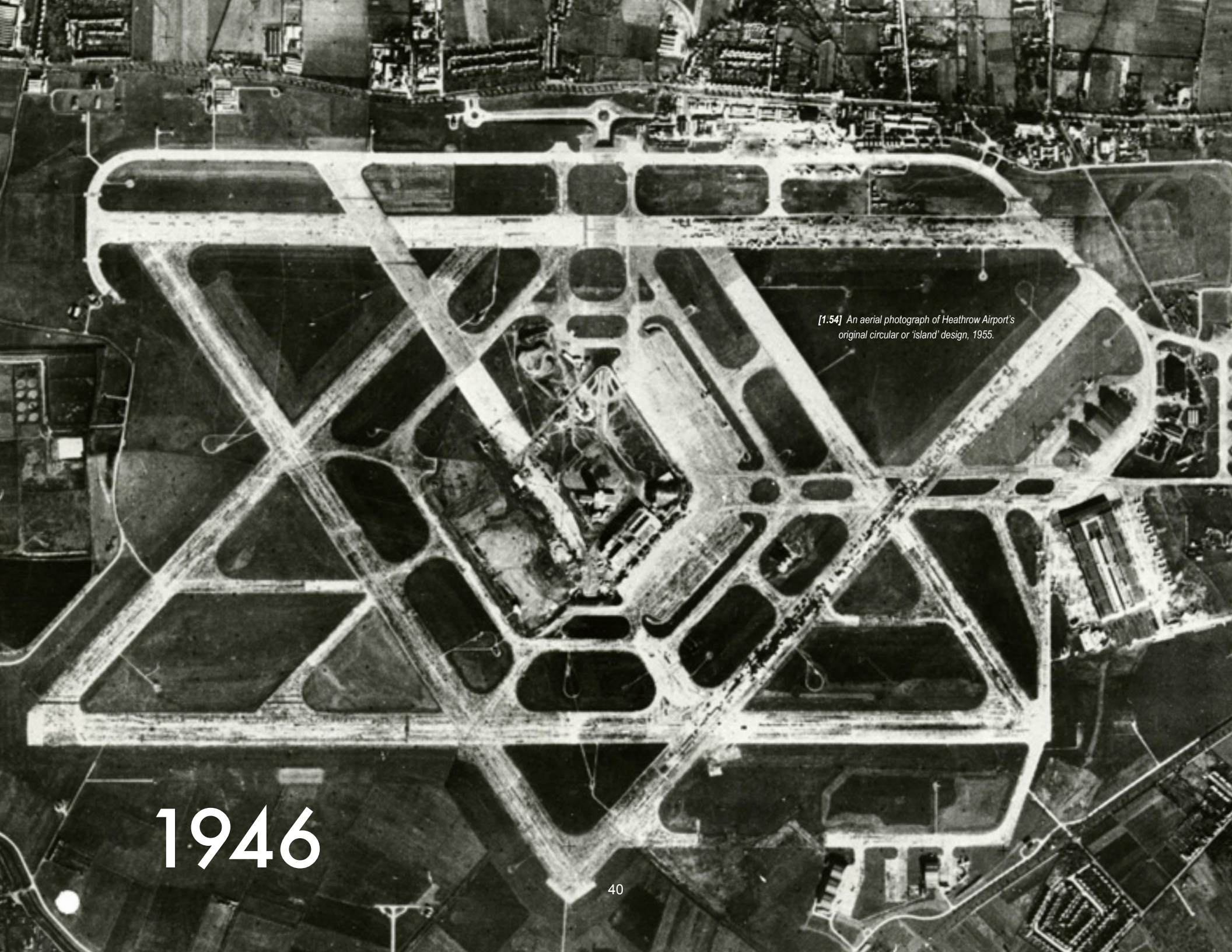
Dramatic developments in airport design would be made in the decades that would follow, changing the equation to bring the plane to the passenger, as opposed to the other way around.

[1.51] *Passengers walking substantial distances on the tarmac to their planes at Cleveland Airport, 1937.*

[1.52] *A group of passengers wait to board their plane beneath an overhang at Cleveland Airport, 1937.*

1940

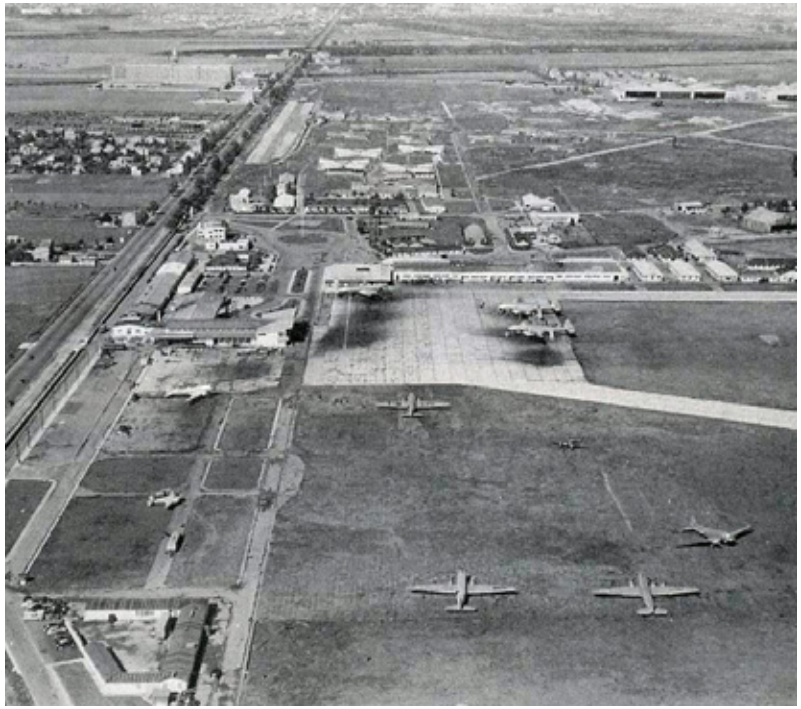
[1.53] *A woman waves goodbye to loved ones before boarding her airplane at Houston Airport, 1940.*



[1.54] An aerial photograph of Heathrow Airport's original circular or 'island' design, 1955.

1946

[1.55] A photograph showing French airliners parked on the tarmac at Paris-Orly Airport, 1948.



[1.56] An aerial photograph of Paris-Orly Airport showing its radial, open apron configuration, 1948.

Island Design

The 1940's saw the development of the so-called 'island' scheme in airport design. This arrangement generally consisted of a centralized terminal building surrounded by a tarmac and runways.[28] The inherent opportunities for expansion in the layout meant that new gates and parking spaces for planes could be added onto the terminal at any time, if done thoughtfully.

London Heathrow and Paris-Orly Airports both exhibited this arrangement, albeit, each slightly differently. Heathrow Airport, officially opened for commercial operation in 1946, located the passenger terminal building dead centre on site, with the runways later arranged in a hexagram-like pattern around the terminal. This unique hexagram configuration meant that planes could land from and take-off in any direction, regardless which way the wind blew.[45] Despite the revolutionary nature of the project, the rigid elements of the star-shaped layout resulted in road traffic bottlenecks and an inability to further expand the terminal.

Paris-Orly Airport showcased a modified version of 'island' design that left the passenger terminal sitting on a corner of the site, with runways arrayed around it. Although this meant that the terminal could only expand in two directions, it was still better than only one, which had previously been the standard.

In recognizing the need for continual expansion, architects began designing increasingly more flexible terminal layouts that could fairly easily be added onto. Unfortunately, expansion of any sort meant that passengers had to walk longer distances to reach their gates,[28] a problem that exists even in many modern airports. It almost seemed as if any advancement made in airport design was somehow intrinsically linked to a drawback of some kind -- perhaps one reason it remains an imperfect science even today.

Pier Finger Design

A significant evolution in airport design took place in the 1950's with the creation of 'pier finger' terminal buildings. This layout generally consisted of a centralized check-in area with protruding appendages on either side of the building for gates and waiting areas. On occasion, a pier finger terminal could also be star-shaped in plan, allowing for planes to park fairly close to the façade of the building.[28]

One of the earliest examples of a pier finger terminal could be found at Chicago O'Hare International Airport. Terminal 1, which became famous after its renovation by Helmut Jahn in 1988, featured a Y-shaped terminal building that responded well to the increased passenger flow of the era.[46] Today, though Terminal 1 was demolished and reconstructed into a connector terminal (a main terminal building and a satellite), Terminals 2 and 3 still make use of their original Y-shaped footprints.

[1.57] *The first moving sidewalk, or travellator, at Dallas Love Field Airport is installed in response to increased walking distances to gates, 1958.*

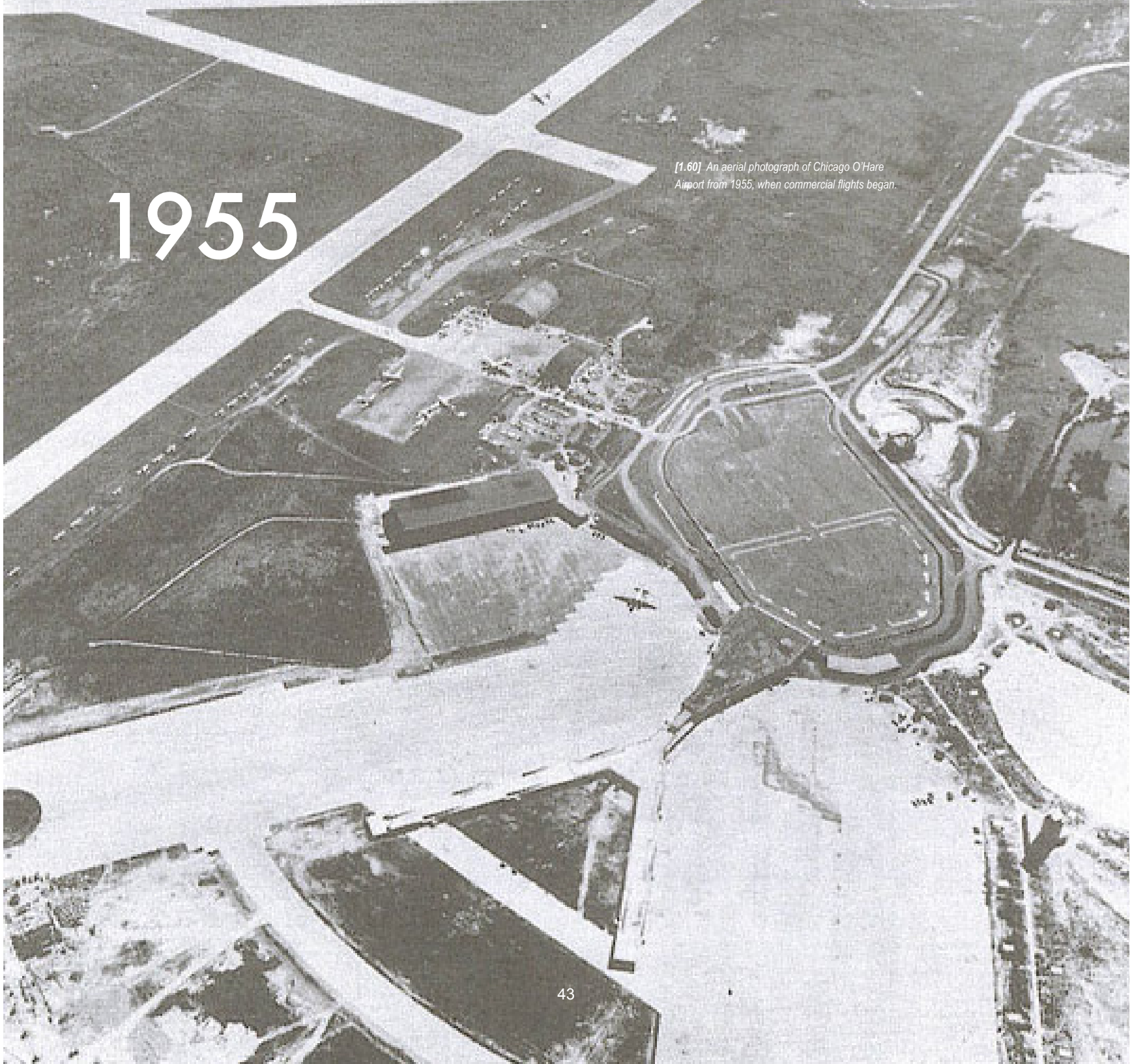
Hartsfield Atlanta Airport was another airport that exhibited this unique layout at the time. Hartsfield Airport capitalized on the benefits of the pier finger approach by using not one, but three protruding appendages in such a way as to array around the linear check-in hall.

A very important feature of many of these terminals was the two-level approach to separating departing and arriving passenger circulation.[28] This would become an invaluable strategy in ensuring that efficiency remained at maximum despite a rapidly increasing annual number of flyers.

[1.58] *An aerial photograph of Chicago O'Hare Airport showing all three Y-shaped terminal buildings, c. 1980's.*

[1.59] *An aerial photograph of Hartsfield Atlanta Airport showing its multi-pier finger design, 1961.*

1955



[1.60] *An aerial photograph of Chicago O'Hare Airport from 1955, when commercial flights began.*

1960

[1.61] *Jetways extend to meet a plane as it taxis to its gate at Malton Airport, 1960.*

[1.62] An exterior view of a mobile lounge at Washington Dulles Airport, c. 1962.

[1.63] An interior view of a mobile lounge showing the waiting area atmosphere that has been created, c. 1962.

Jetways and Mobile Lounges

The pier finger design model, in bringing the plane closer to the terminal, led to introduction of jetways (covered corridors that telescoped out from the terminal to meet the plane) in the gate areas. Pearson Airport in Toronto, built in the early 1960's, was one of the first airports in the world to implement these convenient connectors.[28] It was also one of the first airports to use a decentralized or satellite terminal design, a design that saw piers extend from multiple points along the circular terminal's perimeter.

[1.64] A view of a fully-raised jetway extended to meet a plane for easy passenger boarding, c. 1970's.

Perhaps the most intriguing and innovative feature of 1960's airport design came in the form of Eero Saarinen's 'mobile lounge'. This unique shuttle bus, first used at Washington Dulles Airport, transported passengers to and from their planes in glamorous fashion. The original lounges were spacious and provided passengers with an experience entirely similar to that of sitting in a regular, immobile, lounge at the gate. Adding to the luxury factor, upon first introduction, they even had cocktail bars on board.[47]

Unlike Toronto and other airports at the time, the design of Washington Dulles was extremely simple, used clean lines, and had no extensions of any sort coming off of the terminal. If anything, Saarinen viewed the mobile lounges themselves as extensions of the terminal building, albeit in a more metaphorical sense.[47] Saarinen believed that separating functions and simplifying the overall design of a terminal would lead to a much richer and stress-free passenger experience. This approach would be emulated in the designs of many airports to come.

The Linear Terminal

The early open apron concept brought the passenger to the airplane, albeit in a fairly long and tedious manner. The linear terminal, which generally consisted of a central check-in area and one long linear or curved gates concourse, was the first design approach that literally brought the plane to the passenger by having it taxi directly in front of its designated gate area. Coupled with the increasing use of jetways at airport terminals, this meant that passengers no longer needed to walk as far or take confusing and winding routes throughout the boarding and deboarding process.[28]

The first linear terminals with jetway capacity were seen in European cities such as Rome and Moscow. Rome's Fiumicino Airport, officially opened in 1961, was a prime example of the linear design concept with its main terminal area designated for check-in, baggage claim, and retail areas, and its linear 'wings' supporting gate functions only. Moscow's Domodedovo Airport, which opened a few years later, also sported a linear terminal shape, though used far fewer jet extensions.

Architects of Dallas/Forth Worth Airport's terminal buildings had a slightly different take on the concept. The standard terminal at DFW was semi-circular in form and housed check-in functions along the landside perimeter and gate functions along the airside perimeter. To this day, all of the terminals, except for the new international Terminal D, still maintain this semi-circular footprint.

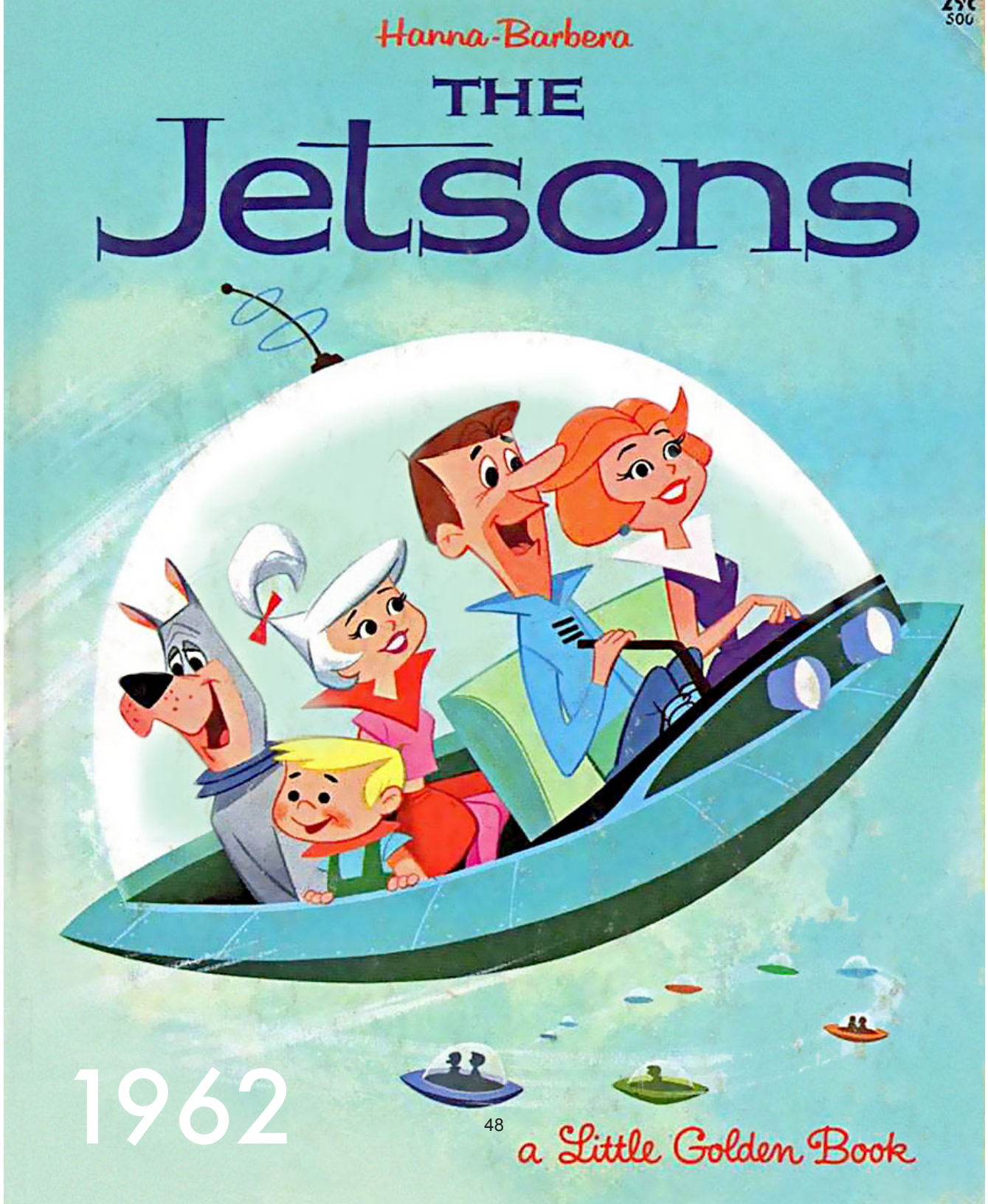
Generally, similar to pier finger terminals, linear terminals were designed with the capacity to expand at a later date if the need arose. With exponentially increasing capacity over the years, multiple expansions and retrofits have already occurred at many such terminals. This built-in ability to be easily expanded upon makes the linear terminal a preferred footprint type even to this day.

[1.65] *The linear terminal design of Domodedovo International Airport, 1968.*

[1.66] *A postcard depiction of one of the curvilinear terminals at Dallas/Forth Worth International Airport, 1970.*
[1.67] *An aerial photograph of Fiumicino Airport showing the main terminal and its 'wings', 1961.*

[1.68] A postcard depiction of Fiumicino Airport, 1978.

1961



[1.69] The Jetsons *(1962)*
*The Jetsons is a story of an upper middle class space-age family living life in typical 1960's fashion and imaginative space-age living -- all chores are accomplished by either the push of a button or by beloved robot maid Rosie.**

** All television show and movie plot summaries denoted have been referenced from the Internet Movie Database (www.imdb.com) and/or Turner Classic Movies (www.tcm.com).*

[1.70] Lost in Space *(1965) ~ A space colony family struggles to survive when a spy/accidental stowaway throws their ship hopelessly off course.**

[1.71] Star Trek *(1966) ~ Captain Kirk and the crew of the Starship Enterprise explore space and defend the United Federation of Planets.**

60's Sci-fi

It is no small coincidence that the airports of the 1960's began to take the form of buildings featured only in science fiction novels. What propelled this change from a very linear and traditional approach to a far more whimsical and outlandish one? -- Googie Architecture and the mid-20th century Space Race.[48]

Architecture will always be bound by the technology of the times. Imagination, as limitless as it may be, cannot materialize in such a way that is beyond what is physically possible at any given point in time. One can only approximate the dream, and thus the result may sometimes seem amateurish, silly, or far too literal. Nonetheless, the effort is valuable because the result means progress.

[1.72] 2001: A Space Odyssey *(1968) ~ Stanley Kubrick's visual masterpiece about evolution.**

While flying cars, brightly decorated spaceship interiors with jagged edges, and robots with strong personalities may not in fact ever come to pass, their roles as 60's pop cultural icons contributed to the creation of a subcategory in the futurist architecture movement. This space age, or 'Googie', architecture was a far cry from the traditional modernist building of the early 20th century. Motels, coffee houses, gas stations, and eventually airports, began to adopt this unusual style characterized by curvaceous and geometric shapes, upswept roofs, and frequent use of floor-to-ceiling glass.[49]

An air of sophistication had already been formed when it came to plane travel, and it was still largely only feasible for the elite who had the reasons and means to partake in such adventures. Pop culture, on the other hand, depicted a future where all men could live equally well -- a place where money and status would have no bearing on the quality of one's experiences.

'Googie' Airports

Googie Architecture, a very unconventional form of modern architecture, has been around since the 1940's. Originally conceived in response to the developing car culture of the West, it experienced a resurgence in the 1960's with the increasingly space-obsessed milieu of the times.[50] In designing in the Googie style, architects tried to capitalize on the excitement of the masses with respect to the newly-realized possibilities in space travel by creating atmospheres that mimicked and exaggerated themes found in science fiction shows and novels. Naturally, the iconic nature of the airport made it a perfect breeding ground for experimenting with and executing this Googie-themed design approach.

Los Angeles International Airport's Theme Building was one of the first examples of the Googie style immortalized in an airport building. Opened in 1961, the landmark resembled a flying saucer stationed on four reinforced concrete 'legs'. It housed, and still houses, a restaurant (that originally rotated 360° before its mechanisms proved too costly to maintain).[51] An observation deck on the uppermost level gave passengers an excellent view of LAX Airport. However, the implementation of strict new security measures prompted its closure shortly after the 9/11 attacks.

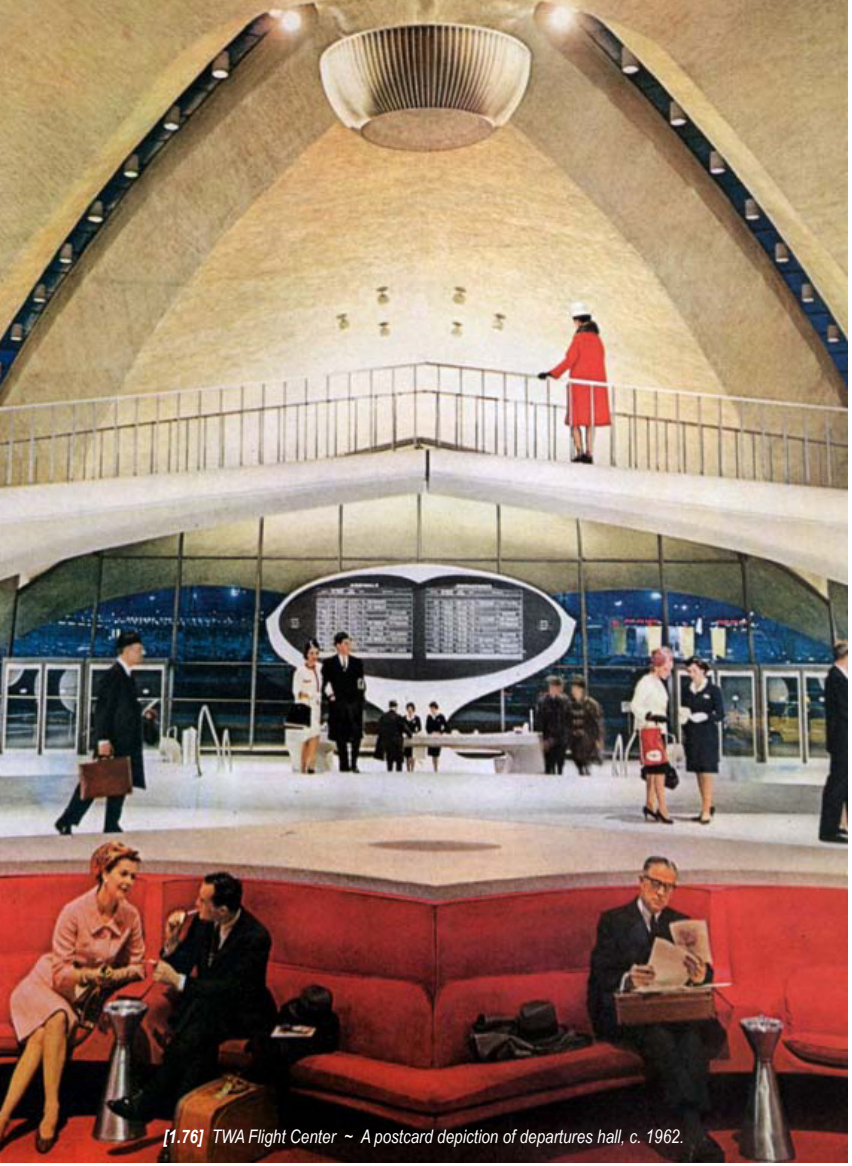
[1.73] Washington Dulles International Airport ~ *Eero Saarinen (1962)*

Saarinen's Dulles International Airport and, especially, his TWA Flight Centre at JFK exemplify Googie characteristics such as dramatic roof slopes, organic and irregular forms, large floor-to-ceiling windows, and an extensive use of concrete. These bold, and almost overwhelming, features enriched the passenger experience by virtue of the dynamic spaces they created.

[1.74] Theme Building, LAX Airport ~ *Pereira & Luckman (1961)*

[1.75] TWA Flight Center, JFK Airport ~ *Eero Saarinen (1962)*

1960s



[1.76] *TWA Flight Center ~ A postcard depiction of departures hall, c. 1962.*

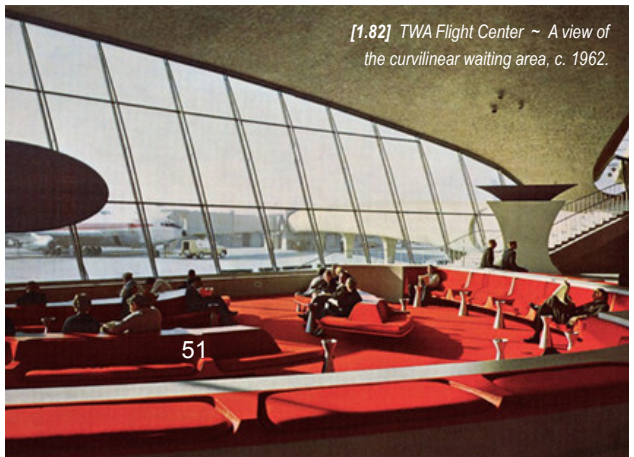
[1.78] Pan Am Worldport *~ Ives, Turano & Gardner Associated Architects (1960)*

[1.79] JFK Airport, International Arrivals Building *~ Skidmore, Owings & Merrill (1957)*

[1.80] *TWA Flight Center ~ The organic interiors, 1962.*

[1.81] *Dulles Airport ~ Curbside view, 1962.*

[1.77] *TWA Flight Center ~ A view of corridor to baggage claim, c. 1962.*



[1.82] *TWA Flight Center ~ A view of the curvilinear waiting area, c. 1962.*

[1.83] *JFK Airport, International Arrivals Building ~ A view of the check-in area, c. 1957.*

[1.84] *Images showing the hijackings and bombings of three commercial airliners in the Jordanian desert, 1970.*

[1.85] *Wreckage of a DC-3 airliner in the aftermath of the first airplane bomb attack in the United States, 1955.*

[1.86] *Relatives of passengers awaiting definitive word on the Cubana Flight 455 bombing, 1976.*
[1.87] *Newspaper clipping profiling passengers that perished on Cubana 455, 1976.*

Rise of Terrorism

The very first airplane hijacking took place in 1931, though it wasn't until the 1950's that airport screening became a norm at most airports.[52] And even then, it would take a series of unfortunate and deadly events to truly instigate fundamental changes in standard security measures.

[1.88] *Metal detectors and x-ray machines are introduced in response to increased terrorism, 1970.*

On September 6, 1970, members of the Popular Front for the Liberation of Palestine hijacked five airliners bound for New York City.[53] The planes were forced to land at Dawson's Field in Jordan, at which point hostage negotiations began and lasted for a number of days. Luckily, despite the long and gruelling ordeal, all hostages were left unharmed and eventually freed. In response to the frightening events, President Nixon immediately initiated an 'air piracy' program to address the growing problem. The program included the introduction of federal agents as air marshals on planes as well as the creation of a commission to examine the potential use of x-ray machines for commercial purposes.[54]

The first terrorist attack on a plane took place on Cubana Flight 455 en route from Barbados to Jamaica in 1976. Two time bombs planted on board exploded killing all 78 passengers in what was by far the most horrific attack on air travel ever seen up to that point. This massive warning sign prompted aviation security officials to institute much more prominent security checks that involved metal detectors, x-ray machines, and potential checks on individuals by private security personnel.[55]

Airplane Catastrophe Films

In the same way that pop culture influenced and was influenced by Googie architecture, the airplane disaster theme, which dominated television screens and movie theatres in the 1970's, was intrinsically linked to the obvious rise of aviation terrorism at the time.[56] The influx of airplane catastrophe films seemed to coincide with the increasing number of hijackings and threats on airliners, as well as unrelated mechanical failures and weather-based calamities.

Planes were getting bigger and more complex, flying farther, and carrying more and more people. The threat of disaster, though often highly exaggerated, was unfortunately a very real one. Pop culture, as it tends to do, responded to this atmosphere of heightened air travel anxiety by releasing a series of airplane catastrophe films that likely served only to further increase it. It had taken people almost sixty years to feel comfortable with the idea of flying on massive mechanical birds, and only a few years to regress back to a state of suspicion and discomfort.

Increasingly invasive security measures certainly did not take away from this general unease that was surfacing. Although nowhere near the severity of what was seen after the attacks of 9/11, tensions in airports were certainly heightened. The so-called 'Golden Age' of air travel, in which passenger comfort and quality of experience was seen as an integral measure for airport and airline success, was quickly coming to an end.

[1.89] The High and Mighty *(1954) ~ When a commercial airliner develops engine trouble, the passengers and crew think back on the lives they could be losing soon.**

[1.90] Zero Hour! *(1957) ~ When a flight crew falls ill, the only man who can land the plane is afraid of flying.**
[1.91] The Crowded Sky *(1960) ~ A passenger jet and a private plane head for a collision.**

[1.92] Airport *(1970)*
*A mad bomber plots to blow up a jet on a snowy night.**

[1.93] Airport 1975 *(1974)*
*A 747 in flight collides with a small plane, and is rendered pilotless. Somehow the control tower must get a pilot aboard so the jet can land.**

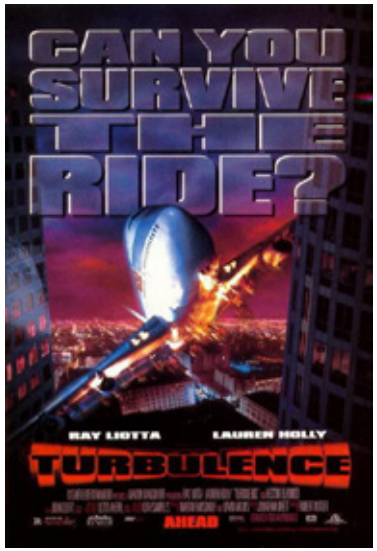
[1.94] Airport '77 *(1977)*
*Rescue workers fight to save a hijacked jet crashed in the Bermuda Triangle.**

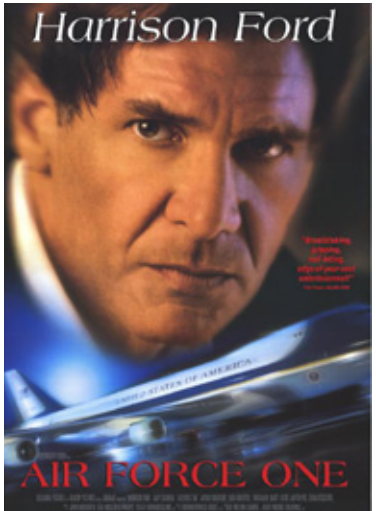
[1.95] The Concorde... Airport '79 *(1979)*
*A plane carrying people to the Moscow Olympics has a bomb on board. When missiles are fired on it, it becomes necessary to fly the plane upside-down.**

[1.96] Skyjacked *(1972)*
*A mad bomber forces a jet to re-route to Moscow.**

[1.97] Airplane! *(1980)*
*When a flight crew falls ill, the only man who can land the plane is afraid of flying.**

[1.98] Airplane II: The Sequel *(1982)*
*A comedy about the first plane flight to the moon.**





[1.99] Turbulence *(1997)*
*After a shootout on a flight transporting prisoners, a stewardess must outwit a smooth-talking serial killer and land the plane herself.**

[1.1.1] Air Force One *(1997)*
*Hijackers seize the plane carrying the President of the United States and his family, but he (an ex-soldier) works from hiding to defeat them.**

[1.1.2] Flightplan *(2005)*
*A bereaved woman and her daughter are flying home from Berlin to America. At 30,000 feet the child vanishes and nobody admits she was ever on that plane.**

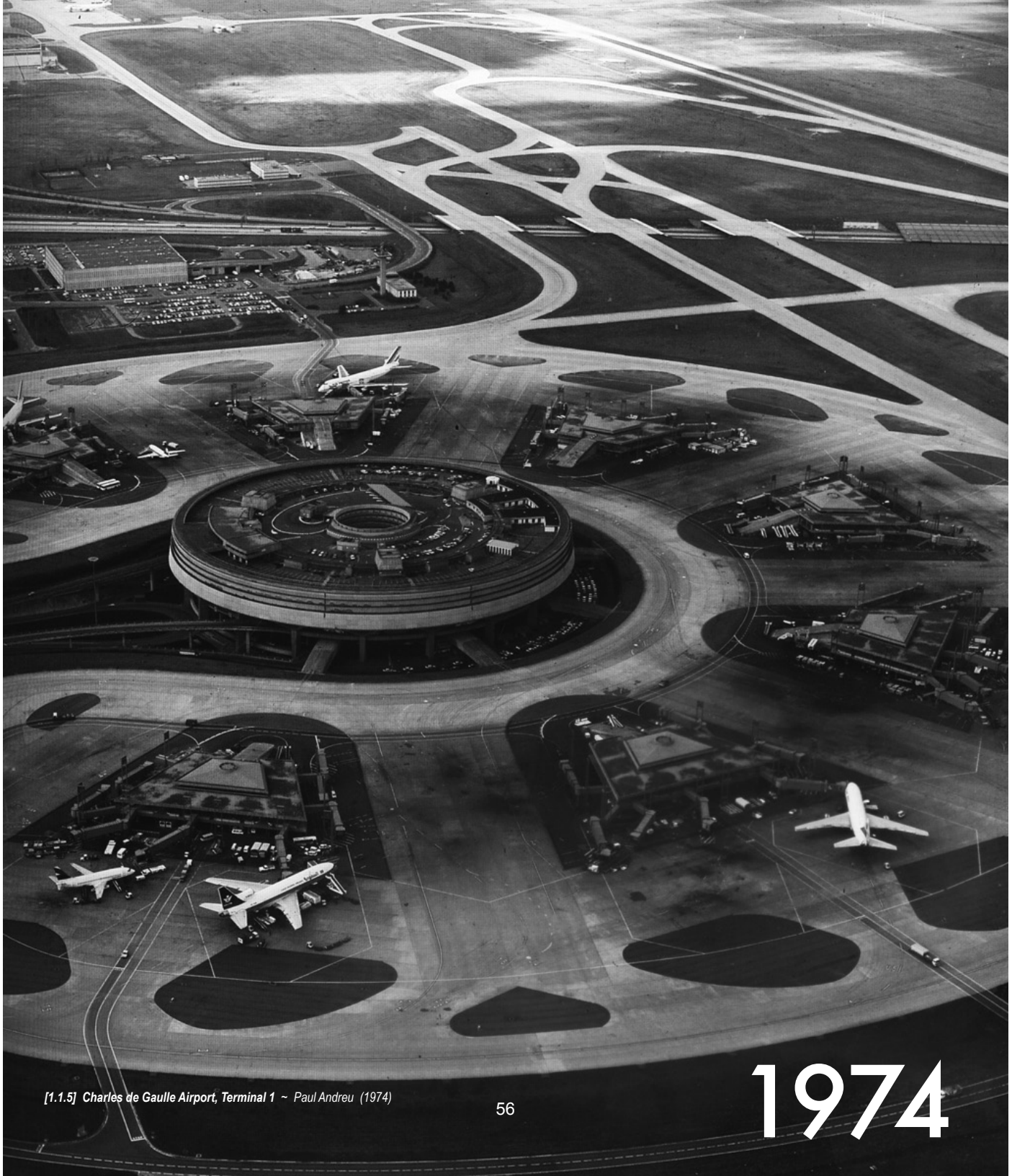
[1.1.3] Red Eye *(2005)*
*A woman is kidnapped by a stranger on a routine flight. Threatened by the potential murder of her father, she is pulled into a plot to assist her captor in offing a politician.**

[1.1.4] Snakes on a Plane *(2006)*
*An FBI agent takes on a plane full of deadly and poisonous snakes, deliberately released to kill a witness being flown from Honolulu to Los Angeles to testify against a mob boss.**

(n.) ***sat·el·lite***

a place or facility physically separated from but associated with or dependent on another place or facility[57]

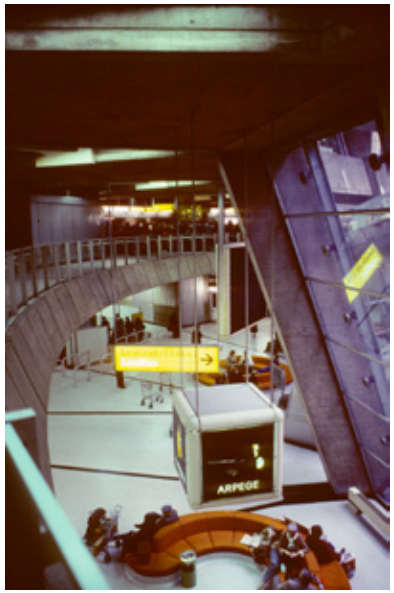
derived from the Latin "satellitem", meaning ***attendant***[58]



[1.1.5] Charles de Gaulle Airport, Terminal 1 ~ *Paul Andreu (1974)*

1974

[1.1.6] A view of the control tower adjacent to Terminal 1 at Charles de Gaulle Airport, c. 1974.
[1.1.7] An overhead view of a waiting area in the main terminal building, c. 1980.



[1.1.8] A view of the covered courtyard area of the main terminal building, c. 1980.
[1.1.9] A postcard of Gatwick Airport showing an early venture into satellite terminal design, c. 1936.

The Satellite Terminal

The early transport terminal designs of the 1940's seem very likely predecessors to the modern-day satellite terminal. In fact, the very first instance of anything even remotely akin to the style of satellite terminal popularized today emerged at Gatwick Airport in the late 1930's.[28] It sported a layout strikingly similar to the one found at Paris Charles de Gaulle's Terminal 1, and was perhaps a precedent for its design. Nonetheless, 30 years would pass before the benefits of satellite terminal design would imprint on the minds of airport designers.

[1.1.10] The unique satellite design of CDG's T1, depicted on a national stamp, 1974.

Charles de Gaulle's Terminal 1, designed by Paul Andreu in the late 1960's, was one of the earliest fully functioning satellite terminals in history. Unlike at Gatwick Airport, the central terminal building stood and functioned entirely separately from its trapezoidal-shaped satellite buildings, while the central building housed the check-in areas, baggage claim zones, security checkpoints, and retail stands.[28] A covered courtyard with a series of crossing escalator bridges remains an iconic focal point located at the centre of the building.

Today, most airports with satellite terminals have people-mover systems installed to transport passengers between the buildings. At CDG's Terminal 1, access to the seven satellites occurred via underground corridors with moving walkways. The complex and inefficient nature of the tunnels and multi-level pathways, along with the lack of views out onto the tarmac from the main building, resulted in a frustrating experience for some passengers. In fact, the time-consuming process of reaching one's gate is still one of the biggest drawbacks of designing with satellite terminals.

AESS in Airports

Passengers in the 1980's were privy to significant changes in airport design. Prior to this decade, most airports were built of structural concrete and used glass relatively sparingly. Helmut Jahn's Terminal 1 at Chicago O'Hare Airport demonstrated a strikingly different take on terminal design, one that emphasized the continuous use of glass throughout the building as well as the exposure of structural elements.

Jahn's vision for Terminal 1 as a modern-day Victorian train shed could be realized through the use of AESS, or architecturally exposed structural steel.[59] The extensive use of exposed structural elements, along with generous amounts of glass incorporated into exterior walls and roofs, was achieved by the rapid advancements being made in construction technology at the time. The never-before-seen architectural composition of Terminal 1 emphasized clarity in plan and program and a dynamic aesthetic that served to fulfil basic passenger needs as well as enhance their overall airport experience.

In describing his design approach for ORD's Terminal 1, Jahn wrote the following:

> *We see our work as an appropriate and innovative recomposition of classic and modern principles of the building arts. Rather than using form as quotations as orthodox duplications of a historic style, we seek conceptual relationships to response of a building to site and to context, entry and procession, spatiality, ornamentation, symbolic associations of historic forms.*[60]

This approach goes beyond simply borrowing from past architectures; it includes drawing inspiration from the natural world itself, a world we seek to understand so desperately. Here, the gesture of flight is evoked indirectly: in borrowing from the train station typology, the terminal symbolizes travel, speed, and discovery.

[1.1.11] ***The Crystal Palace*** *~ Joseph Paxton (1851)*

[1.1.12] *The main terminal building at Chicago O'Hare's T1 bears a striking resemblance to Paxton's arcade.*

[1.1.13] *The gates concourse of the satellite terminal at O'Hare's T1 also makes reference to the Victorian arcade.*

[1.1.14] Chicago O'Hare International Airport, United Airlines Terminal 1 ~ *Helmut Jahn (1988)*

[1.1.15] London Stansted Airport *~ Norman Foster (1991)*

[1.1.16] Diffuse light pours into the baggage claim area at Stansted Airport.

[1.1.17] A view of the Gothic nave ceiling at Bourges Cathedral in France, 2008.
[1.1.18] A typical roof module at Stansted Airport supported by a structural tree with an integrated information unit.

Modular Plan

Norman Foster's Stansted Airport near London was one of the first airports to use the so-called 'elegant shed' approach in its design.[61] As the name somewhat suggests, this approach rejects conventional ideas of incorporating metaphors for flight or classical imagery into the final design. Though many airports followed suit, Stansted was the first of its kind to try and achieve this completely generic aesthetic based entirely on satisfying a functional rationale.

The modular nature of its design meant that it could be easily expanded upon at any time. In fact, a large expansion project took place in the mid-2000's that added a total of 5,900 square metres of usable floor space.[62] Iconic elements of the terminal included a series of structural trees dispersed throughout that incorporated flight information panels, HVAC systems, and electrical systems into large black box units at their bases. At Stansted, structure was intended to remain entirely separate from program, which allowed for a good degree of flexibility when it came to planning and modifying various areas in the main terminal building.

Perhaps in homage to Saarinen's Dulles Airport, Foster allocated gates solely to the satellite terminals, leaving the main terminal responsible only for airside functions like check-in and security processing. As will be expanded upon in Chapter 3 of this book, a major drawback of this rigorous separation, as well as the plethora of retail packed into the main terminal building, is a time-consuming and inefficient journey toward the gate.

Ironically, despite Foster's insistence upon breaking ties with the past in designing Stansted, it's not hard to see the structural and aesthetic similarities between the roof system and historic Gothic cathedral ceilings -- perhaps evidence that the grandeur architects often seek to embody cannot be achieved entirely in a vacuum.

Space and Light

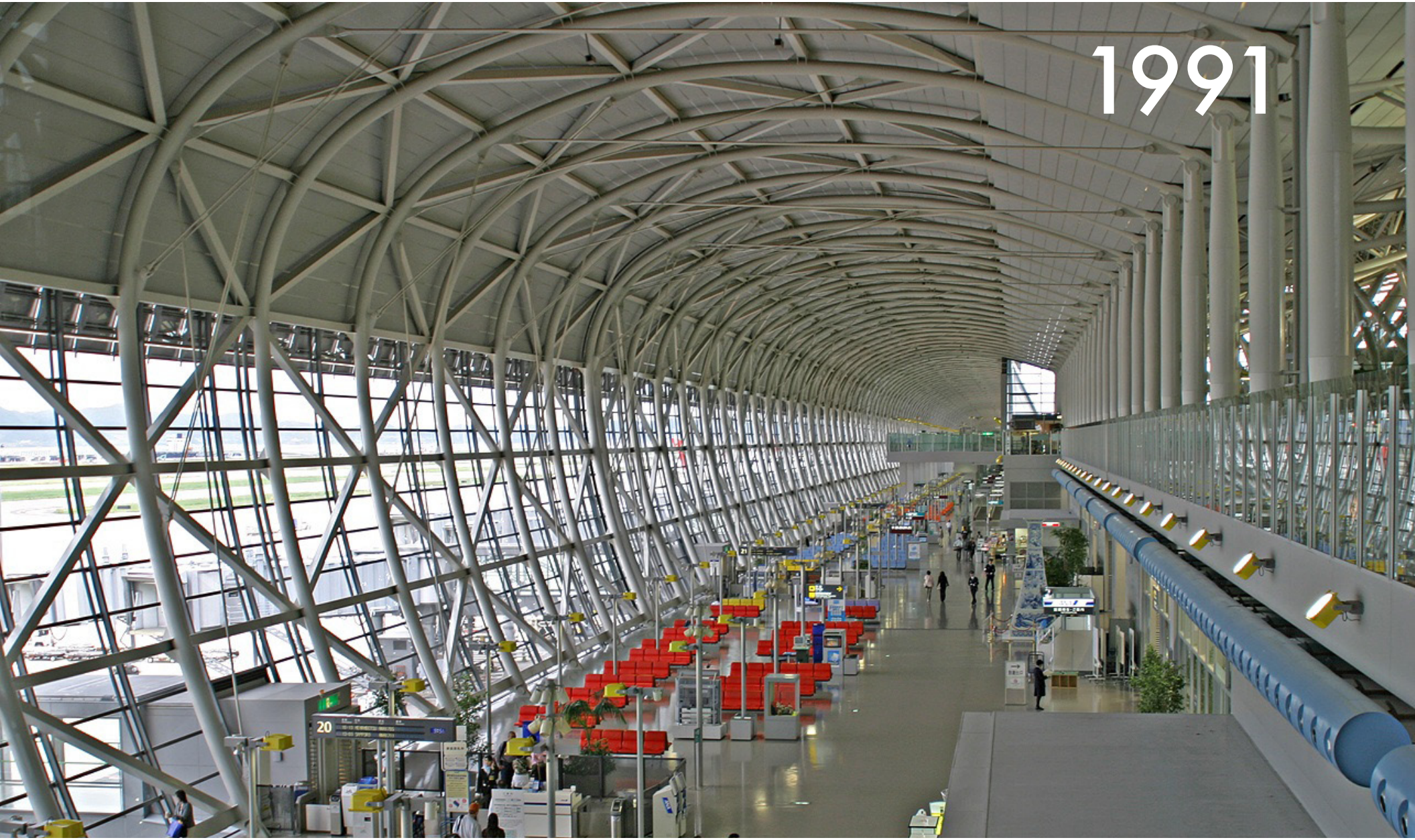
Renzo Piano's Kansai International Airport in Osaka, officially opened in September of 1991, demonstrates the next evolution in airport design. Using a fairly standard linear terminal shape, Piano created a central terminal area for the check-in process and various retail and administrative functions, and a 1,660-metre long[63] gate concourse to be serviced by a people-mover system. The airport, which sits on a man-made island, is one of the longest airport buildings in the world, and one of only a few linear terminals to use trains instead of moving walkways to transport passengers to and from their gates.

The gates concourse at Kansai Airport is enormous to say the least. In a distinct departure from airports like Stansted, which famously uses indirect and reflected light to illuminate terminal interiors, Kansai employs a fully glazed curved façade system to brightly light interiors. Although the glazing only travels up three-quarters of the height of the exterior skin, the sheer size of the structure means that every corner of the space receives natural light throughout the day. The expansive and curvaceous nature of the structure in waiting areas makes reference to the dirigible shed of the past used to build and house airships, and the swooping roof covering the central terminal area again manifests a metaphorical taking off into flight.[64]

The spacious and clear layout at Kansai borrowed from two distinct airport design styles: the modular, rigorous, functional approach and the whimsical, organic, and spatially engaging approach. This combining of two methodologies would become a popular strategy for airport designers in the coming decades and would be most impressively realized in the design of Beijing Capital Airport's Terminal 3 in 2009.

[1.1.19] *A view of the roof structure over the check-in hall at Kansai International Airport. The airfoil-shaped roof promotes air circulation throughout the space.*

[1.1.20] *The USS Macon Aiship under construction at the Akron, Ohio airship hangar, c. 1932.*



[1.1.21] Kansai International Airport ~ *Renzo Piano (1991)*

1995

[1.1.22] Denver International Airport *~ Fentress Bradburn Architects (1995)*

Tensile Structures

Tensile design in airport construction also became popularized in the late 1980's and early 90's. Denver International Airport (opened in 1995) and its famous roof system is one such example. The satellite terminal concept used at Denver makes no gestural references to flight in any way, the emphasis lying rather on the spatial qualities of the interior and ambient lighting effects created by translucent tensile fabric coverings.

[1.1.23] *An image of WWI temporary airplane hangars. The military hangar was the first building type to use tensile materials at airfields and airports.*

At Denver, the roof membranes are anchored to large steel masts placed at strategic structural points along the perimeter of the terminal, while glazed openings sit atop the masts at the point of connection. The beauty of this terminal lies in its seemingly floating roof structure, and the sense of lightness that manifests on the interior as a result.

Jeddah International Airport, which preceded the construction of Denver Airport, also uses a tensile roof structure in its design. A strikingly similar system of masts, fabric, and cable is used at Jeddah to create a series of modular tensile roof forms over the main terminal area. Both terminals also take advantage of the stack effect principle through the vertical nature of the roof structure, a departure from most airports that tend to emphasize long and linear roof lines.

[1.1.24] ***King Abdul Aziz International Airport, Hajj Terminal*** *~ Skidmore, Owings & Merrill (1981)*

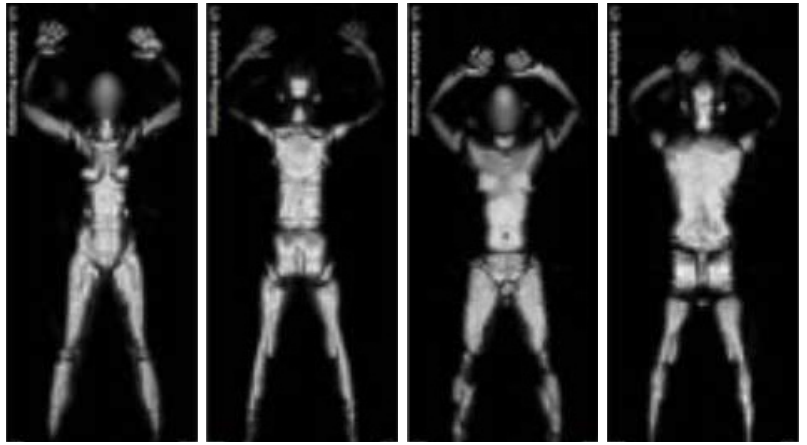
Security Post 9/11

On September 11, 2001, the world of air travel would be changed dramatically. Although dozens of airliner hijackings had occurred in the decades prior to 9/11, the magnitude of the devastation that took place on this sunny summer day was simply incomparable. The events that wreaked havoc on downtown Manhattan would drastically alter the degree of security in place at many public and government buildings, and particularly at airports. A veil of suspicion had settled itself in the psyches of the American public, and with it came a far more severe and dogmatic approach to the passenger screening process.

Shortly after the attacks, the United States government created and introduced the Transportation Security Administration (or TSA), replacing private contracted companies, to handle passenger screening at all American airports.[65] New security measures meant that passengers could be randomly patted-down, searched, and interrogated if deemed suspicious. Knives, nail clippers, and other belongings that could possibly be transformed into weaponry were confiscated. Following a series of disrupted terrorist plots, including the infamous shoe bomber incident in 2002, shoes, jackets, laptops, and other digital devices all required x-raying.

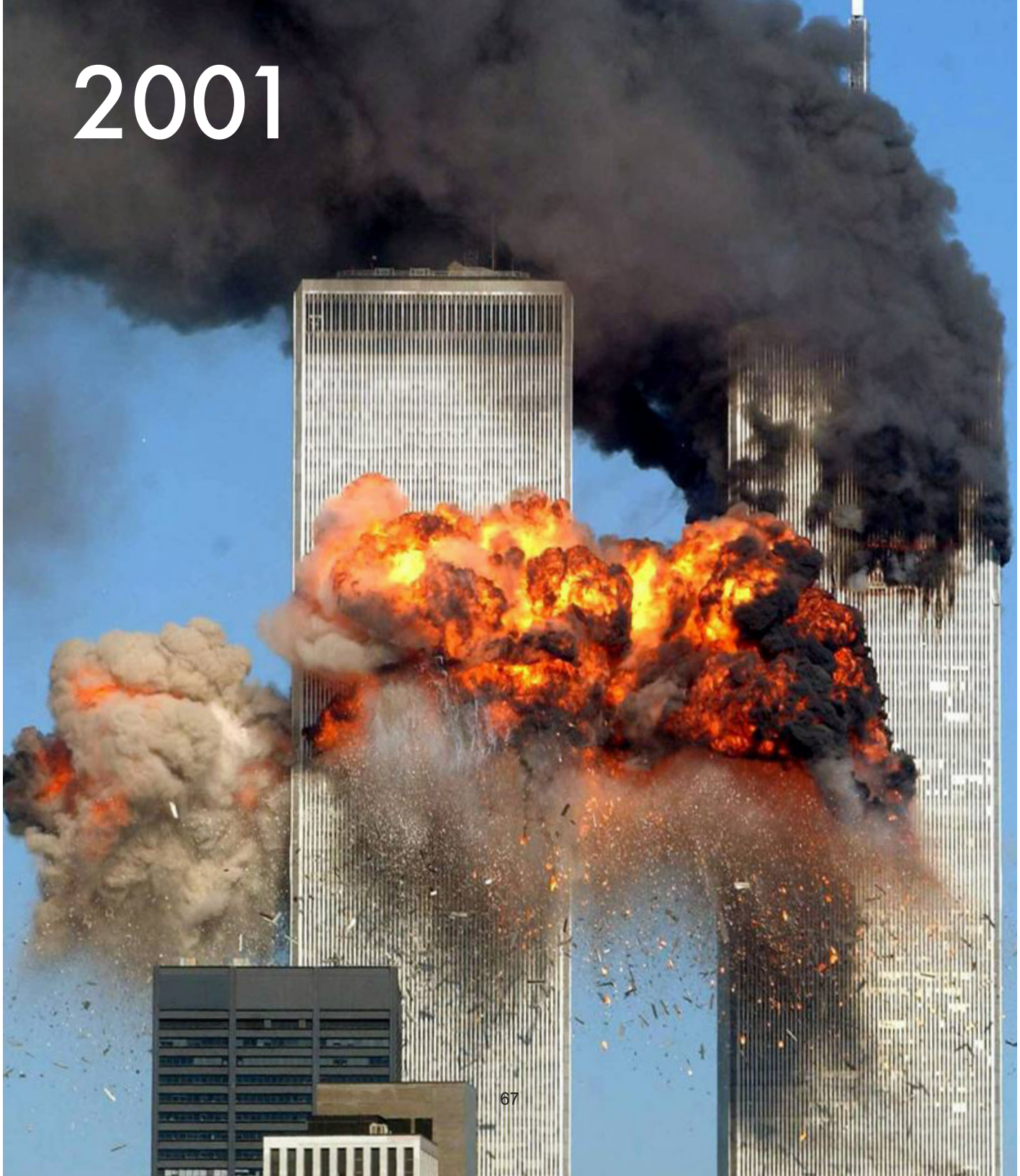
The paranoia that had first appeared in the 1970's had now been heightened to a degree that made even the average American passenger feel suspect in his own country. Combined with an increasingly out-dated and crumbling airport infrastructure that already made security checkpoints unpleasant spaces to experience, the new tactic of passenger intimidation unleashed by the TSA would make the airport process an even more difficult one to bear.

[1.1.25] *Airport security personnel holding machine guns outside of a baggage claim zone.*



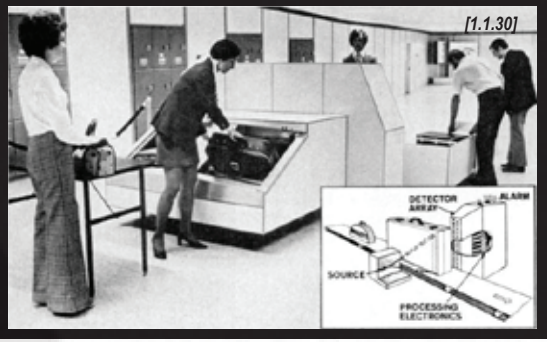
[1.1.26] *A woman being scanned in a full-body imaging machine at a security checkpoint.*
[1.1.27] *A sample of the nude-like images produced by the newly installed full-body scanners.*

2001



[1.1.28] *A view of the World Trade Center towers shortly after the second plane hits WTC 2 on September 11, 2001.*

BAG SEARCH | X-RAY MACHINES | MD'S | SCREENING | PATDOWNS

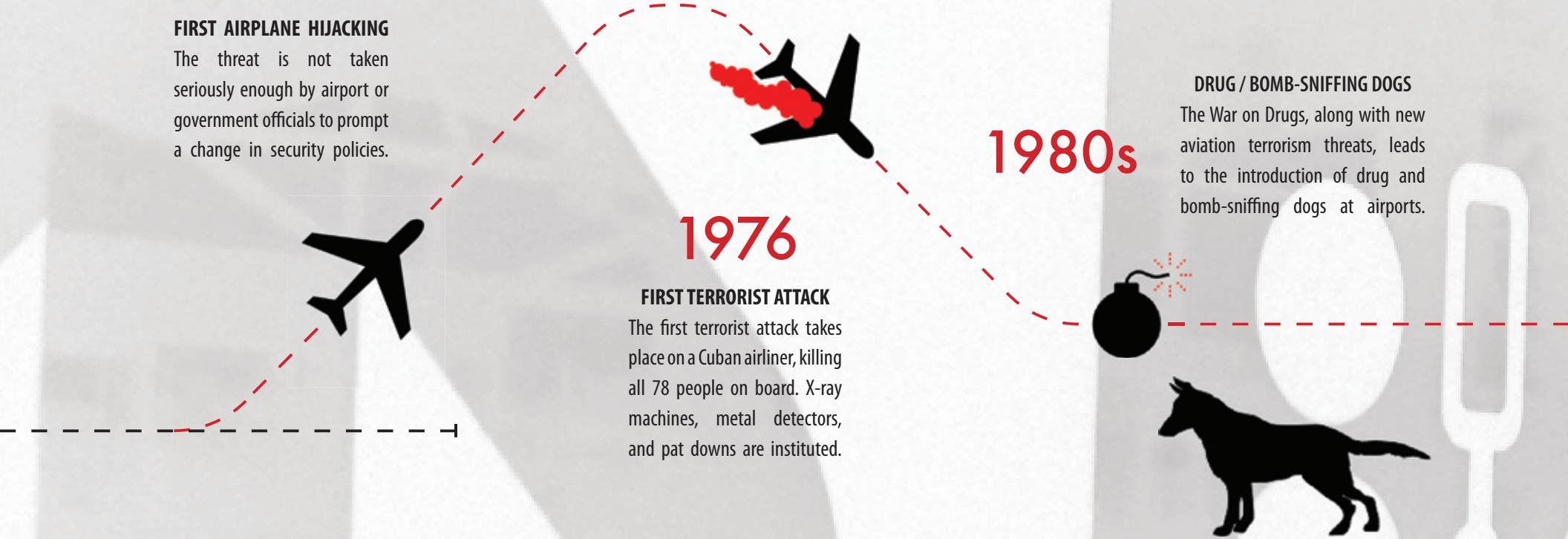


... SECURITY TIMELINE VISUALIZED ...

1931

FIRST AIRPLANE HIJACKING

The threat is not taken seriously enough by airport or government officials to prompt a change in security policies.



1976

FIRST TERRORIST ATTACK

The first terrorist attack takes place on a Cuban airliner, killing all 78 people on board. X-ray machines, metal detectors, and pat downs are instituted.

1980s

DRUG / BOMB-SNIFFING DOGS

The War on Drugs, along with new aviation terrorism threats, leads to the introduction of drug and bomb-sniffing dogs at airports.

*"**It's become a rite of passage,** literally, for anyone who travels by airplane. You pass through a doorframe-like metal detector that beeps when loose change dares to pass beneath it. You place your carefully packed belongings onto **an ominous conveyer belt that draws the bags into a dark netherworld** to be X-rayed and inspected. But there was a time, only thirty years ago, when passengers could **walk straight from the ticket counter to the tarmac and onto the plane without being stopped.**"*[66]

** Information sourced from: http://gizmodo.com/5696276/the-history-of-airport-security-visualized

SEP 2001

KNIVES BANNED

All knives (including Swiss Army and nail clippers) are prohibited.

[1.1.34] Logo of the TSA (Transportation Security Administration).

NOV 2001

TSA IS FORMED

The TSA, or the Transportation Security Administration, is introduced to handle screening at all airports.

NO FLY LIST CREATED

By mid-December of 2001, the original 'no transport' list grows to 594 people and is officially renamed the 'no fly' list. By March 2006, the list is said to contain 44,000 names.

NOV 2001

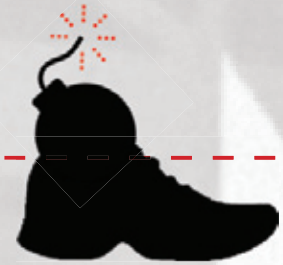
This is a stupid game, and we should stop playing it.

It's not even a fair game. It's not that the terrorist picks an attack and we pick a defense, and we see who wins. It's that we pick a defense, and then the terrorists look at our defense and pick an attack designed to get around it. ***Our security measures only work if we happen to guess the plot correctly.*** *If we get it wrong, we've wasted our money.* ***This isn't security; it's security theater.***[67]

DEC 2001

CHRISTMAS DAY SHOE BOMBER

Richard Reid packs explosives in his shoe and attempts to destroy an airliner en route from Paris to Miami. Passengers must now remove their shoes at security checkpoints.



2004

ALL JACKETS MUST BE X-RAYED

In addition to shoes, jewellery, and metal, passengers must now remove and x-ray their jackets. Passengers selected for further screening may be patted down.

BOMB DOGS


[1.1.35]

SHOES OFF


[1.1.36]

GUNS


[1.1.37]

QUARANTINE


[1.1.38]

BODY SCAN


[1.1.39]

2010

2006

LIQUIDS BANNED

Passengers can no longer carry liquids past security checkpoints or onto airplanes. Some of the banned items include drinks, breast milk, and snow globes.

2009

UNDERWEAR BOMBER

Full-body scanners are installed at major US and international airports after a man tries to detonate a bomb hidden in his underwear.

2010

FULL-BODY SCANNERS MANDATED

In further attempts to curb terrorism at airports and on planes, the TSA introduces and mandates full-body imaging technology. Along with new, aggressive patdown measures, the full body scanners are deeply criticized by passengers and privacy advocacy groups.

Tom Hanks
Catherine Zeta-Jones

A STEVEN SPIELBERG Film

The Terminal

[1.1.40] ***The Terminal*** *(2004)*
*An eastern immigrant finds himself stranded in JFK airport, and must take up temporary residence there.**

Life is waiting.

DREAMWORKS PICTURES presents A PARKES/MacDONALD Production A STEVEN SPIELBERG Film
TOM HANKS CATHERINE ZETA-JONES "THE TERMINAL" STANLEY TUCCI CHI McBRIDE DIEGO LUNA
Casting by DEBRA ZANE, CSA Production Designed by SERGIO MIMICA-GEZZAN Music by JOHN WILLIAMS Costume Designer MARY ZOPHRES Edited by MICHAEL KAHN, A.C.E.
Production Designed by ALEX McDOWELL Director of Photography JANUSZ KAMINSKI, ASC Executive Producers PATRICIA WHITCHER JASON HOFFS ANDREW NICCOL
Produced by WALTER F. PARKES LAURIE MacDONALD STEVEN SPIELBERG Story by ANDREW NICCOL and SACHA GERVASI Screenplay by SACHA GERVASI and JEFF NATHANSON
AMBLIN ENTERTAINMENT Directed by STEVEN SPIELBERG DREAMWORKS PICTURES

George Clooney

UP IN THE AIR

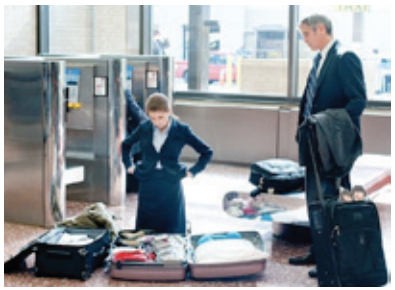
From the Director of
"Juno" and "Thank You for Smoking"

[1.1.41] ***Up in the Air*** *(2009) ~ With a job that has him travelling around the country firing people, Ryan Bingham leads an empty life out of a suitcase, until his company does the unexpected: ground him.**

The story of a man ready to make a connection.

ARRIVING THIS DECEMBER
TheUpInTheAirMovie.com

[1.1.42] *Viktor awkwardly tries to sleep in a disused waiting area at the terminal.*
[1.1.43] *Viktor is stunned to see a news report on his native country going to war on an airport screen.*



[1.1.44] *Ryan shows Natalie how to pack lightly.*
[1.1.45] *Ryan stands in the check-in area of an airport contemplating his nomadic lifestyle.*

Airports in Film

The Terminal is a story about a man trapped at JFK Airport after being denied an entry visa into the United States.[70] He finds himself stuck in an international limbo of sorts: he can't step foot on American soil, nor can he go home to his war-torn native country of Krakozhia. He eventually is allowed entry after a very long and drawn-out stay at the terminal. Interestingly, the plot is based on the real-life event of Mehran Karimi Nasseri's 17-year stay at Charles de Gaulle International Airport Terminal 1, from 1988 to 2006.[71]

While Viktor and Mehran's terminal experiences are certainly unique, they provide a nuanced glimpse into the inherent difficulties faced by the average passenger at airports. The terminal provides no sleeping space, so Victor is forced to awkwardly sleep on two rows of seats that he forcibly manoeuvres together. So little variety exists in terms of the types of food outlets in the terminal, that Viktor is forced to eat the same fast-food meals every day. And of course, Victor must also deal with the incredible amount of bureaucracy involved with passing through, or in his case trying to pass through, an airport.

Up in the Air follows the life of a man that flies around from city to city firing people for a living.[72] Ryan Bingham's nomadic lifestyle leads to a series of philosophical revelations about life and its purpose. While freeing at first, his constant, nonstop travelling eventually disillusions him, making him reconsider his on-the-go, noncommittal lifestyle.

Both films challenge the perception of an airport as a transient space. *The Terminal* exposes the inherent lack of provisions made by airports for passengers with long layovers, and particularly overnight stays, and *Up in the Air* tries to depict the mundane and entirely uninspiring nature of air travel, as it exists today.

Megastructures

Terminal 3 at Beijing International Airport is a by-product of all that came before it; a megastructure that combines past ideas that bred both failure and success. Whether or not it masters every fundamental aspect of airport design is not as important as whether or not it has at least tried to. Because, it is in that trial, that effort, that boundaries can be broken and limits be dissolved. It is the only way to evolve, and the only way in which to eventually manifest our 60's sci-fi dreams into reality, without skipping any steps.

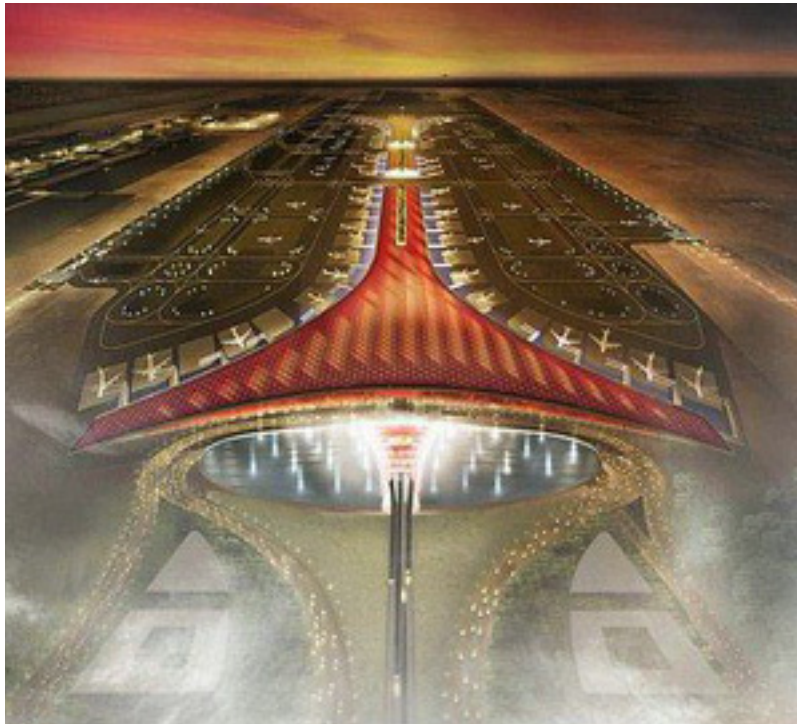
[1.1.46] *A colourful Chinese dragon kite. T3 evokes a dragon-like form traditional Chinese colours and symbols.*

The megastructure of Terminal 3 is the present-day incarnate of Speer's Tempelhof in terms of its utter massivity and overwhelming presence. Despite all of its colours and structural magnificence, there is a tendency to feel very small at T3 because of its sheer size. This inability to identify with the structure on a more human scale, at least in central terminal areas, is a theme that reappears at many modern-day airports.

[1.1.47] *A an airplane hangar at Le Bourget Airfield, c. 1974. The 'elegant shed' motif is referenced in Beijing Capital's Terminal 3 and its Transportation Centre.*

The terminal satisfies all of the most basic functional criteria that make for a more or less successful airport, but still fails to make the passenger's satisfaction, in my opinion, central to its purpose. We began this journey in air travel without much consideration for the human component in airport design. With that being the case, can we afford to do the same again?

[1.1.48] *An aerial rendering of Beijing Capital's T3. It measures 800 metres in width and 3.5 kilometres in length.*



[1.1.49] *The Ground Transportation Centre (or GTC) at Beijing Capital Airport. The space is made to feel larger than it actually is through the use of highly-reflective, polished stone flooring.*

[1.1.50] Beijing Capital International Airport ~ *Foster + Partners (2008)*

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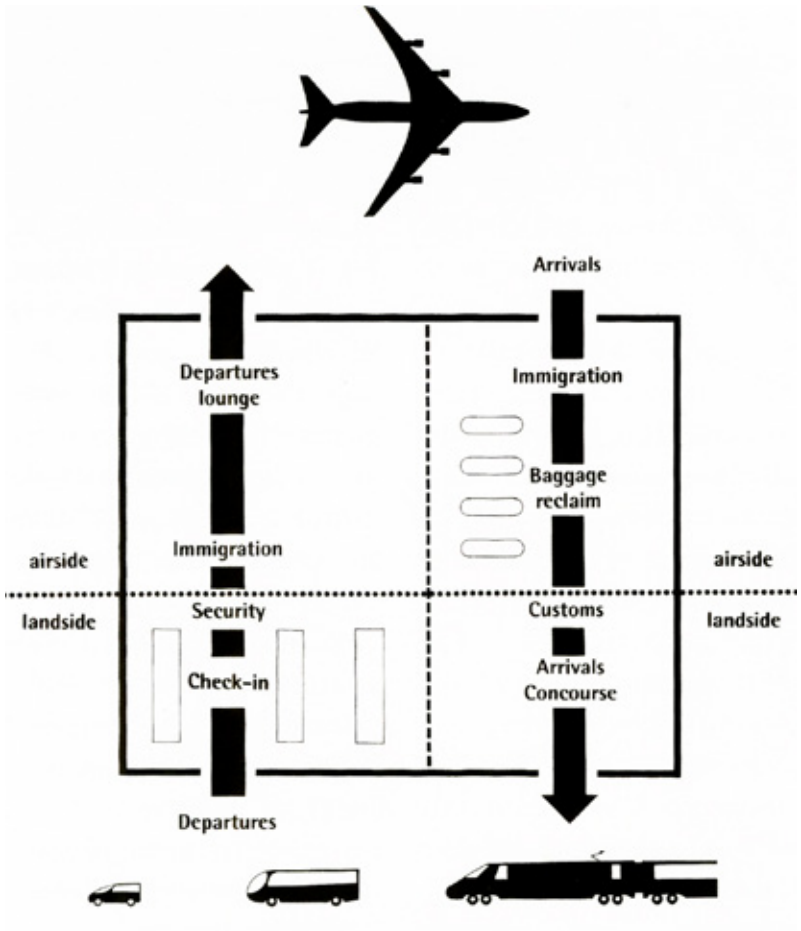


[2.1] Diagram of circulation and location of program at Stansted International Airport.

Preface

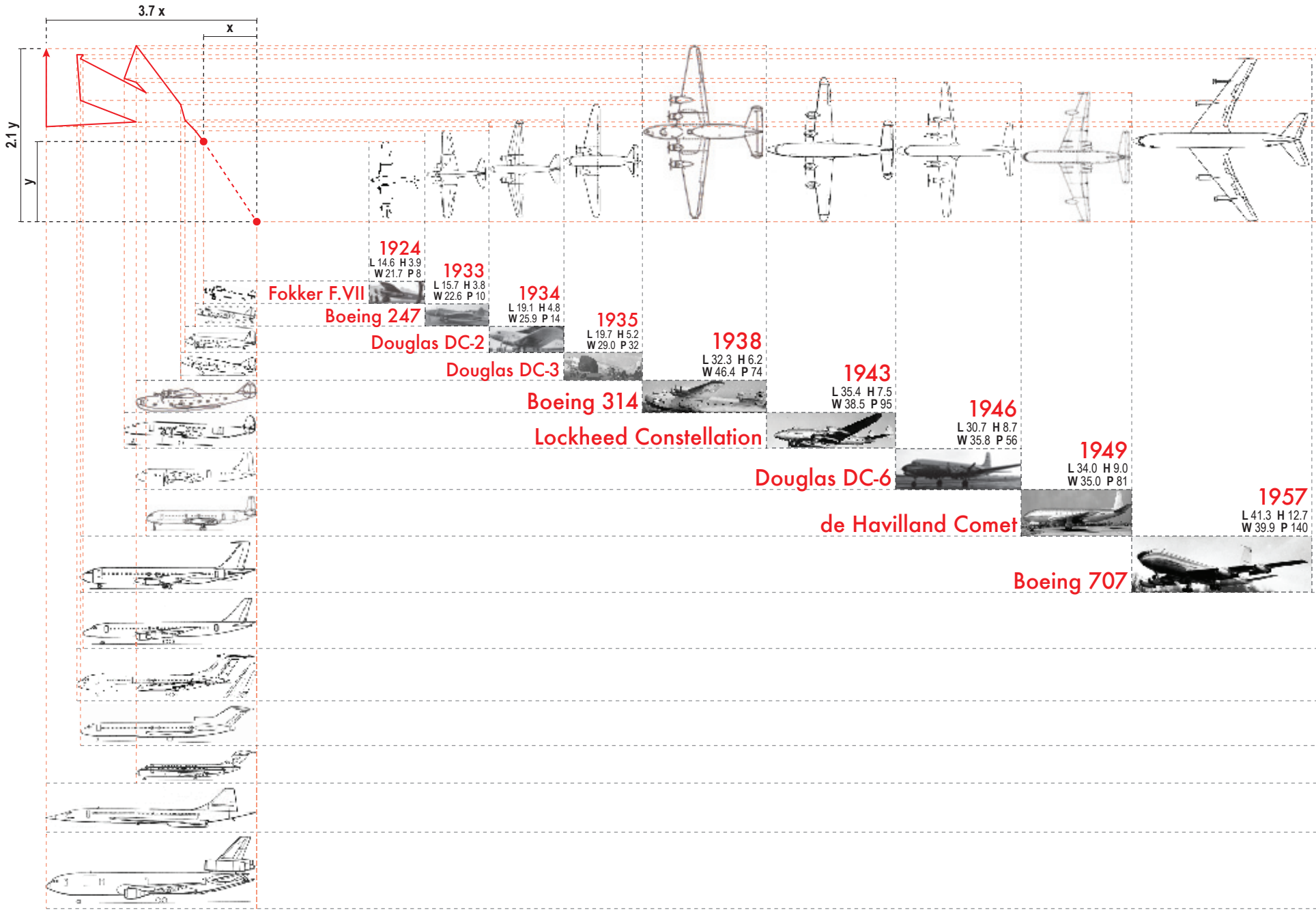
In trying to formulate an argument for the final design proposal, I thought it crucial to begin dissecting the various pre- and post-security areas of a generic airport. A scope of study was established from the beginning in order to limit the analysis to one that would most directly relate to my design. The analysis itself is shaped by airport design literature, my own experiences in various airports, and intuitive predilections. Ultimately, the purpose of this systematic breakdown is to suggest the most responsible and holistic approaches architects should take in designing for a pleasant passenger experience at a multi-level international airport.

All airports consist of a number of public and restricted areas, including but not limited to: the curbside, departures (check-in) and arrivals (bag claim) halls, security and passport control, and gate concourses. At most international airports, these areas are kept strictly segregated from one another to ensure a smooth and efficient passenger flow from beginning to end. At large international airports, departing and arriving passengers circulate independently from one another, often on different floors entirely. As architects, we must ensure that the main purpose of the airport (efficient passenger and luggage processing) is achieved in such a way that does not compromise the appeal of the passenger experience.

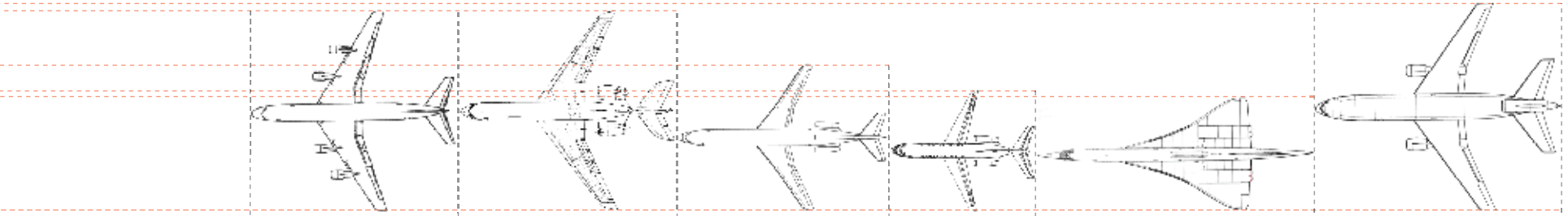
The analysis goes beyond examining entire terminal areas to focussing on specific elements within these areas that work together to form the overall atmosphere or character of a space. These elements, such as seating and signage, work with the more traditional aspects of the architecture to either positively or negatively influence the passenger experience. A holistic approach requires that architects assert control over every aspect of terminal design, including those aspects which may initially seem out of their realm of influence. Like an organism, if the modern airport is to evolve into something greater, it must do so with every fibre of its being.

[2.2] *View of atrium over baggage claim area at Madrid-Barajas Terminal 4.*

2. Anatomy of an Airport


3.7 x
x
2.1 y
y
1924
L 14.6 H 3.9
W 21.7 P 8
Fokker F.VII
1933
L 15.7 H 3.8
W 22.6 P 10
Boeing 247
1934
L 19.1 H 4.8
W 25.9 P 14
Douglas DC-2
1935
L 19.7 H 5.2
W 29.0 P 32
Douglas DC-3
1938
L 32.3 H 6.2
W 46.4 P 74
Boeing 314
1943
L 35.4 H 7.5
W 38.5 P 95
Lockheed Constellation
1946
L 30.7 H 8.7
W 35.8 P 56
Douglas DC-6
1949
L 34.0 H 9.0
W 35.0 P 81
de Havilland Comet
1957
L 41.3 H 12.7
W 39.9 P 140
Boeing 707

[2.3] *Mapping changes in size and capacity of airplanes built between the 1920's - 1970's.*



1958
L 45.9 H 13.2
W 43.4 P 124

Douglas DC-8

1962
L 48.4 H 12.0
W 44.6 P 151

Vickers VC10

1963
L 46.7 H 10.4
W 32.9 P 189

Boeing 727

1965
L 31.8 H 8.4
W 27.3 P 90

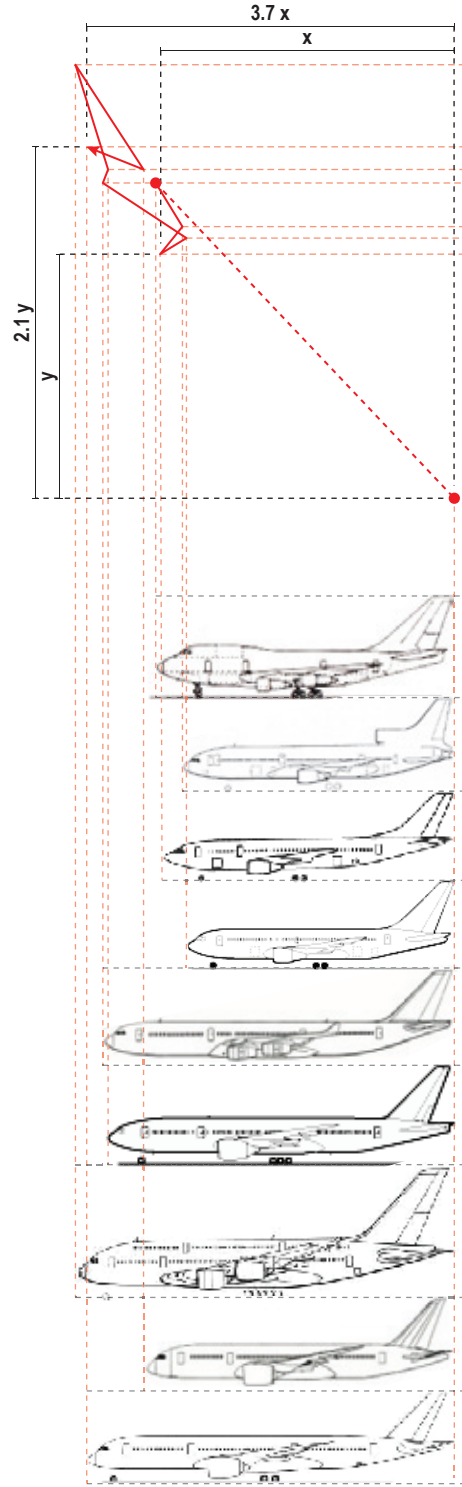
McDonnell Douglas DC-9

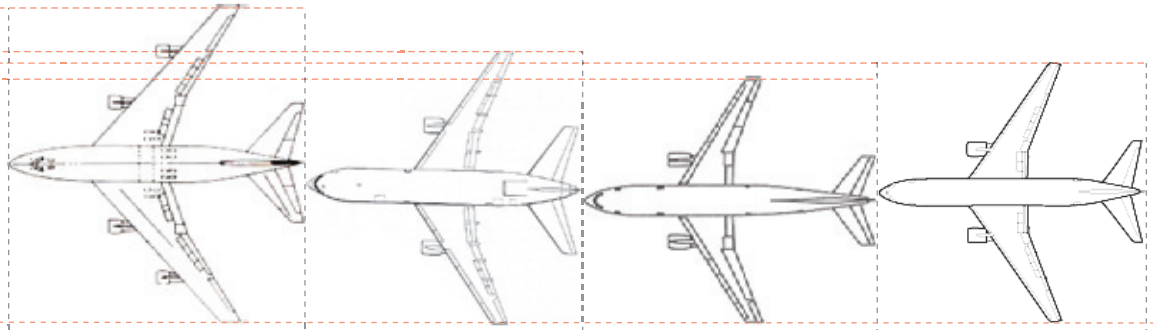
1969
L 61.7 H 12.2
W 25.6 P 120

Concorde

1970
L 52.0 H 17.7
W 47.3 P 255

McDonnell Douglas DC-10





1969
L 70.6 H 19.3
W 59.6 P 452

Boeing 747

1970
L 54.2 H 16.9
W 47.4 P 253

Lockheed L-1011

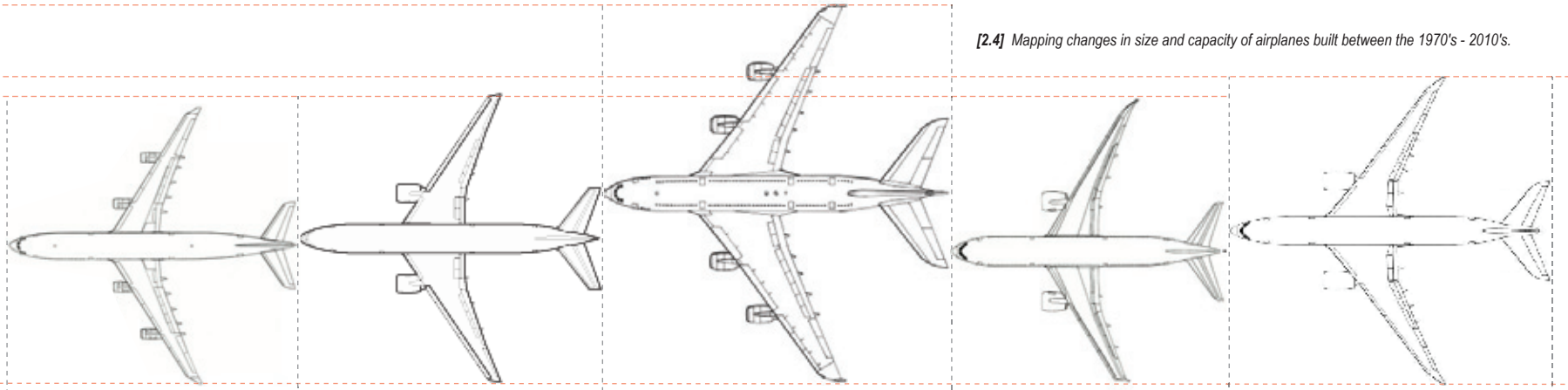
1972
L 54.1 H 16.6
W 44.9 P 266

Airbus A300

1981
L 48.5 H 15.8
W 47.6 P 224

Boeing 767

[2.4] *Mapping changes in size and capacity of airplanes built between the 1970's - 2010's.*



1991
L 59.4 H 16.7
W 60.3 P 300

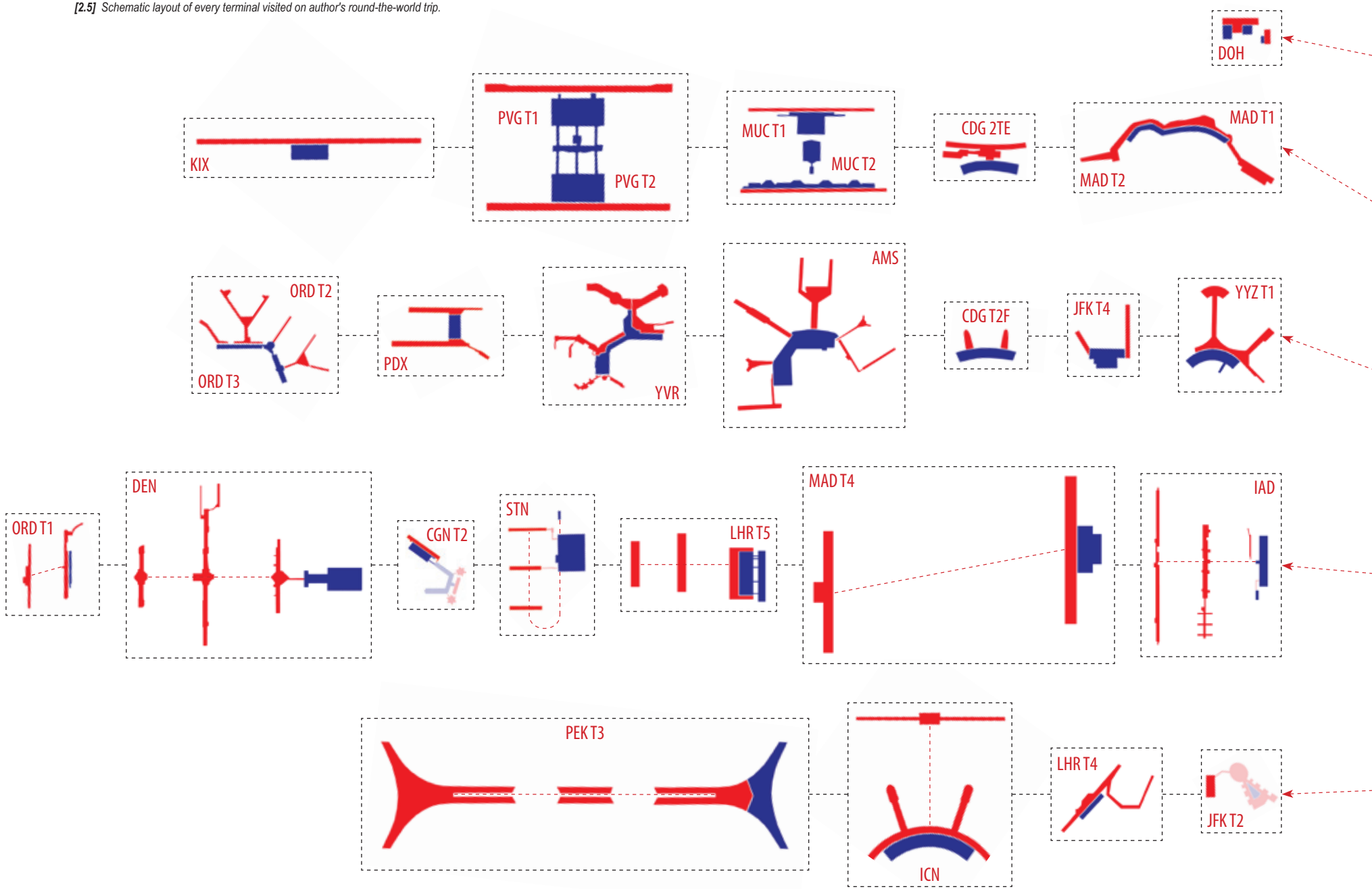
1994
L 63.7 H 18.5
W 60.9 P 400

2005
L 72.7 H 24.5
W 79.8 P 644

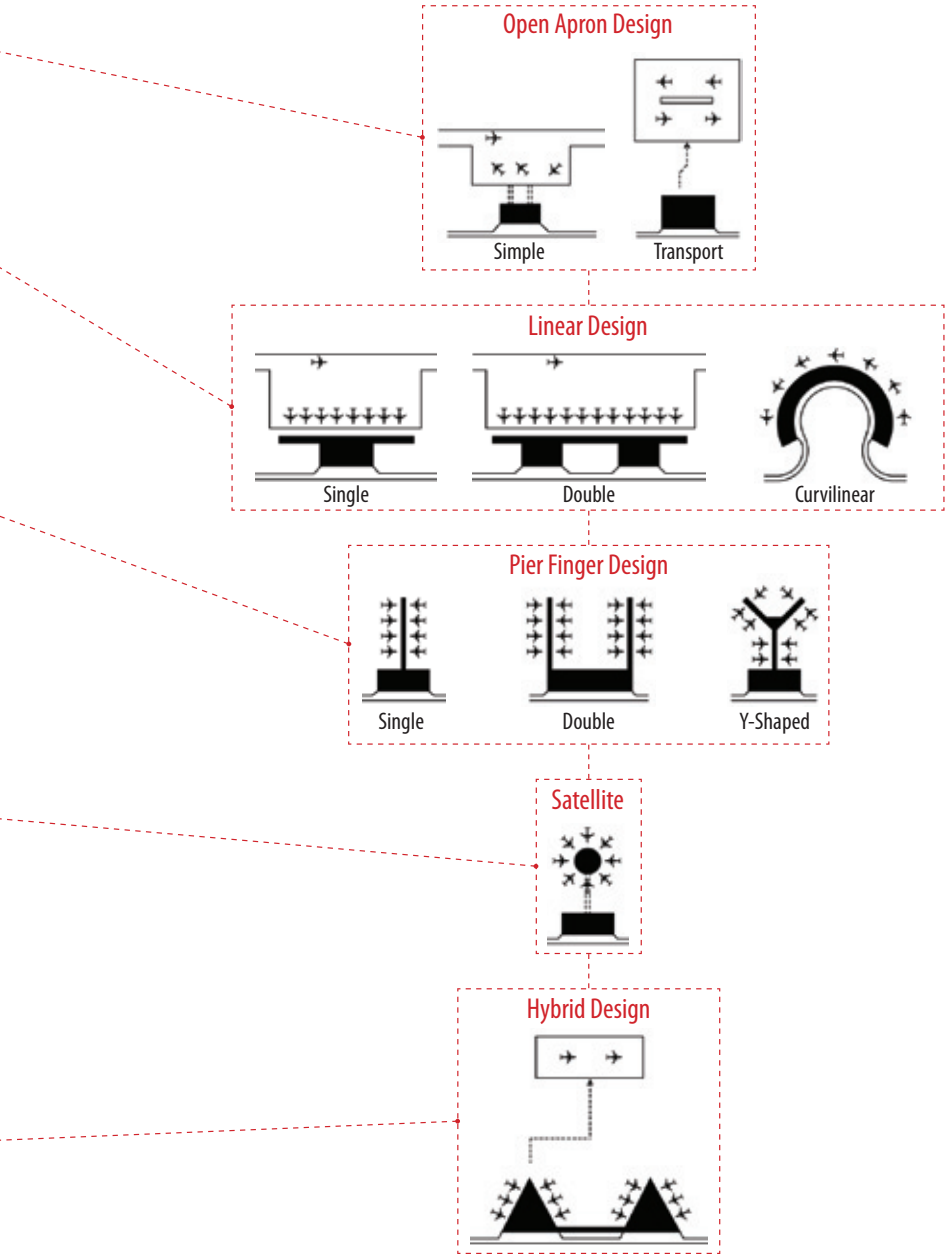
2009
L 56.7 H 16.9
W 60.0 P 264

2013
L 60.5 H 17.1
W 64.8 P 312

[2.5] Schematic layout of every terminal visited on author's round-the-world trip.



[2.6] Standard terminal types.



Terminal Types

The shape of an airport terminal can influence the passenger experience in more ways than one. Each terminal must be designed to adequately service and process the millions of passengers that flow through it annually. Future expansions are generally unavoidable, but are necessary and beneficial so long as they occur thoughtfully and leave room for further adaptations.[1] A successful footprint results in an efficient passenger circulation, navigation, and boarding process.

Chapter 3 of this book details the author's travels around the world to experience, document, and analyse a variety of airport terminals and layouts. Of the 28 terminals visited, most fall into the linear, pier finger, satellite, and hybrid design categories. Only Doha International Airport in Qatar exhibits an open apron design, meaning that the terminal makes no provisions for airplane docking, forcing passengers to walk or be driven to airplanes lined up on the tarmac.

The open apron scheme is becoming increasingly obsolete in many parts of the world and is rarely implemented in the design of new international airports.[2] Large footprints with extensive surface areas for docking are becoming the new norm when dealing with the unavoidable increase in annual passenger flow. Flexibility, and capacity for expansion are also becoming prerequisites for modern-day airport design, leaving many of the airports built in the 60's and 70's to face enormous challenges with regards to upgrading and standardization.

The condition of decrepitude that is beginning to take hold of many airports, particularly in the United States, will be examined and expanded upon in later sections and serves as one of the primary instigators for the specific scope and focus of the final design proposal.

Terminal Sizes

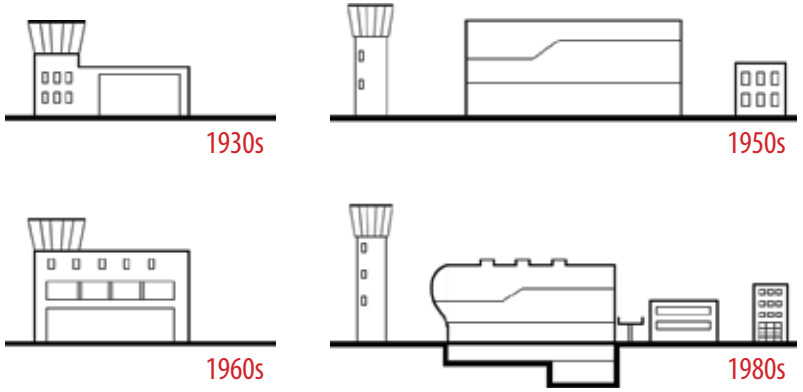
In deconstructing the elements that work together to form the basic underlying composition of an airport terminal, it is important to first narrow the scope of focus down to include only international airports. The ultimate goal of this thesis is to propose a holistic design approach, that attempts to counteract the chaotic and overwhelming nature of some international airport terminals, in order to give way to a far more pleasant and stress-free experience.

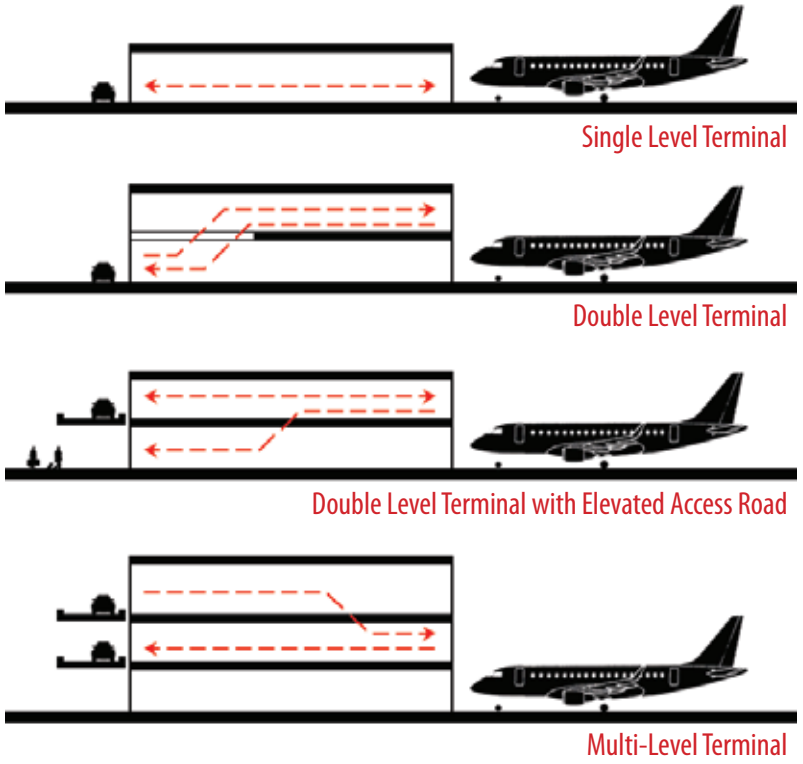
At 4 levels, 69,000 square metres, and a capacity of 6 million passengers annually, Köln-Bonn's Terminal 2 falls into the category of an international airport.[3] At almost 14 times its size and 7 times its capacity, Beijing Capital's Terminal 3 falls into the same category, albeit at the complete opposite end of the spectrum.

International airports come, literally, in all shapes and sizes. Over the years, they've evolved from one-storey administration buildings only, to four or sometimes even five-level megastructures that house services for passengers, planes, and airport personnel, as well as include links to existing infrastructure.[4] Hangars, as has been the case from the very early days of the airport, remain removed from the main passenger terminal for practical purposes and as a means of separating and emphasizing the importance of the passenger experience.

The following analysis will breakdown a generic, multi-level airport in order to demonstrate which design approaches cater best to the needs of passengers at every step along the way in the airport process, both from the perspective of departure and arrival. Logic, common sense, precedents, standards, experience, and basic intuition will guide the analysis, which in turn will form the foundational arguments for the final design proposal.

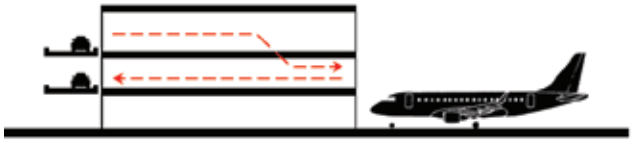
[2.7] *Changing pattern of airport design.*





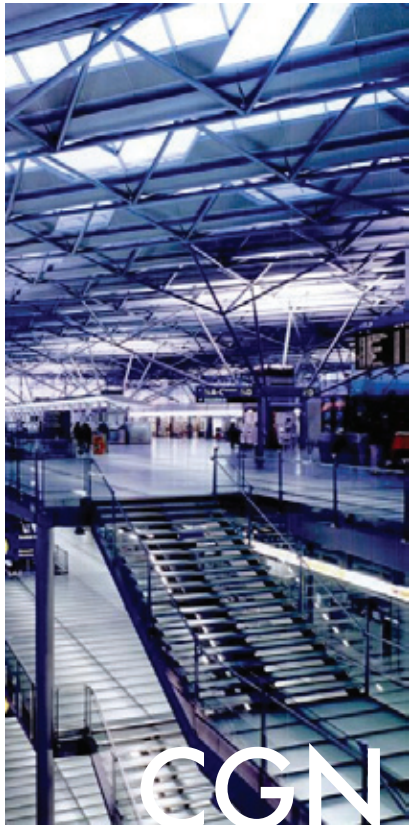
[2.8] *Vertical segregation in typical terminals.*

Study Area



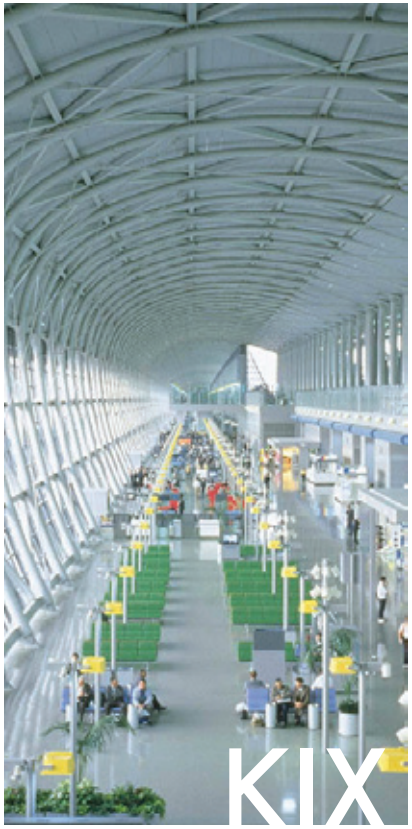
Multi-Level International Airports

Koln-Bonn Airport T2
Annual Capacity: 6 million[5]
Area: 69,000 sq m[3]
Levels: 4



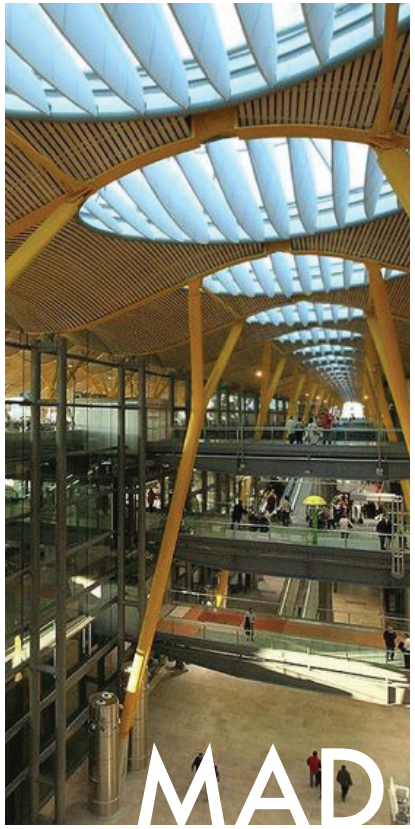
[2.9] Köln-Bonn International Airport, Terminal 2
~ Murphy/Jahn (2000)

Kansai Airport
Annual Capacity: 17 million[6]
Area: 303,000 sq m[7]
Levels: 4



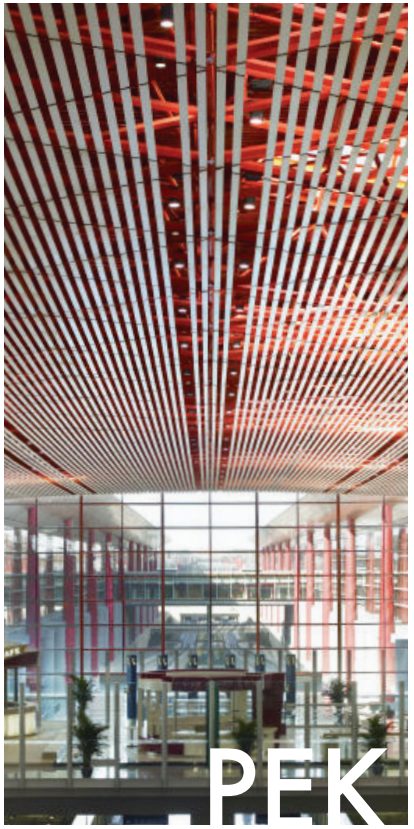
[2.10] Kansai International Airport
~ Renzo Piano (1991)

Madrid-Barajas Airport T4
Annual Capacity: 35 million[8]
Area: 785,000 sq m[8]
Levels: 5

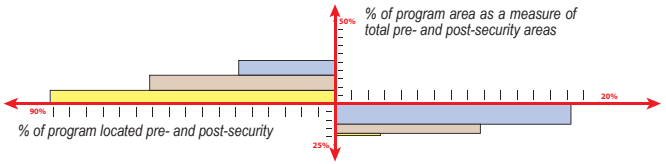


[2.11] Madrid-Barajas Airport, Terminal 4
~ Rogers Stirk Harbour + Partners (2006)

Beijing Capital Airport T3
Annual Capacity: 50 million[9]
Area: 1,300,000 sq m[9]
Levels: 6



[2.12] Beijing Capital International Airport, Terminal 3
~ Foster + Partners (2008)

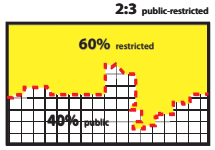


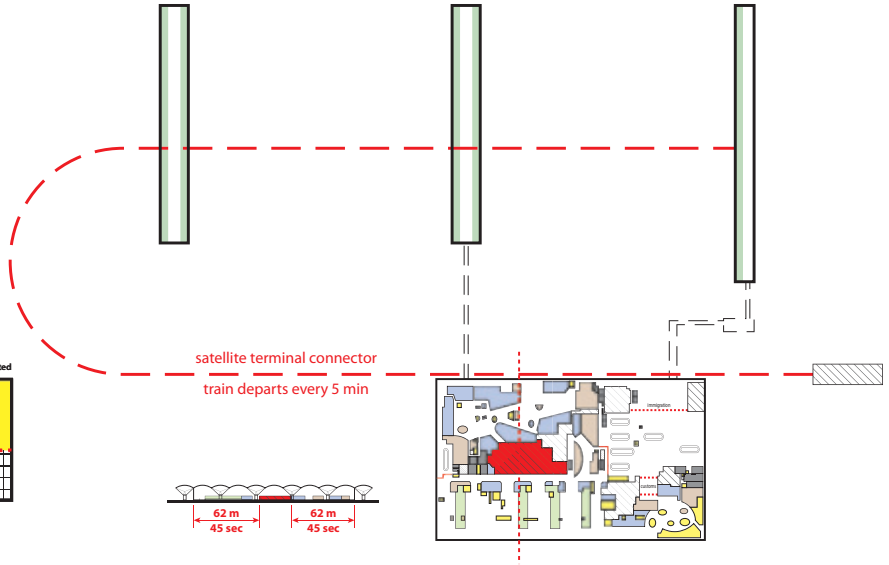
over 85% of the service program and less than 30% of the retail is located prior to the security checkpoint

the program area located pre-security makes for only 30% of the entire floor area located prior to the checkpoint, while the program area located post-security only amounts to 20% of the entire secured floor area

what the graph tells us is that there is an adequate amount of service program located prior to the security checkpoint, but perhaps not enough food or retail outlets

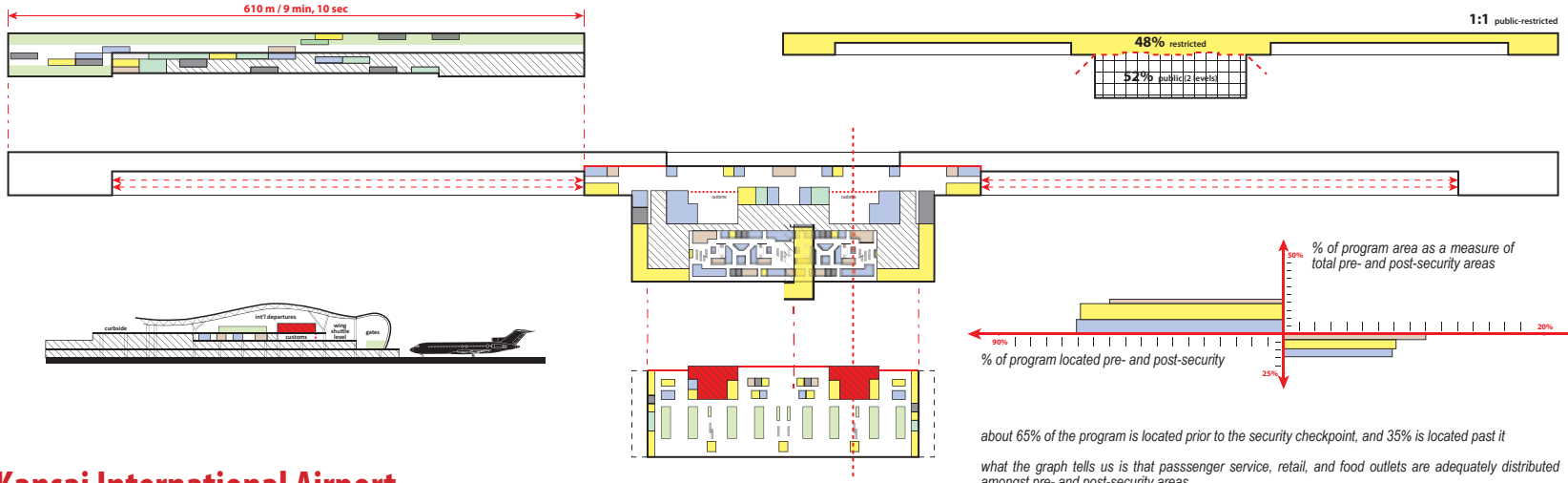
the graph also indicates that there is too high a concentration of particularly retail and food outlets located past the security checkpoint





Stansted International Airport

London, United Kingdom



about 65% of the program is located prior to the security checkpoint, and 35% is located past it

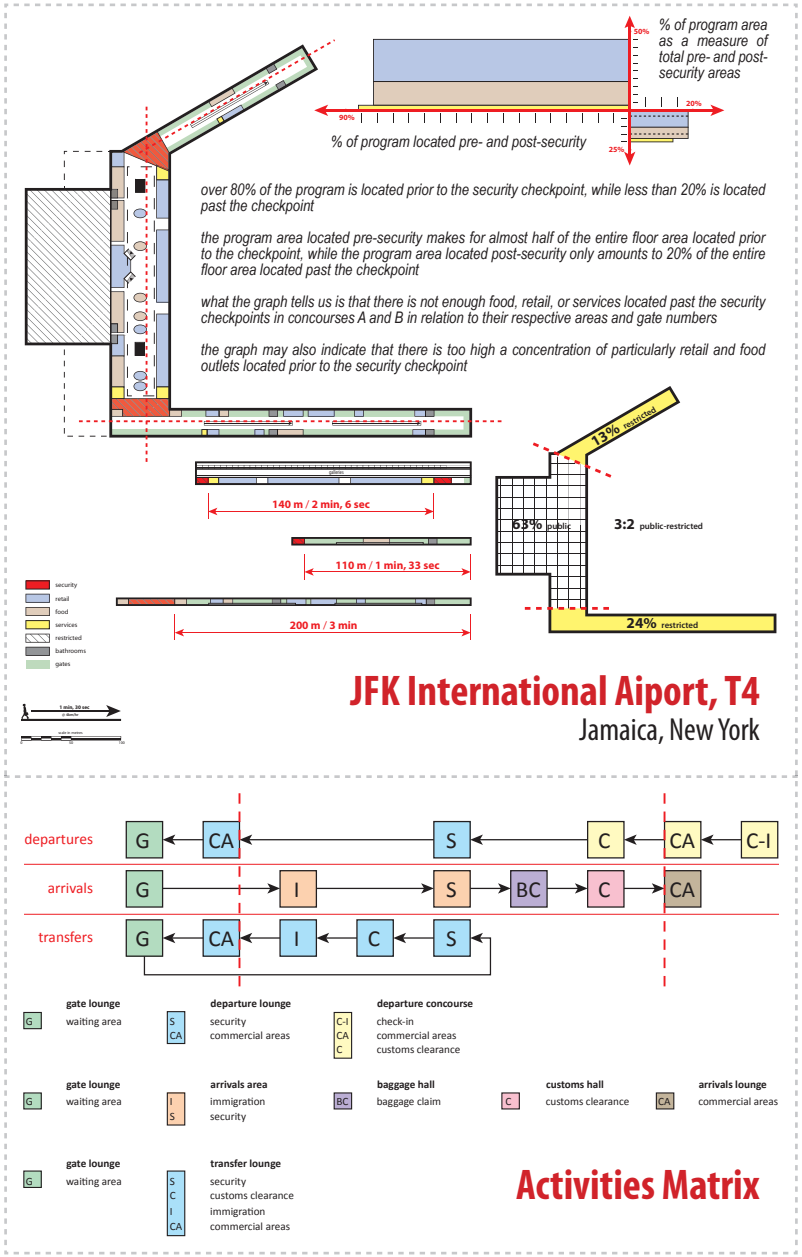
what the graph tells us is that passsenger service, retail, and food outlets are adequately distributed amongst pre- and post-security areas

the graph may also indicate that there is too low a concentration of particularly retail and food outlets located past the security checkpoint as compared to the total secured floor area

Kansai International Airport

Osaka, Japan

[2.13] Programmatic breakdowns of three terminals with distinctly different footprints.



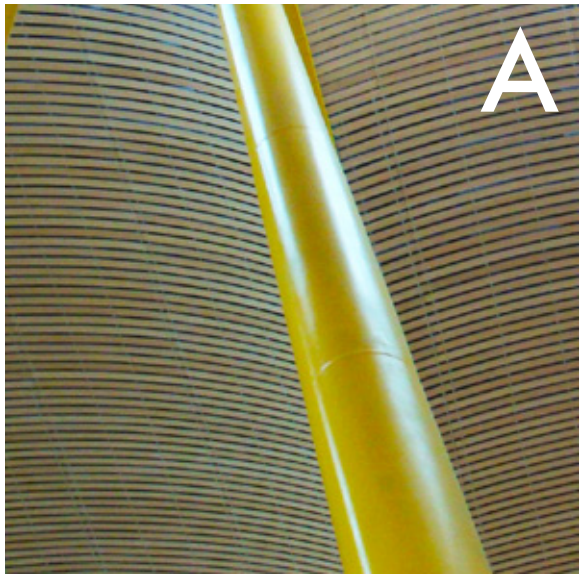
[2.14] Activities matrix showing standard departure, arrival, and transfer sequences.

Case Studies

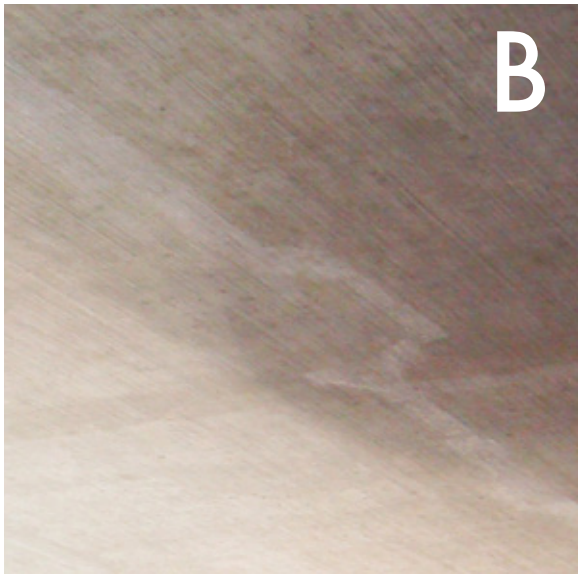
Upon returning from my travels, I felt it prudent to begin dissecting the configurations and programmatic arrangements of a number of the airports I had seen. The focus shifted in on three airports in particular, ranging from the somewhat small, in terms of size and capacity, at Stansted in London, to the mid-sized at JFK's Terminal 4, and to the considerably larger terminal at Kansai International in Osaka. The plans, including the location of shops and services, circulation routes, and gate areas, were recreated primarily from photos and memory in an attempt to more genuinely depict a passenger's experience of the architecture and, more specifically, its functionality.

There often seems to be an imbalance between the amount of program, including retail and food outlets, located prior to and post the security checkpoint. Depending on where the checkpoint itself is located, as well as how effectively floor space is used, one of two things tends to happen. Either passengers find themselves passing through security prematurely simply because there is not much to do or see with their loved ones prior to the checkpoint, or oppositely they may linger in pre-security areas for far too long, taking advantage of the multitude of shops and restaurants available, knowing that the gate concourses will offer little of the same.

The case study airports exhibit three distinct approaches to the amount of program located pre- and post-security. At Stansted, 70% of the retail and food services are located past the checkpoint, while the opposite is true at JFK's T4. The condition at Stansted is made worse by the fact that the main terminal building acts only as an intermediary between the passengers and their gates, a risky situation that could lead to mad dashes to gates or missed flights entirely. Of the three terminals examined, the most balanced condition exists at Kansai International, where retail, food outlets, and services are dispersed fairly evenly throughout.



[2.15] *Coated bamboo roof cladding at Madrid-Barajas Airport Terminal 4.*



[2.16] *Salt stain on the underside of the concrete roof finish at CDG's T2F.*

[2.17] *Damaged stucco exterior at John F. Kennedy Airport Terminal 2.*

Introducing...

THE GOOD, THE OK, AND THE BAD

A

★★★

functional and
aesthetically pleasing
+
caters to all
passenger needs

B

★★

somewhat functional and/or
aesthetically pleasing
+
caters to some
passenger needs

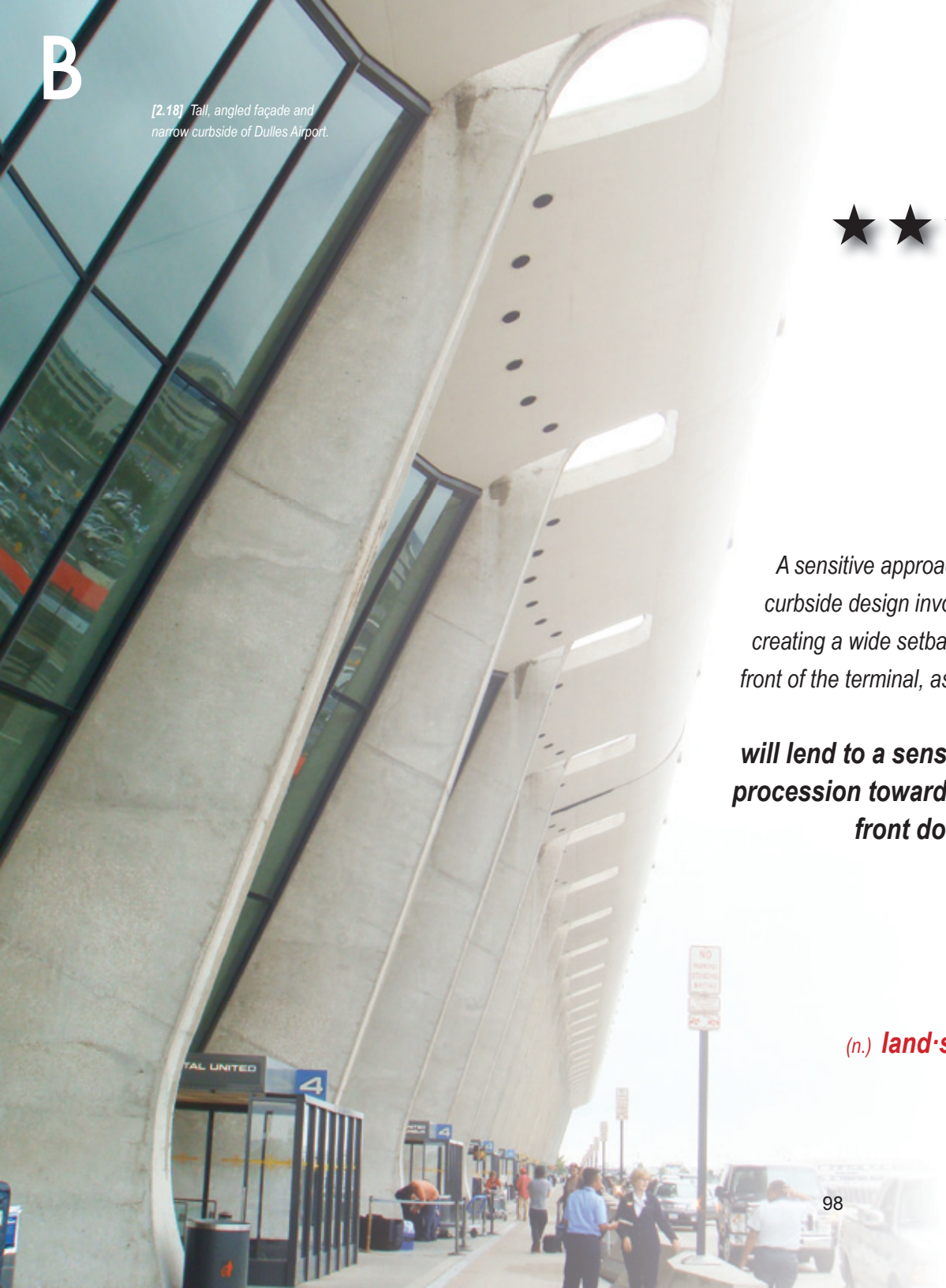
C

★

not functional and/or
aesthetically pleasing
+
does not cater to
passenger needs

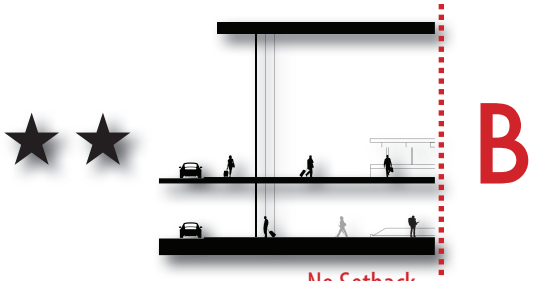
B

[2.18] Tall, angled façade and narrow curbside of Dulles Airport.



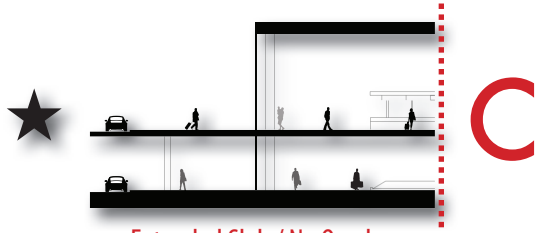
A

Setback / Covered Walkway



B

No Setback



C

Extended Slab / No Overhang

A sensitive approach to curbside design involves creating a wide setback in front of the terminal, as this

will lend to a sense of procession toward the front doors.

(n.) ***land·side***

the part of an airport farthest from the aircraft, the boundary of which is the security check, customs, passport control, etc.[10]

[2.19] A generous setback makes room for a waterjet feature in front of the entrance to Terminal 5 at Heathrow.
[2.20] The looming entrance façade of JFK's Terminal 4.

[2.21] A view of the massive overhang over the curb at Beijing Capital's Terminal 3.
[2.22] A dark and less-than-impressive exit area at JFK's Terminal 2.

Curbside

While this thesis focuses mainly on interior airport design, as it most directly relates to the passenger's airport experience, the importance of a well-designed curbside cannot be overstated. For the purposes of this section, curbside will refer to the designated entrance façade of the airport that faces the drop-off and pick-up points.

All too often, like at Dulles International Airport, the entrance façade sits practically flush against the roadway, resulting in a very narrow sidewalk and congested lateral circulation. A similar situation, albeit with a slightly wider sidewalk, exists at John F. Kennedy's Terminal 4. In both cases, the double-height check-in space, along with an angled façade toward the curb, makes a towering and almost intimidating impression on the passenger. Although such gestural angles work nicely in section, they sit removed from the human scale, particularly if no setback exists. At JFK's Terminal 2, where a substantial setback does exist, the protruding slab of the departures level makes for a dark and uninviting exit area for arriving passengers. Although any sort of overhang is a bonus (even a cantilevered slab), the almost underground feel of the space signifies to the passenger that, at least from the point of view of the architect, arriving is not as important as departing.

A much more sensitive approach to curbside design involves creating a wide setback in front of the terminal, as this will lend to a sense of procession toward the front doors. In doing so, the architect also avoids convoluting the space directly in front of the entrance and can concentrate on creating a spacious and an aesthetically pleasing approach. By setting back the roadway, it is now possible to expose the lower-level exits, ensuring that both departing and arriving passengers will experience a similar quality of space. The curbside, being the first and last thing a passenger will experience, must never be overlooked in the design process.

Check-in The first interior space a departing passenger will experience is the check-in hall. From the moment they enter the terminal, passengers begin scoping out the area to determine where they need to go to get their boarding passes, and afterwards to reach security. In addition to implementing clear and straightforward wayfinding measures, it is essential for the architect to create a free-flowing and one-directional (as much as possible) space. In doing so, congestion and cross-traffic can be reduced to a minimum, allowing the passenger to move from one point to the next in a linear and timely manner.

In most recently built international airports, check-in desks are freestanding and arrayed along the length of the hall in an orientation parallel to the flow of traffic. This modular layout not only makes for an efficient check-in and bag drop process, but also provides architects with enough inherent design flexibility to expand the hall at a later date if need be.[11] This capacity for expansion and layout modification is almost nonexistent at many older airports, in particular those built before the modular design approach of the 90's became popularized. At O'Hare's T2 and Heathrow's T4, almost identical planometric conditions create almost identical circulation blockages. Passengers are forced to line up in front of built-in check-in desks in a fairly narrow hall that relies on them to circulate sideways to reach security checkpoints. Instead of a consistently forward-moving flow, a back-and-forth sideways flow is created, which results in periodical congestion.

In addition to making sure that the check-in hall works well in plan, it is equally important to design thoughtfully in section. A tall and well-lit (both artificially and naturally) space creates a brighter and less claustrophobic atmosphere, ensuring that passengers will be able to orient themselves more easily, have a far more pleasant experience, and get where they need to go with the least hassle.

[2.23] *Bright and spacious check-in hall, with standalone kiosks, at Pearson Airport's Terminal 1.*

[2.24] *High ceilings at Chicago O'Hare Terminal 2 with kiosks built-in to the front wall facing the entrance.*

[2.25] *View of the check-in hall at London Heathrow's Terminal 4, showing a low ceiling and lack of daylighting.*

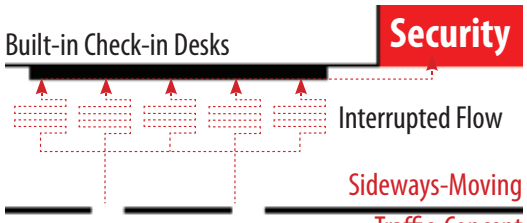
A

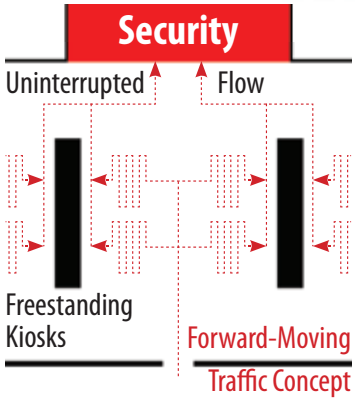
[2.26] *Freestanding kiosks at Köln-Bonn Airport.*

Flexibility must become a prerequisite *for thoughtful expansion.*

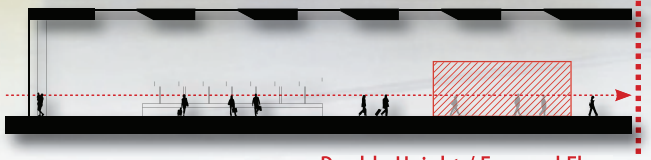
Prefabricated Kiosks

An adaptable layout *ensures that changes in capacity will never have the power to render an airport obsolete.*





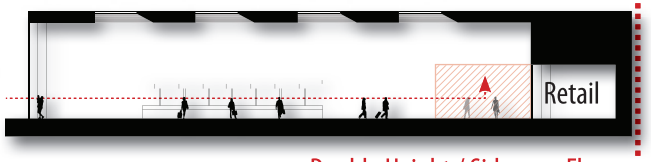
★★★



A

Double Height / Forward Flow

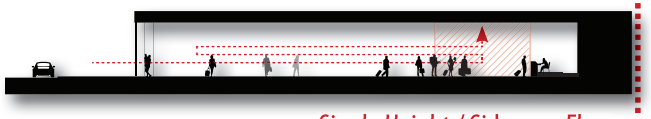
★★



B

Double Height / Sideways Flow

★

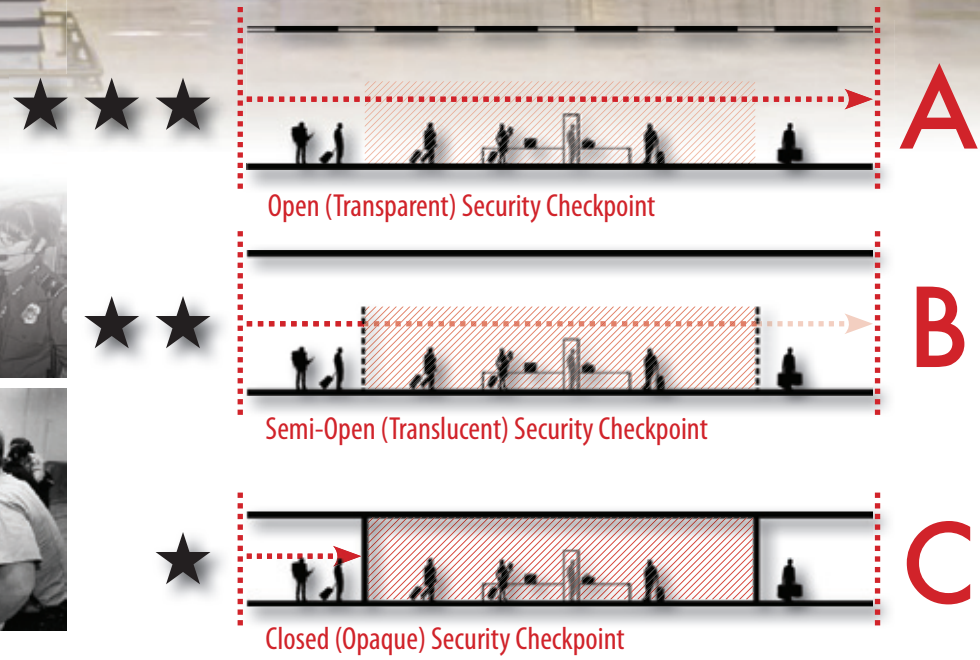


C

Single Height / Sideways Flow

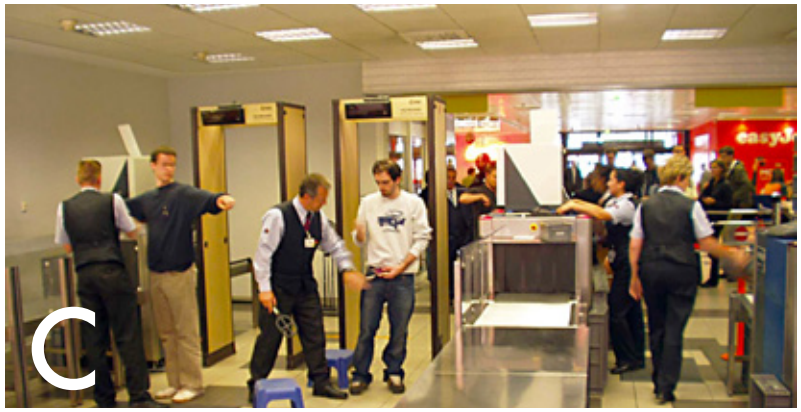
A

[2.27] The transparent customs and security area of Madrid-Barajas Terminal 4.



[2.28] Similarities between airport security and prison screenings. Can you guess which is where?

[2.29] Security checkpoint utilizing translucent barriers to blur screening procedures.



[2.30] A fully enclosed security checkpoint sporting a low, T-bar ceiling.
[2.31] A chaotic scene at Denver International as a result of high traffic and a poor queueing layout.

Security Checkpoint

The most contentious area in any airport has to be the security checkpoint, simply because of the extensive hassles and logistical issues passengers are forced to face. Modern airport security has, in a sense, hijacked the airport experience and made it dreadful, negative, and almost unbearable. As architects, we must reclaim what it has taken from us and from everyone else and offset the negative aspects of the experience with positive ones.

Transparency at the checkpoint has multiple meanings. An enclosed security zone with opaque walls prevents the passenger from establishing sightlines beyond the checkpoint, resulting in an inability to perceive distances or times to gates. On a psychological level, a closed-off checkpoint instils a sense of uncertainty in the passenger, as well as feelings of trepidation, and undoubtedly raises stress levels.

By opening up the area both visually and spatially, the passenger immediately feels less threatened by his or her surroundings and will naturally begin to feel more relaxed in the process. In terms of circulation, the fewer walls and winding corridors, the better, thus making it important to keep the area as open and free-flowing as possible. High ceilings, attractive interiors, extensive glazing, daylighting, and so on, ensure that the holistic nature of the design is not lost amongst the chaos of third-party security procedures.[12]

Security should be invisible. This does not mean it needs to be ineffective, but rather that it must become sensitive to the needs of passengers. If airport security and human paranoia begin to overshadow the essence of what the airport was, and could become again, it will be the last and only thing that any passenger will ever remember from his or her so-called ‘airport’ experience.

Gates Concourse

Depending on where the security checkpoint is located, how early on in the process passengers decide to go through it, as well as the length of layovers for those transferring, passengers may find themselves spending quite a bit of time waiting at their gates prior to boarding. As such, it is crucial that architects make an effort to ensure that these areas work well both functionally and aesthetically, in order to create the most pleasant waiting environment.

As a means of separating departing and arriving passengers, many airports use a two-level gates concourse scheme.[13] While this certainly avoids cross-circulation congestion and confusion, it also tends to lead to the design of low-ceiling spaces, particularly on lower floors. This exact scenario can be found at JFK's Terminal 4, which situates the departing level above the arrivals level. The floor plate is surprisingly wide, and the ceiling height is surprisingly low, making for an almost oppressive environment. At least the design showcases floor-to-ceiling glass along the perimeter, something which cannot be said for most gate areas at Chicago O'Hare's T2. To make matters worse, at O'Hare, circulation for departing and arriving passengers is combined on one level, creating congestion in a gates concourse that already projects an institutional and uninviting atmosphere.

At Seoul Incheon Airport, a double-height space, as well as extensive use of glazing along the perimeter and via skylights, makes for a well-lit, spacious concourse. Unlike at O'Hare T2 where program is often located along the perimeter and takes up valuable seating space, retail, shops, and services at Incheon line up along the spine of the floor plate. Traffic is also kept entirely separate and localized in the middle of the space, ensuring that gate areas remain undisturbed and tranquil. And, most importantly, departing passengers occupy the lower floor while arriving passengers occupy the upper, avoiding cross-traffic entirely.

[2.32] *Separated departures and arrivals circulation at Pearson Airport Terminal 1.*

[2.33] *A double-height space with no skylights at Madrid-Barajas, Terminal 2.*

[2.34] *A wide, single-height gates concourse with no skylights at JFK Terminal 4.*
[2.35] *A narrow gates concourse with windows few and far between at O'Hare Terminal 2.*

The airside corridor needs to accommodate departing and arriving passengers ***without undue congestion.***

Segregation may occur within the overall space to define gate lounges, but generally the departure lounge [should be] ***a wide, spacious and leisurely concourse.***[14]

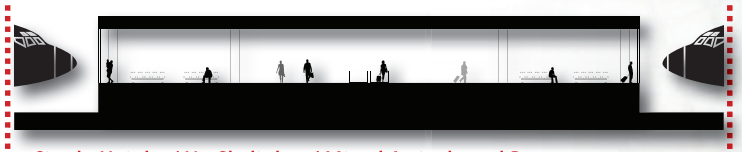
A

Double Height / Skylights / Distinct Arrivals and Departures

B

Double Height / No Skylights / Mixed Arrivals and Departures

C



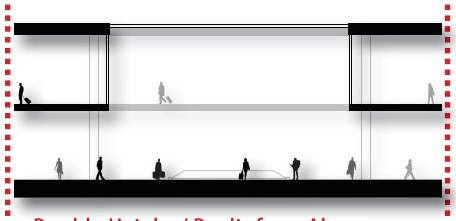
Single Height / No Skylights / Mixed Arrivals and Departures

[2.36] *The sleek and well-lit gates concourse of Seoul Incheon Airport.*

A

[2.37] Atrium space over baggage claim hall at Madrid-Barajas Airport Terminal 4.

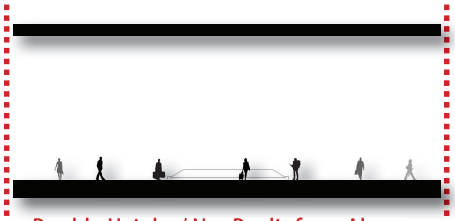
★★★



A

Double Height / Daylit from Above

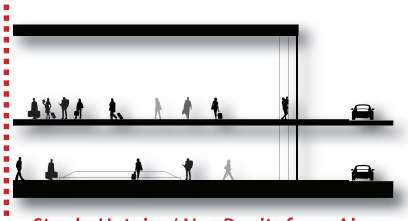
★★



B

Double Height / Not Daylit from Above

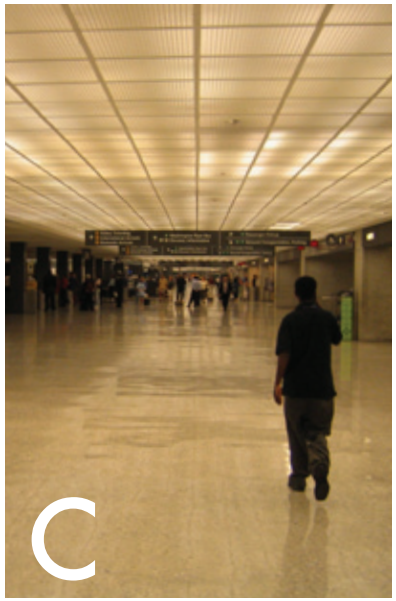
★



C

Single Height / Not Daylit from Above

[2.38] A view of the baggage claim hall, and its intricate ceiling detail, at Heathrow's Terminal 5.



[2.39] Beige-coloured bag claim hall at Dulles Airport.

[2.40] Bag carousel in a factory-like hall at Heathrow T4.

Baggage Claim

All too often, baggage claim areas at airports are left underdeveloped and unattractive, despite being one of the last program areas that arriving passengers will see before leaving. Low ceilings, garish artificial lighting, and a general lack of natural lighting combine to make baggage claim areas extremely depressing final stopping points for passengers. Considering the long and tiring flights that usually precede their arrival, the fact that most bag claim areas fail to reflect a basic standard of design is a sad and unacceptable reality of modern-day airport design.

Many older airports, like Dulles, exhibit these shortcomings simply by virtue of their restrictive plans and sectional arrangements. At Dulles, the bag claim is catered to a sideways traffic flow, creating a congested condition not unlike what is found above in its check-in hall. In addition, natural light only enters the space at the glazed exit points, making for a very dark space along the opposite wall where the carousels happen to be located. An even less attractive scenario exists at the baggage claim zone of Heathrow's T4, which bears a shocking resemblance to a factory floor. Whatever breathing room passengers gain from the double-height ceiling is quickly countered by the unnerving nature of this dark and completely uninspiring space. No natural light, unintentionally exposed ceiling features, fluorescent lighting, and a poorly laid out floor plate make for a disappointing end to one's travels.

Heathrow's T5, designed more recently, does well to streamline circulation, and also provide an attractive material palette, but again does little in terms of allowing natural light into the hall. At MAD's T4, an atrium is created over the bag claim area that opens up the floor plate and allows ample daylight to filter through into the spaces below. Here, it is clear that the architect gave the design of the bag claim hall the importance it deserved as a central aspect of one's terminal experience.

Arrivals Hall

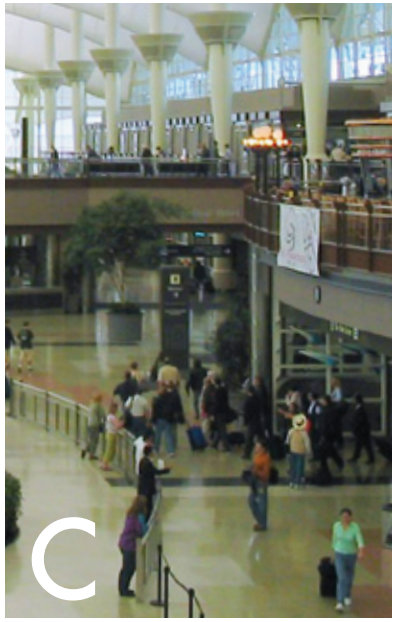
Very few airports make provisions for generous and attractive arrivals halls, for reasons similar to those that apply to baggage claim areas. For almost the entire history of airport design, departing has been seen as more important than arriving from the perspective of architects and airport authorities. This occasionally even meant the omission of an arrivals area entirely, forcing the passenger to meet with his or her family and loved ones at the exits of the airport. While this may have been a perfectly acceptable and appropriate design strategy for airports designed prior to the commercial flight boom of the 60's and 70's, it no longer adequately responds to the current capacity situation.

Unlike at Dulles where no arrivals hall actually exists, Denver International does in fact showcase a public (perhaps almost too public) arrivals area. The upper level of this large atrium space handles departing traffic, while the lower caters to arriving passengers. These divisions are not fixed in stone however, as passengers can freely move about from floor to floor to access retail and food outlets. Unfortunately, no measures were taken to create an actual arrivals hall or at least hide the arrivals area from plain view of everyone in the terminal, a fact that likely leaves arriving passengers feeling exposed, rushed, and unable to take in their surroundings.

At London Heathrow T4, a semi-exposed arrivals hall has been created near the front façade of the terminal. Here, half of the hall functions as an atrium space, while the other half, directly in front of the arrival doors, exhibits a far more intimate feel. Clearly demarcating the arrivals area, while still being able to open up the space and allow natural light in, provides the privacy necessary for reunions and also emphasizes the importance and significance of the arrivals process. Architecture must cater to both the physical and emotional needs of passengers at every point along their airport experience, and that cannot exclude the very last.

[2.41] *Atrium space over arrivals area at Vancouver Airport. Light penetrates to below via skylights.*

[2.42] *Very public arrivals hall at JFK T4. A poor layout that emphasizes sideways circulation leads to congestion.*



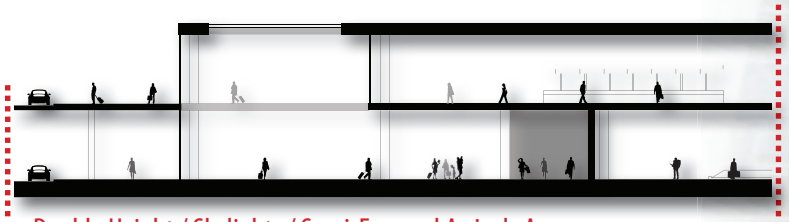
[2.43] *At Denver Airport, the arrivals hall sits open and exposed on the lower level of the main terminal.*

[2.44] *Almost nonexistent arrivals area at Dulles Airport. Passengers are quickly ushered out of the terminal.*

For almost the entire history of airport design,
departing has been seen as more important than arriving *from the perspective of architects and airport authorities.*

Architecture must ***cater to both the physical and emotional needs of passengers at every point along their airport experience,***
and that cannot exclude the very last.

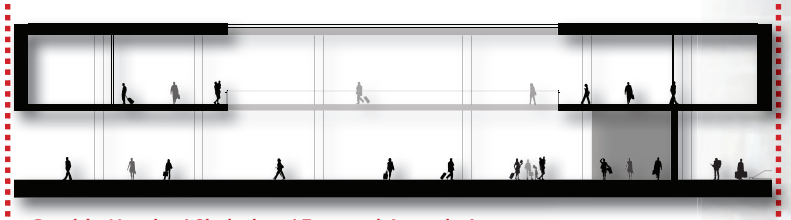
A



Double Height / Skylights / Semi-Exposed Arrivals Area

★★★

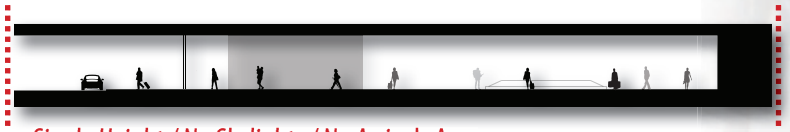
B



Double Height / Skylights / Exposed Arrivals Area

★★

C



Single Height / No Skylights / No Arrivals Area

★

[2.45] *Spacious and well-lit arrivals area at Heathrow Airport T5. A niche space and an atrium provide a measure of privacy, interesting views, and natural light penetration.*

A

As a designer, you have to think in time and see things in sequence.

You have to see information as a narrative form.[15]

[2.46] *Clear, simple, and well-integrated gate signage at Shanghai Pudong T1.*

AIGA Pictograms / Standard

Toan Vu-Huu Pictograms / Nonstandard

ERCO Pictograms/ Traditional

★★★

Standard Pictograms w/ Standard Type

Great Contrast / Easy to Grasp

A

★★

Nonstandard Pictograms w/o Any Type

Good Contrast / More Difficult to Grasp

B

★

Traditional Pictograms w/ Nonstandard and Excessive Type

Adequate Contrast / Most Difficult to Grasp

C

[2.47] *Schiphol Airport; Köln-Bonn Airport T2; Beijing Capital T3*

[2.48] Simple and distinct signage at Schiphol Airport showing average walking times to gates.
[2.49] Large pictograms integrated into the glass façade of Köln-Bonn Airport.
[2.50] Poorly-backlit and fairly confusing signage at Frankfurt International Airport.

[2.51] Pictogram styles from around the world. First row: Ольга Куликова, МХУПИ (Moscow Art College of Applied Arts and Academy of Graphic Design); AIGA; Cheongju International Airport (South-Korea); Logo-Arte (It); Hong Kong Airport; ERCO (e.g.: Frankfurt Airport). Second row: LB/T 001-1995 (China) Western Restaurant; LB/T 001-1995 (China): Chinese restaurant; ERCO Nº 0195; AIGA; ISO 7001: PI CF 001; Doha International Airport

Signage

A crucial aspect of wayfinding at any airport is the presence of clear and simple signage throughout the terminal. Signage starts on the outside, in the form of airline names and logos along the curbside, and moves to the interior in the form of navigational signs and symbols. In the departures hall, passengers must understand how to reach their check-in desks and the security checkpoint. Beyond the checkpoint, they need to know how to reach various amenities and, most importantly, their gates. If signage is successful in its design, these processes will be fluid and relatively straightforward. If it fails in terms of clarity, it will result in confusion, congestion, and ultimately panic on the part of the passenger.

In his article *Don't Screw with Conventions*, graphic designer Mark Boulton explains the importance of designing signage around three simple ideas: conspicuity, contrast, and task. He writes:

> *Conspicuity is obvious. Make the signage stand out. They should compete with other things; architecture, or advertising. They should be high contrast. Most of all, they should help users complete their task.*[16]

In addition, as the title of his article suggests, standard type and pictograms, being more familiar to the masses, will always be easier to grasp than unconventional text and symbolism. Over the course of many years of usage, certain symbols, like the ones promoted by the AIGA (American Institute of Graphic Arts), have been imprinted into our psyches. To introduce anything entirely new would automatically result in a lag time when it comes to processing the information.

Lastly, integrating signage into architecture, as can be seen at Köln-Bonn T2, can be very interesting and even effective if thoughtfully done. However, pictograms alone are too simplistic; writing is necessary as a secondary measure for understanding.

Art From the early days of airport design, art has played a role in shaping the character of the spaces inside terminals. Originally, the inclusion of art was meant only as a means of establishing a sense of place within the airport.[17] In other words, if the architecture itself failed to tell you what city or country you were in, the art would fill in the gaps. In order for passengers to truly be able to appreciate their surroundings and the essence of their experiences, art should not trump architecture in hierarchical terms, but rather act, like other so-called 'standalone' elements in the terminal, to reinforce it.

At Chicago O'Hare Terminal 1, a life-size, fibreglass replica of a Brachiosaurus dinosaur can be found standing to the side of the gates concourse post security. What makes the piece especially interesting is how perfectly its skeletal structure sits against the backdrop of Jahn's terminal -- the curvature of its spine follows the curve of the roof arc and its skeletal frame mimics the structural ribbing along the length of this arcade-like space.[18] It enhances the form and aesthetic of the architecture and also establishes a sense of place by virtue of its ties to the famous Field Museum of Natural History, headquartered in Chicago.

Other approaches, like sculptures and paintings, which do little in the way of relating to the architecture, fair less well when placed in terminals. For instance, at Dulles International, photos of various monuments located in the United States are scattered about the gates concourse. The irony of showing a picture of St. Louis' Gateway Arch in an airport located in Washington, D.C., cannot be lost on the passenger. This effort falls short of what would be considered a successful coalescence of art and architecture and ends up taking away from the interior design of the waiting areas. Unlike sculpture, painting or photography alone lacks the required dynamism to engage with both the architecture and the passenger.

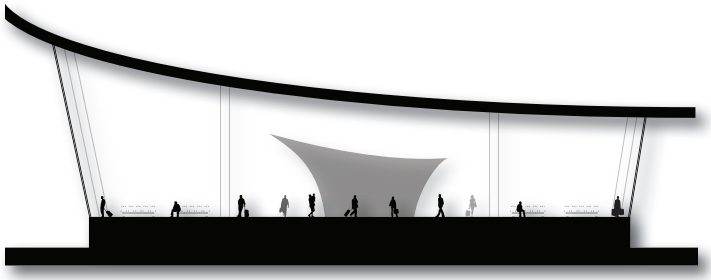
[2.52] *Engaging human-like figures depicting typical airport habits are scattered throughout Shanghai Pudong T2.*

[2.53] *A Richard Serra sculpture located post-security at Pearson Airport T1. The sculpture looms over passengers.*
[2.54] *Posters of American landmarks hang on a side wall in a waiting area at Dulles Airport. Note the fire alarm.*

Airport art should exist to reinforce airport architecture.

It should serve to enhance the aesthetic qualities of a space and ease, through its inherent beauty, passenger stresses. It must do these things all the while effortlessly integrating itself into the broader context of its surroundings.

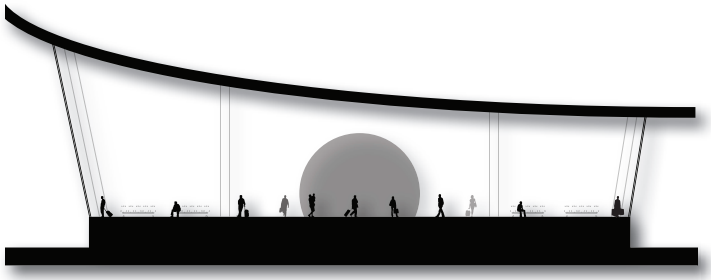
A



★★★

Sculpture that Correlates to the Architecture

B



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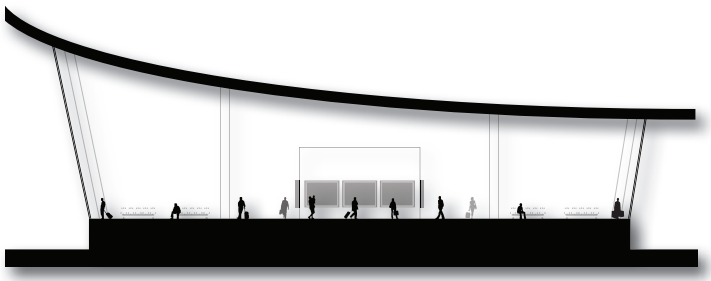
Sculpture that Does Not Correlate

C



★

Painting / Other

[2.55] *A Brachiosaurus at Chicago O'Hare T1 set against the architecturally exposed steel structure of the gates concourse.*

A

[2.56] The living wall at Singapore's Changi Airport T3. Reflective ceiling panels give the impression that the greenery stretches around the entire baggage claim hall.

There is nothing pointless *about trying to make spaces pleasant for their occupants.*

Infusing nature into an experience that has become entirely unnatural
serves to humanize a process that has become increasingly dehumanized.

[2.57] Greenhouse-like corridor connecting Incheon Airport's Transportation Center to the main terminal building.

[2.58] Inaccessible greenspace separating Terminals 1 and 2 at Shanghai Pudong Airport.

[2.59] An occasional plant, like this one at Madrid-Barajas T2, is not akin to accessible greenspace.

Greenspace

In trying to satisfy basic logistical and programmatic needs, architects occasionally overlook the importance of introducing more natural elements into their airport designs. These greenscapes in the form of gardens, green walls, courtyards, and so on, connect the passenger and the architecture back to the natural world and provide a measure of tranquillity that can offset the hectic nature of the airport experience. While the space-age theme of the 60's did little to necessitate the integration of these more 'earthly' elements, current trends are increasingly turning toward the inclusion of greenspace in airport design.

The occasional plant scattered about a terminal as can be found at Madrid-Barajas T2, despite being better than nothing, is not equivalent to finding an oasis in the midst of the madness. However, an oasis is exactly what SOM has tried to create at Changi International Airport, Terminal 3, with its enormous green wall located above the bag claim area.[19] This 300-metre long wall covered with vines and interspersed with four waterfall features, can be viewed from both the arrivals and departures halls. And although the space seems too large and removed from the human scale, the visually pleasing and emotionally calming aspects of the greenery, along with its clever integration into the architecture, undoubtedly enhances the quality of space.

The beauty of the green wall at Changi Airport is that not only is it visible to passengers, it is accessible to them as well, which is more than can be said for Shanghai Pudong T2's exterior courtyard. Any greenspace helps to offset the institutional feel of an airport, however, restricting access to such areas seems like a shame and even counterintuitive. Understandably, security prior to and beyond the checkpoint must not be compromised in any way, but this does not mean that architects should avoid seeking solutions that will satisfy both security and passenger needs. For an oasis is largely useless if ultimately unreachable.

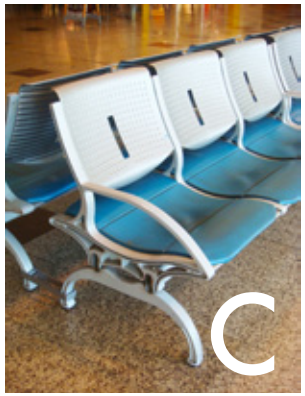
Seating

Like the design of security areas, airport architects tend to take a hands-off approach when it comes to the design of seating in waiting areas. Unfortunately, this unwillingness or inability to involve themselves in the decision-making process insofar as seating is concerned can lead to some unfortunate sacrifices being made in terms of comfort and style. A holistic approach mandates designing for passenger comfort on every level, and this cannot exclude seating.

Armrests at seats generally do more harm than good. Passengers all over the world tend to agree that armrests are terribly annoying when it comes to trying to get a couple of hours of rest before a flight. One conspiracy theory suggests that airport authorities insist on installing armrests in order to prevent passengers from lying down and taking up crucial seat space.[20] Even if this is true, there is a slight hole in the argument. Most passengers tend to try and sleep, not during the morning or afternoon when airport traffic is at its peak, but at night when traffic slows to a crawl. Furthermore, if given the choice of sleeping on a cold, hard floor or awkwardly manoeuvring themselves to sleep on cushioned seats with armrests, many passengers will still choose the seats. Comfort trumps convenience.

So, instead of designing for the worst-case scenario of hard seats with armrests on either side of each seat, as can be found at Heathrow's T5, architects should design for the best-case scenario of cushioned seats with no armrests whatsoever. This approach, exemplified at Seoul Incheon, not only looks more attractive if the right colour and material palettes are chosen, but is also much simpler and far more comfortable. There is one simple truth about passenger behaviour that every architect must keep in mind: If given the option of sitting on an ugly chair that feels good or sitting on a beautiful chair that feels bad, the passenger will still choose the former. In this sense, comfort is non-negotiable.

[2.60] *Brightly-coloured, cushioned seats at Kansai Airport. Indents in the seats make sleeping somewhat awkward.*
[2.61] *Red, cushioned seating with armrests at Charles de Gaulle Airport T2E.*

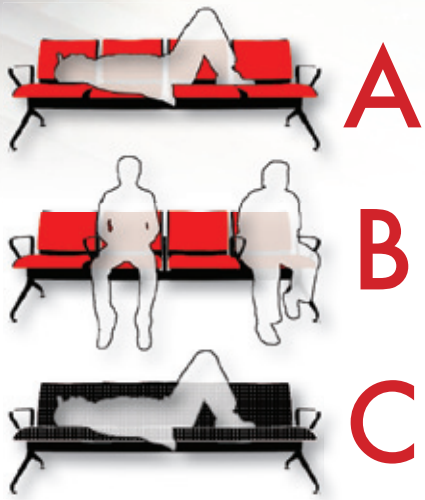


[2.62] *Hard seats with armrests at Heathrow's Terminal 5.*
[2.63] *Metallic, perforated seating at Charles de Gaulle T2F.*
[2.64] *Incredibly uncomfortable, hard seats and seat backs at Madrid-Barajas T2.*

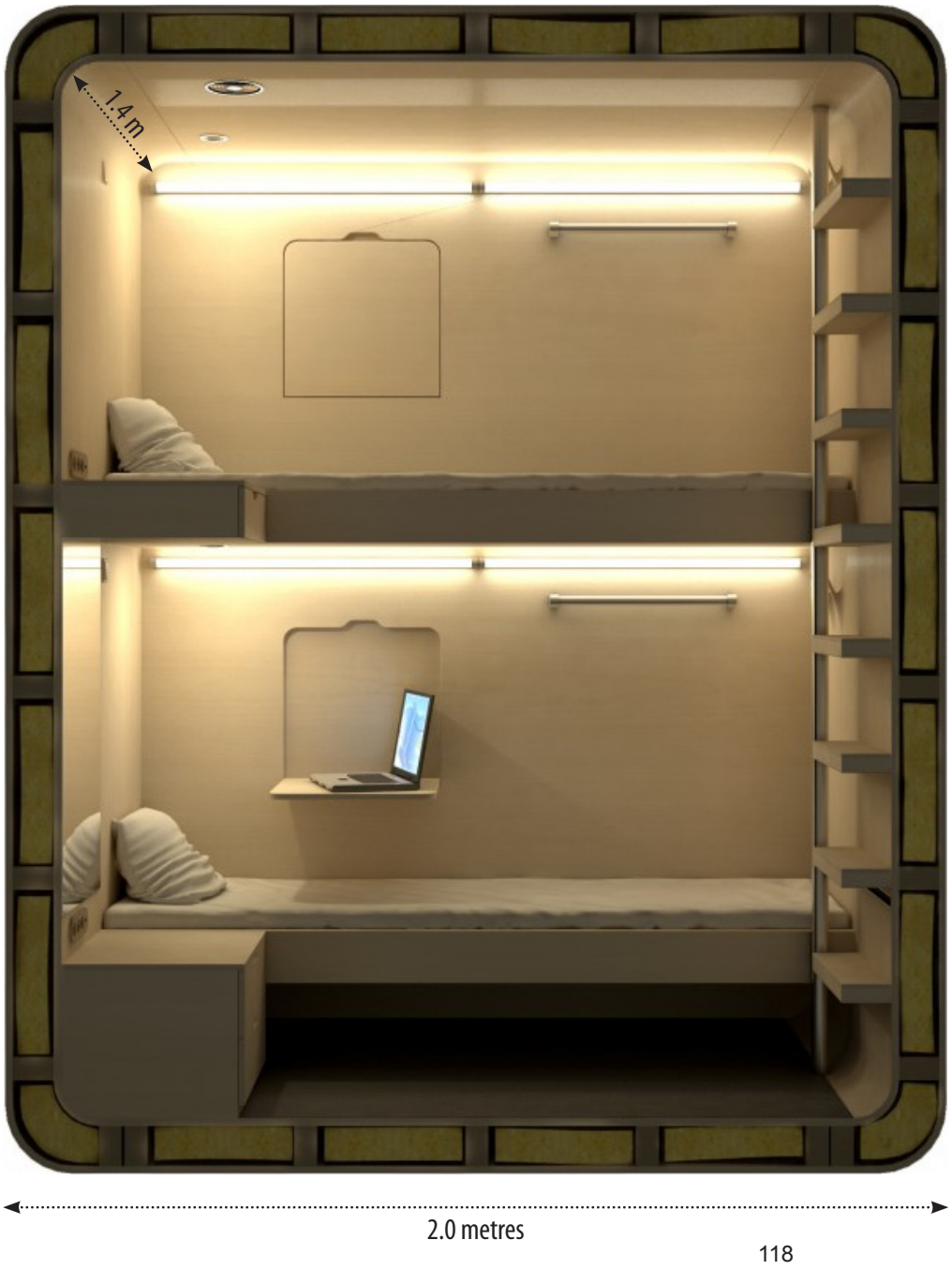
Always design a thing by considering it in its next larger context

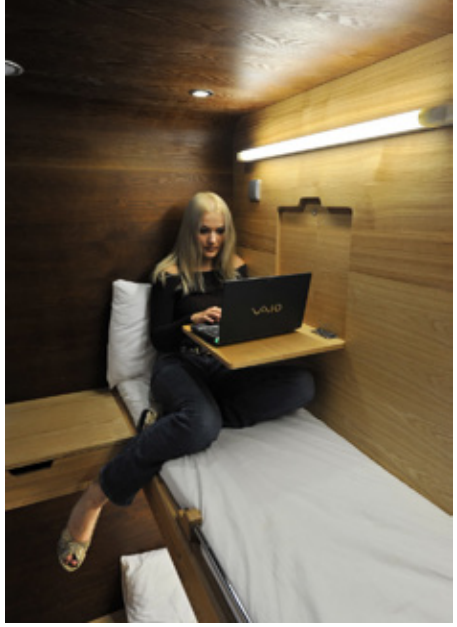
-- a chair in a room, a room in a house, a house in an environment, an environment in a city plan.[21]

[2.65] *Sleek, cushioned seats with no armrests at Seoul Incheon Airport.*



[2.66] *The SLEEPBOX, a mobile sleep capsule designed specifically for airport use. Images of the interior showing a 2-bedroom scheme.*





[2.67] *The 'Airport Oasis' concept by Andrew Bouldin which features a reclining, noise-cancelling sleeping pod.*

[2.68] *An area designated for reclinable seating. An eye must be kept on luggage at all times.*
[2.69] *A view of passengers sleeping awkwardly on top of oddly-shaped furniture pieces.*

Sleeping

For longer layovers, where sleeping on uncomfortable seats or hard floors is the last thing that any passenger wants to do, some airports have started to introduce quiet sleep zones throughout their terminals. In addition to providing comfort and security for your luggage, these areas must cancel out background noise as much as possible, and yet make sure that the passenger is alerted prior to his or her boarding time.

In 2009, a Russian architecture firm called Arch Group revealed their design for the *SLEEPBOX*, a 4m^2 mobile capsule intended to afford a restful sleep for up to three people.[22] The first SLEEPBOX was installed at the Aeroexpress Terminal of Moscow's Sheremetyevo International in August of 2011 and more are set to be installed at various airports around the globe, including Beijing's T3, later this year. At a cost of only about 15 USD per hour,[23] a box can be rented anywhere from 30 minutes to a number of hours. The true brilliance of such a design, in addition to providing a peaceful sleeping environment, is the security it affords to the passenger and his or her luggage. They also come equipped with alarm and intercom systems that will alert passengers of their approaching flight times and can be modified to contain a variety of features including matted films on windows, mood lighting, built-in routers, and even touch-screen TV's.

Another interesting idea comes in the form of a 'sleep pod'. This unique concept, called the *Airport Oasis*, was envisioned by entrepreneur and frequent traveller Andrew Bouldin and involves setting up cushioned, private, noise-cancelling pods at various points along the airport route.[24] There, passengers will have the option of purchasing services like food delivery, wireless internet, foot massages, and so on. While not exactly as all-encompassing as a *SLEEPBOX*, the sleep pod can nonetheless offer a peaceful repose for the weary traveller.

Flooring

In terms of both practicality and aesthetic, floor material choices in an airport matter immensely. In departures and arrivals halls and concourses, the architect must choose a type of floor material that will allow passengers to maintain a fluid, continuous flow of traffic. In other parts of the terminal, such as at waiting areas, a material change might be beneficial as a means of demarcating a space and changing up the colour palette.[25] Ultimately, whatever material is chosen for any given area, it must never negatively interfere with the passenger experience.

At Madrid-Barajas T4, terrazzo tiling is used throughout the terminal and is made to appear and feel almost seamless. Not only does the soft colour palette and pattern match the materiality of the bamboo roof cladding perfectly, it also functions as a continuous, smooth surface. This is certainly not the case with the stone and ceramic tiling found at JFK's T4 or Charles de Gaulle's T2F. The latter, in particular, uses a dramatic colour palette that is anything but 'soft' or complimentary to its surroundings. And, more importantly, the use of such small-scale tiles means the presence of frequent seams and grouting, resulting in a bumpy ride for luggage.

Normally, carpeting is only used in less trafficked zones, particularly at waiting areas, where it also serves to separate the space from the circulation spine along the middle of the concourse. However, at Charles de Gaulle's Terminal 2E, the entire floor area of the gates concourse has been covered in a bright red-coloured carpet. The choice of colour and pattern is incredibly unconventional and, though not unattractive, is perhaps unnecessarily vibrant for its surroundings. Furthermore, one of the reasons that architects tend to avoid the use of carpeting even at gates is because of the inherent friction, and potential staining, that will result from trolleys and luggage being dragged across it.

[2.70] *Seamless terrazzo flooring at Madrid-Barajas Terminal 4.*

[2.71] *Standard stone flooring with seams at JFK T4.*
[2.72] *Busy carpet pattern in a waiting area at Dulles.*

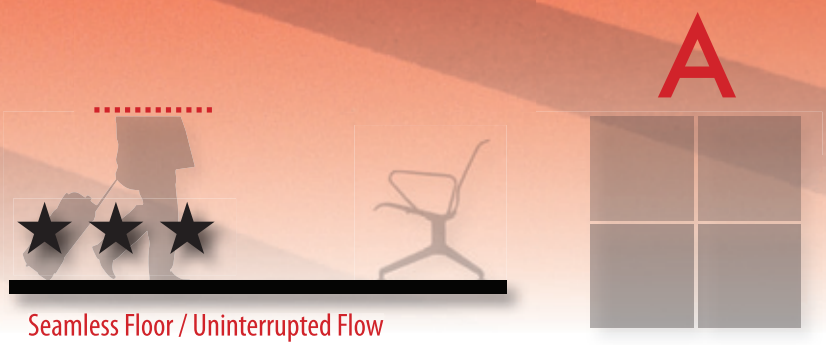
[2.73] *Uncomplimentary carpet colour at Denver Airport.*
[2.74] *Ceramic tiles in a circulation corridor at CDG T2F.*

The choice of finishes is an aesthetic and practical one.

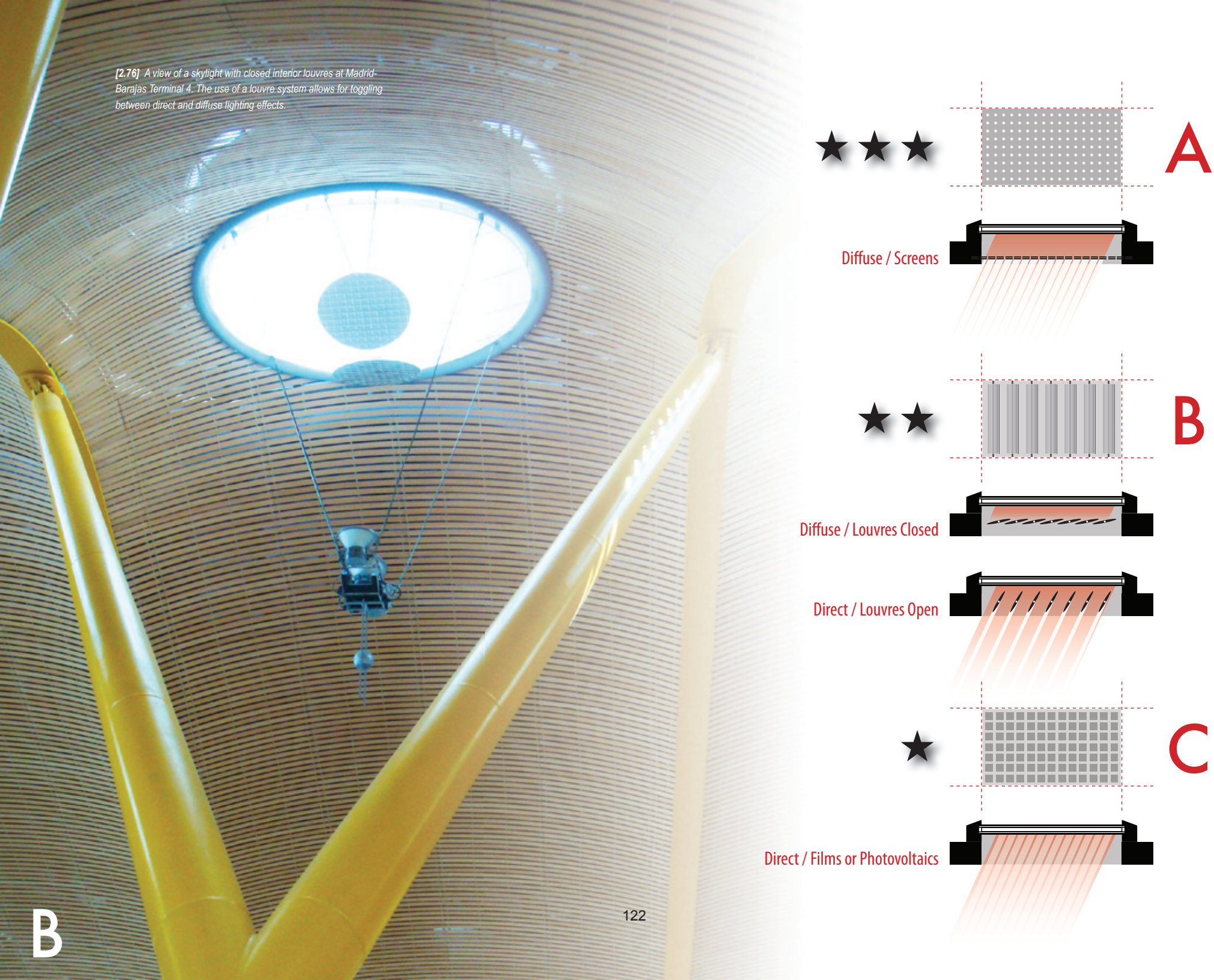
Terminals are demanding places for materials: wall and floor finishes should continue to look good in spite of high levels of use and the wear and tear of baggage trolleys.[26]

We must remember that ***everything depends on how we use a material,*** *not on the material itself.*[27]

[2.75] *Vibrant red carpeting covers the entire floor area of the gates concourse at Charles de Gaulle Airport Terminal 2E.*

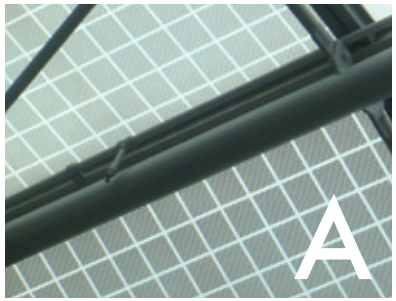


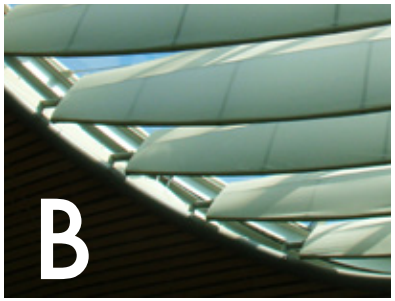
[2.76] A view of a skylight with closed interior louvres at Madrid-Barajas Terminal 4. The use of a louvre system allows for toggling between direct and diffuse lighting effects.



B

[2.77] Intricate light patterns on the translucent canopy that covers the main terminal building of Denver Airport.





[2.78] Fritted glass reduces heat gain at O'Hare T1.
[2.79] Curtainwall with no glass coatings at MAD T2.

[2.80] Detail of louvre system used at MAD T4.
[2.81] Diffuse lighting via screens at Stansted Airport.

Glazing

Interior light quality can vary greatly depending on what type of glazing is used inside of a terminal. Using insulated glass, coating the exterior surface of the glass, applying films, using embedded photovoltaics, louvres, or a combination of these strategies will reduce excessive heat gain and also create a more interesting aesthetic and shadow pattern on the interior. With that being said, it is important not to excessively dilute the amount of light coming into a space, or else interior spaces may appear dark and dull to passengers.

At Stansted International outside of London, Foster incorporated a series of screens beneath his skylights in order to diffuse natural light penetrating into the space.[28] Unfortunately, coupled with the generally dark skies of London, the amount of ambient light that exists within the main terminal hall is not enough to ensure good-quality illumination throughout. Additionally, artificial lighting does not do enough to counter the lack of strong natural lighting, thus resulting in a dark and shadowy environment.

By using interior louvre systems with translucent covers, as is the case at Madrid-Barajas T4, airport personnel can toggle between allowing in direct natural lighting for overcast days and diffuse lighting on sunnier days.[29] The louvres can be rotated to any angle, giving the operator good control over how much direct and diffuse light will penetrate into the spaces below. However, the lack of coatings and films applied to the glass itself will likely result in unnecessary heat gain.

Although perhaps counterintuitive, the simpler the strategy, the better when it comes to glazing types. Films and embedded photovoltaics allow in plenty of natural light while also reducing solar heat gain, with PV glass having the additional advantage of being able to convert solar energy to power people-mover systems.

Daylighting

Dark corridor-like spaces do little to inspire the imagination. In a typology such as an airport, having a windowless room is fairly ironic and also quite sad. It almost automatically creates an institutional vibe -- a vibe that does nothing but add to the anxieties passengers already feel. By creating views and letting in natural light, the dark and depressing atmosphere of a walled-in space is immediately transformed. For, what does it mean to appreciate the architecture of a space if one cannot experience it in the best possible light?

The exterior of CDG Terminal 2E's gates concourse is fully glazed, even though this may not seem to be the case at first glance. From the interior, it appears as if glazing only occurs in strips along the concourse simply because that is where natural light visibly penetrates into the space. In fact, a double-skin system of wood strip cladding on the interior and a continuous curtain wall on the exterior[30] work together to create a fairly magical atmosphere at the gates. Light comes in from the side and above as direct or diffuse and intense or filtered. A rhythm is established by virtue of structure and light, which gives the passenger a good sense of space.

A less effective strategy with respect to introducing daylighting into a space is to do so only through sidewalls. In general, gates concourses are designed to be fairly wide in order to ensure that waiting areas and circulation corridors can exist side-by-side with as little congestion as possible. The simple truth is that by only glazing the sidewalls of a wide and sometimes single-height space, light will not penetrate all the way to the middle, leaving passengers to navigate, almost literally, in the dark. While artificial lighting can certainly pick up some of the slack, the architect should not rely on it to do a job best left for actual daylighting, especially at crucial points along the airport route.

[2.82] *Ample daylighting from above at O'Hare T1.*

[2.83] *Perimeter daylighting at Madrid-Barajas T2.*

[2.84] *A view of a windowless corridor in the gates concourse at Dulles International Airport.*

Light should be moulded, manipulated and directed with the ***sensitivity of a sculptor.***

Used in the correct fashion, light can be a solid, expressive material to guide travellers through the complex changes of direction and level encountered in a modern airline terminal.[31]

There is one fundamental fact about lighting:

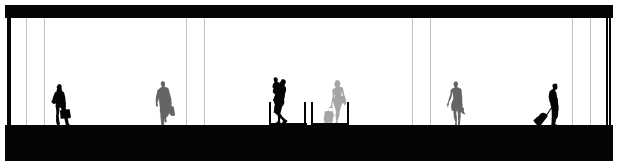
Where there is no light, there is no beauty.[32]

A

★★★

Perimeter Glazing / Skylights

B



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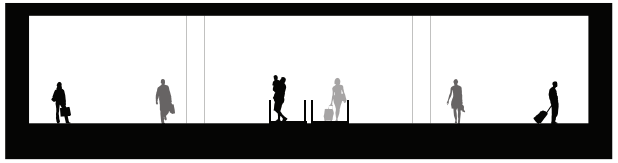
Perimeter Glazing / No Skylights

C



★

No Perimeter Glazing / No Skylights

[2.85] *The semi-circular form of the gates concourse at Charles de Gaulle T2E allows light in from all angles.*

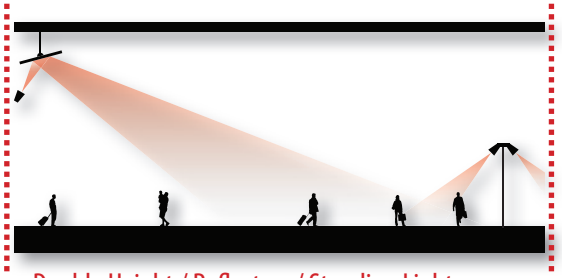
B

[2.86] Fluorescent light boxes embedded in a waffle slab ceiling at JFK's Terminal 2. The high ceiling renders the lighting semi-useless at floor level.

The artificial lighting of terminals is normally the chief source of energy use, and the means of lighting, the lamp sources used, etc., have ***great impact upon comfort, safety and general ambiance.***

It is important to ***maintain a similar pattern of lighting by day and by night*** *so that passenger perceptions of route and volume do not vary.*[33]

★★★



A

Double Height / Reflectors / Standing Lights

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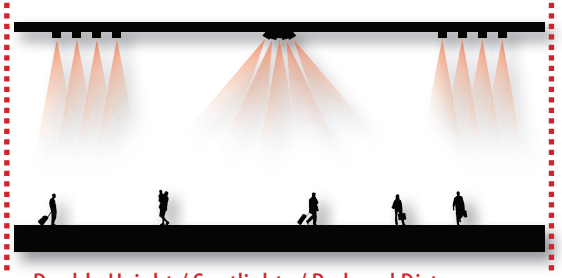

B

Double Height / Spotlights / Reduced Distance

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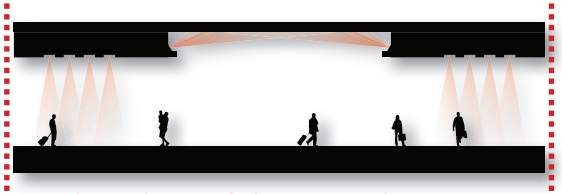


C

Single Height / Spotlights / Cove Lighting

[2.87] *Reflector panels at Heathrow T5.*
[2.88] *Spotlights in Schiphol Airport's check-in hall.*
[2.89] *Standing light beside a row of seating at Kansai.*
[2.90] *Spotlights in the concrete roof slab at Dulles.*

[2.91] *Ambient cove lighting over the circulation spine of the gates concourse at Chicago O'Hare Airport T2.*

Artificial Lighting

Like in any building type, daylighting alone cannot be depended upon to properly illuminate every space during the day. This is where artificial lighting comes into play. Successful artificial lighting will illuminate spaces at nighttime and also compliment natural light during daytime to achieve a standard of 200 LUX.[34] Knowing what type and strength of lighting will best suit a space is a balancing act that the architect must deliberately undertake in order to ensure that the passenger experience remains pleasant and undisturbed by garish lighting.

When dealing with double or even triple-height spaces, lighting designers have begun introducing light deflectors into their schemes. At Madrid-Barajas T4, for instance, the departures hall is so grand that reflectors are practically necessary to direct light all the way down into the spaces below. Indeed, reflectors can be used even with single-height spaces; the whole point being that with just one light bulb angled strategically at a deflector, a much wider floor area can effectively be illuminated. In concourse areas with high ceilings, standing lights can also be used in and around areas that require more direct or stronger lighting. An example of this can be found at Kansai International, where standing lights that resemble modern street lamps have been installed at seating areas and in circulation corridors.

Poor lighting choices, in terms of type, strength, and even colour, can reinforce the institutional feel of a space, particularly if it is of an older construction. At Chicago O'Hare's T2, cove lighting with an odd yellowish tint is used throughout the single-height gates concourse. The colour itself is likely the least appealing aspect of these lighting features, though the square recesses in the ceiling, complete with T-bar panelling, certainly don't help. Despite the light being strong on the ceiling, it does not translate well into the space as ambient lighting, and in fact ends up contributing to the strange and almost eerie atmosphere of the concourse.

Sustainability

Airport energy demands are enormous to say the least. As they increase in capacity and size, new and innovative systems must be introduced to offset the massive energy loads airports place on our grids. A variety of sustainable features have already been incorporated at airports around the world, and many integrate quite fluidly with the architecture. In designing holistically, architects must begin with the premise of adding green elements to their designs wherever possible, whether through the use of photovoltaics, green roof systems, natural ventilation strategies, and so on.

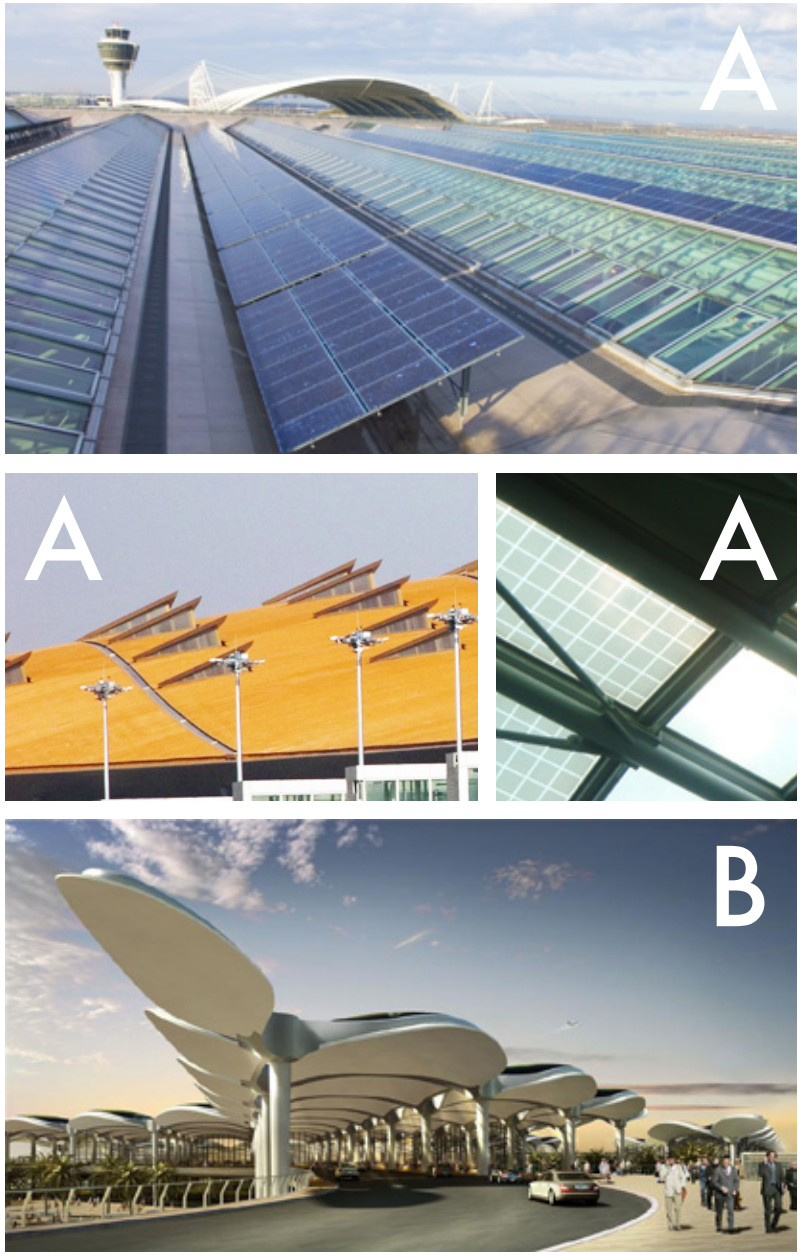
At Vancouver International, a green wall feature was installed near the SkyTrain station in 2009. In explaining the concept, the architects wrote:

> *The wall is a living tapestry featuring flowing waves of foliage, colours, and textures. The modular living wall system is composed of pre-vegetated panels made of stainless steel. Beyond aesthetics, the wall has multiple environmental benefits including evaporative cooling, air purification, and acoustical control.*[35]

The extensive green roof system used at Chicago O'Hare's FedEx hangar is another example of a simple application of vegetation that helps to reduce the heat island effect, regulate interior temperatures, capture rainwater and reduce runoff, and generally purify the air in and around an airport.[36] O'Hare recently also delved into the realm of aeroponics, a process of growing plants in air or mist without using soil or aggregate, to produce vegetables in-house for its many food outlets.[37]

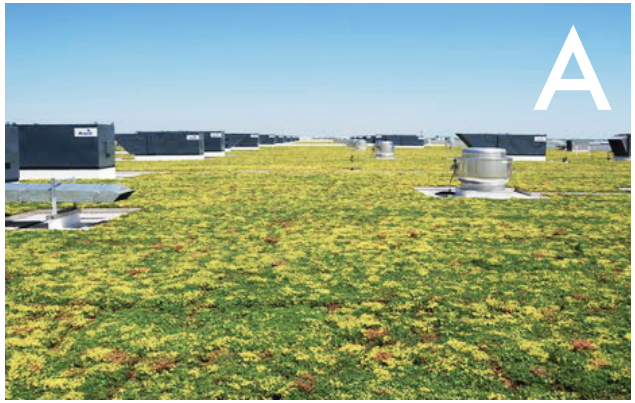
Ultimately, any green feature that adds to the cause of sustainability at airports is a good one. A quality passenger experience is intrinsically linked to the success of these measures on a tangible level, now and in the future.

[2.92] *Solar panels arranged in rows on the roof of an airport building at Munich International.*
[2.93] *Propped up glazing at Beijing Capital T3. Operable windows allow for cross-ventilation.*



[2.94] *Embedded photovoltaics in glass minimize heat gain while collecting energy to power people-movers.*
[2.95] *Foster's palm leaf design proposal for Queen Alia Airport in Jordan integrates solar panels on the roof, collects rainwater, and encourages natural ventilation through 'gaps' in the palm tree structures... at a cost of 600 million USD. Perhaps this is an example of a proposal that is "too expensive to become a model of sustainable architecture."*[38]

[2.96] *The extensive green roof on top of O'Hare's FedEx building.*



[2.97] *O'Hare's 'Aeroponics Garden' grows vegetables for its many food outlets.*

The terminal of the twenty-first century will work with ecology and not against it: *environmental systems and building systems operating largely in tune.*

The terminal of the future will live, move and breathe like a giant living organism, *stretching out tentacles of life and recycled impacts into the wider environment.*[39]

[2.98] *The living wall at Vancouver Airport's SkyTrain Station is the first thing arriving international passengers see upon exiting the terminal.*

A

Notes

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[i1.1] *A man looks out onto the tarmac.*

An Interlude

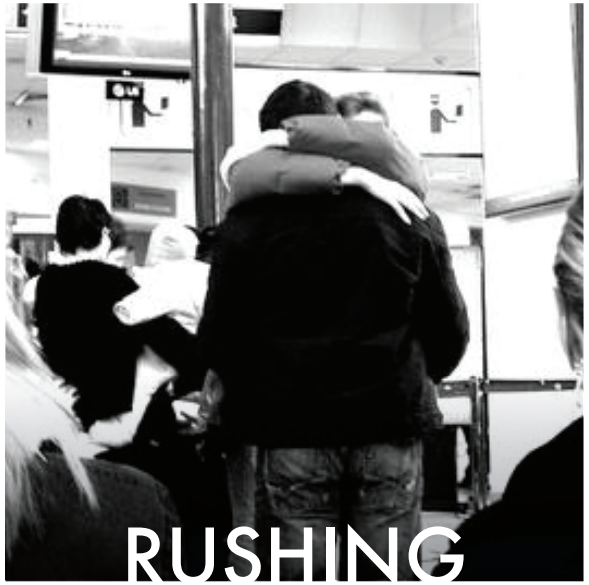
[i1.2]

[i1.3]

[then + now]

[i1.4]

[i1.5]



[i1.6]

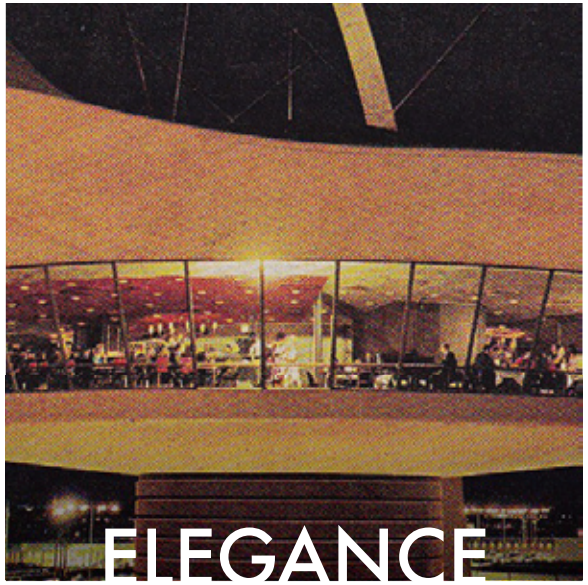
[i1.7]

[then + now]

[i1.8]

[i1.9]

[i1.10]



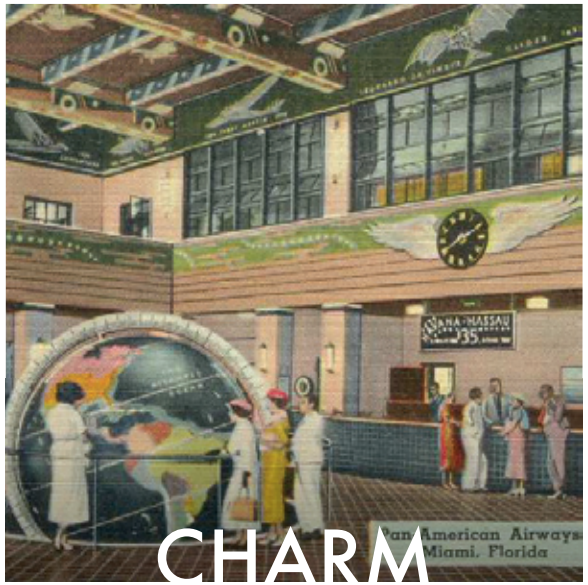
ELEGANCE

[i1.11]

ADVERTISING

[then + now]

[i1.12]

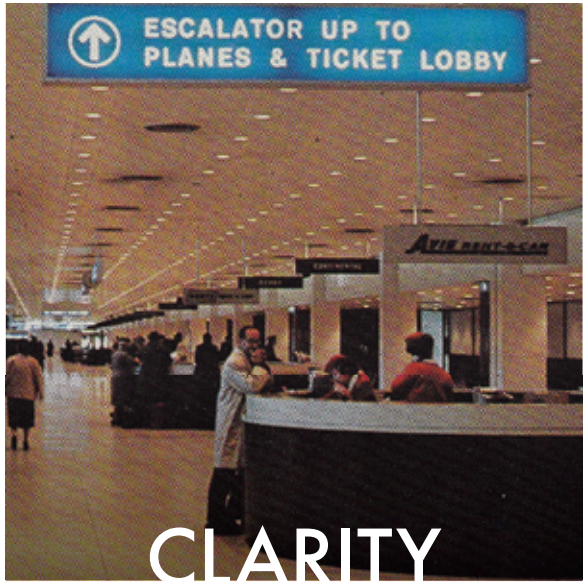


CHARM

[i1.13]

CONVENTION

[i1.14]



CLARITY

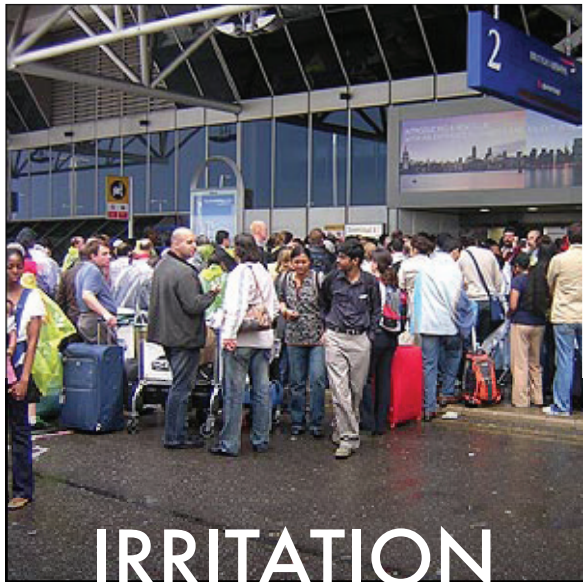
[i1.15]

DILAPIDATION

[then + now]

ANTICIPATION

[i1.16]



IRRITATION

[i1.17]

[i1.18]

[i1.19]

[then + now]

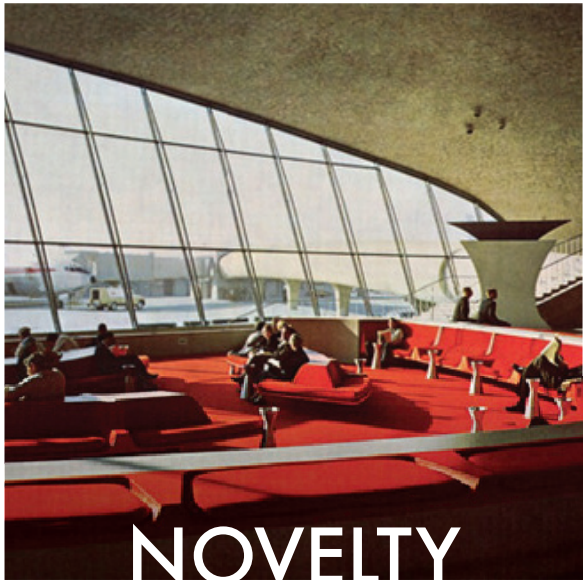
[i1.20]

[i1.21]

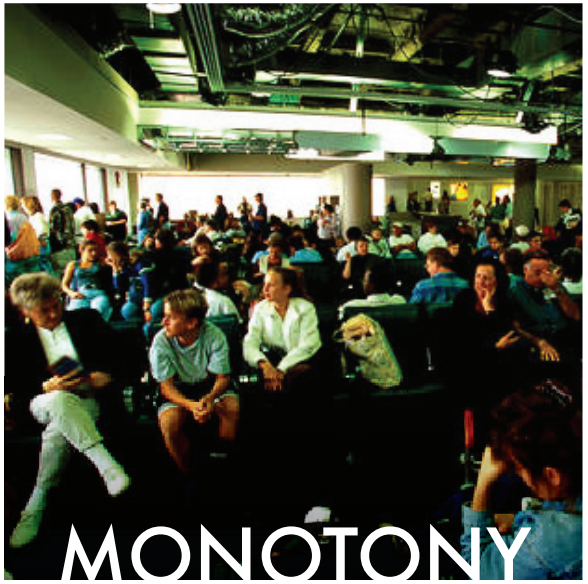
[i1.22]

[i1.23]

[then + now]



[i1.24]



[i1.25]

[i1.26]

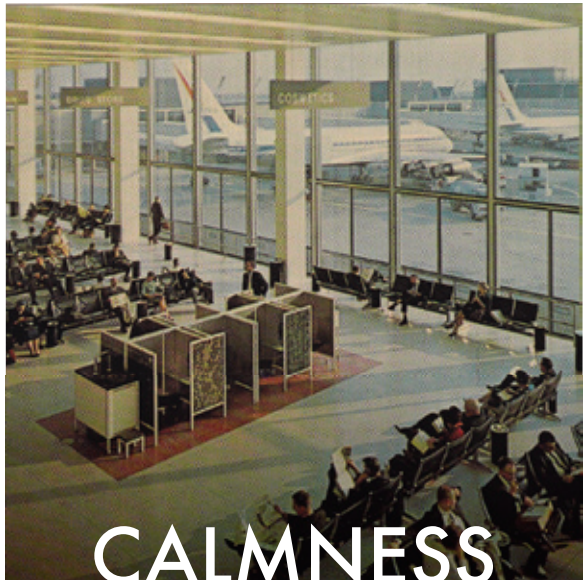
[i1.27]

[then + now]

[i1.28]

[i1.29]

[i1.30]



[i1.31]

[then + now]

[i1.32]

[i1.33]

this is airport security ...

... this is a police frisk

[i1.34]

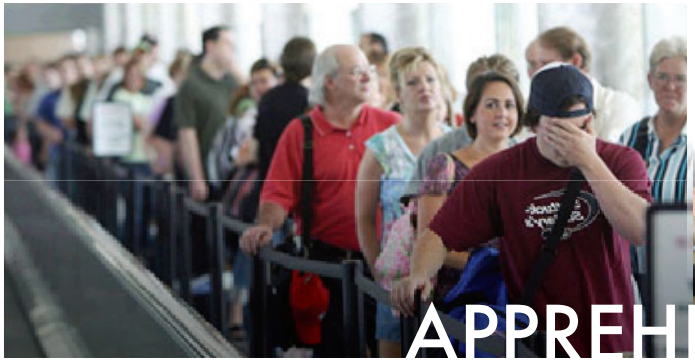
[i1.35]

SCRUTINY

this is airport security ...

... this is a cow corral

[i1.36]



[i1.37]

APPREHENSION

this is airport security ...

... this is an assembly line

[i1.38]

[i1.39]

MASS PRODUCTION

this is an airport ... ... this is a hospital

[i1.40]   [i1.41]

DESOLATION

this is an airport ... ... this is a factory

[i1.42]   [i1.43]

BLEAKNESS

this is an airport ... ... this is a doctor's office

[i1.44] 

 [i1.45]

RESIGNATION

these are passengers sleeping ...

... this is an emergency shelter

[i1.46]

[i1.47]

CONSTRAINT

this is a passenger sleeping ...

... this is a homeless person

[i1.48]

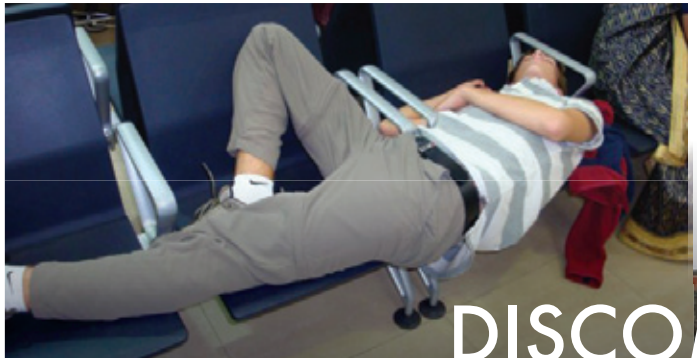
[i1.49]

INDIGNITY

this is a passenger sleeping ...

... this is a soldier training

[i1.50]



[i1.51]

DISCOMFORT

this is an airport ...

... this is a shopping mall

[i1.52]

[i1.53]

CONFORMITY

this is an airport ...

... this is an office building

[i1.54]

[i1.55]

ANTIQUATION

this is an airport ...

... this is an abandoned warehouse

[i1.56]

[i1.57]

DECREPITUDE

There is a crisis here.

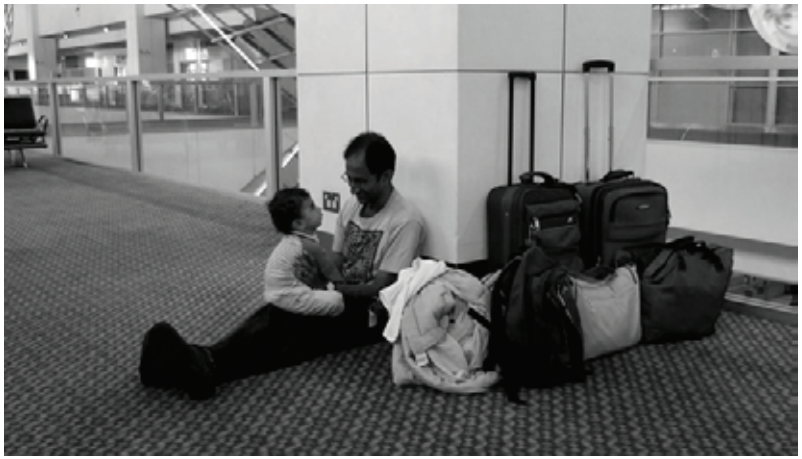


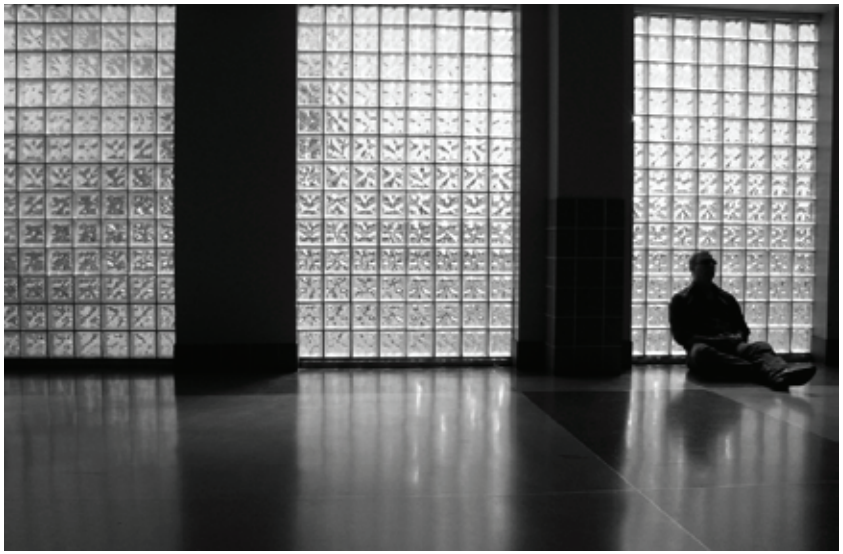







[i1.58] Scenes from the modern airport.





Isn't this proof enough?

[3.1] E.T. the Extra-Terrestrial *(1982) ~ E.T. and Elliott ride a bicycle above a forest.*

Preface

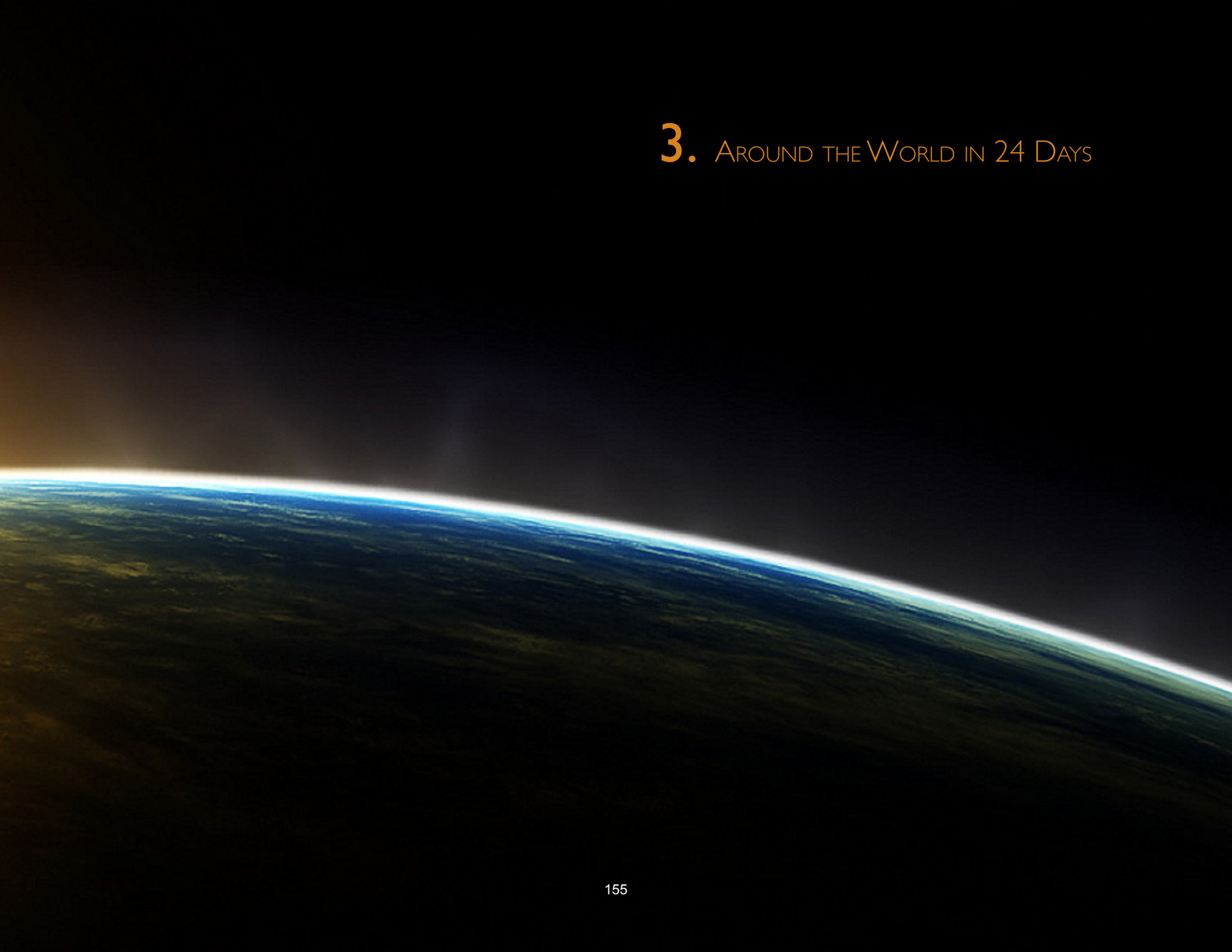
In September of 2011, I embarked on a journey to see, experience, and document over two dozen airport terminals around the world. In comparing and contrasting the architecture, in all of its manifestations, I began to better understand what an architect must do in order to create a pleasant and fulfilling passenger experience. For twenty-four days, I gave myself fully to my cause, perceiving the spaces in these airports as best as I could both from the perspective of the passenger, as well as that of the architect. For twenty-four days, I trained myself to scan and absorb as much information and detail as possible at every point along the terminal experience. For twenty-four days, the transient nature of the airport became permanent for me.

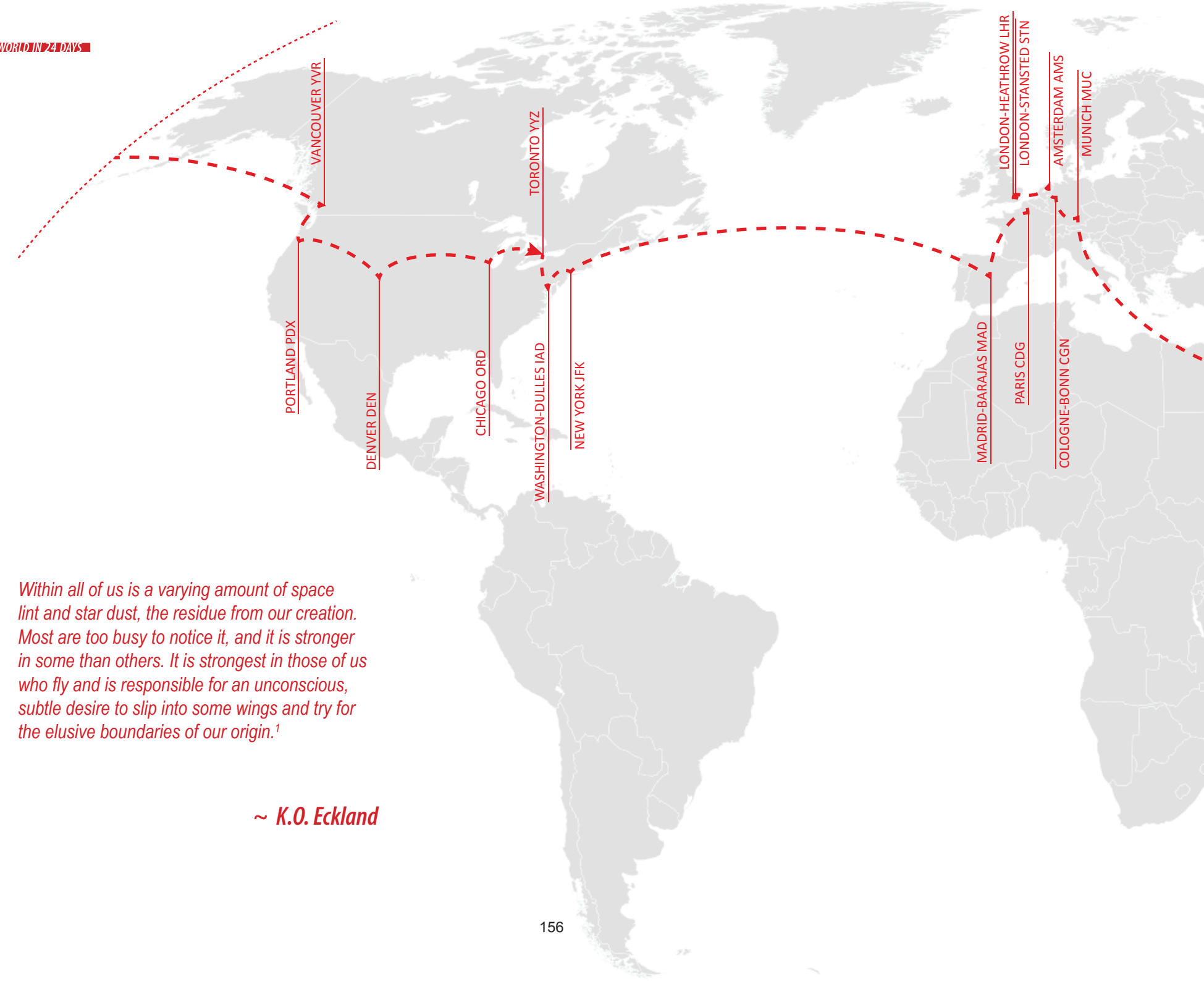
Naturally, many will ask how I decided upon the airports on my list. The answer is very simple and is based partly on logic and partly on practicality. I narrowed my scope down to airport terminals that are unique in one or more ways, whether functionally, programmatically, or aesthetically. So as to conduct a legitimate case study analysis, the chosen airports needed to be sufficiently different from one another in order for me to be able to experience the full range of quality. Regardless of when an airport was built, if it is currently in use as an international airport, I applied my criteria for analysis to it equally and without distinction. For how can architects understand what passengers need at every point along their experience if they cannot reference the full spectrum of what currently exists?

I looked. I took pictures. I drew sketches. I talked to people. I thought about what was right and what was wrong and why. I stood still and listened. I became a vessel for the information that would later shape my goals. I quickly came to the conclusion that in order to truly understand a problem and offer real solutions, one cannot do so in a vacuum, commenting only from afar.

[3.2] *View of the earth and the sun from outer space.*

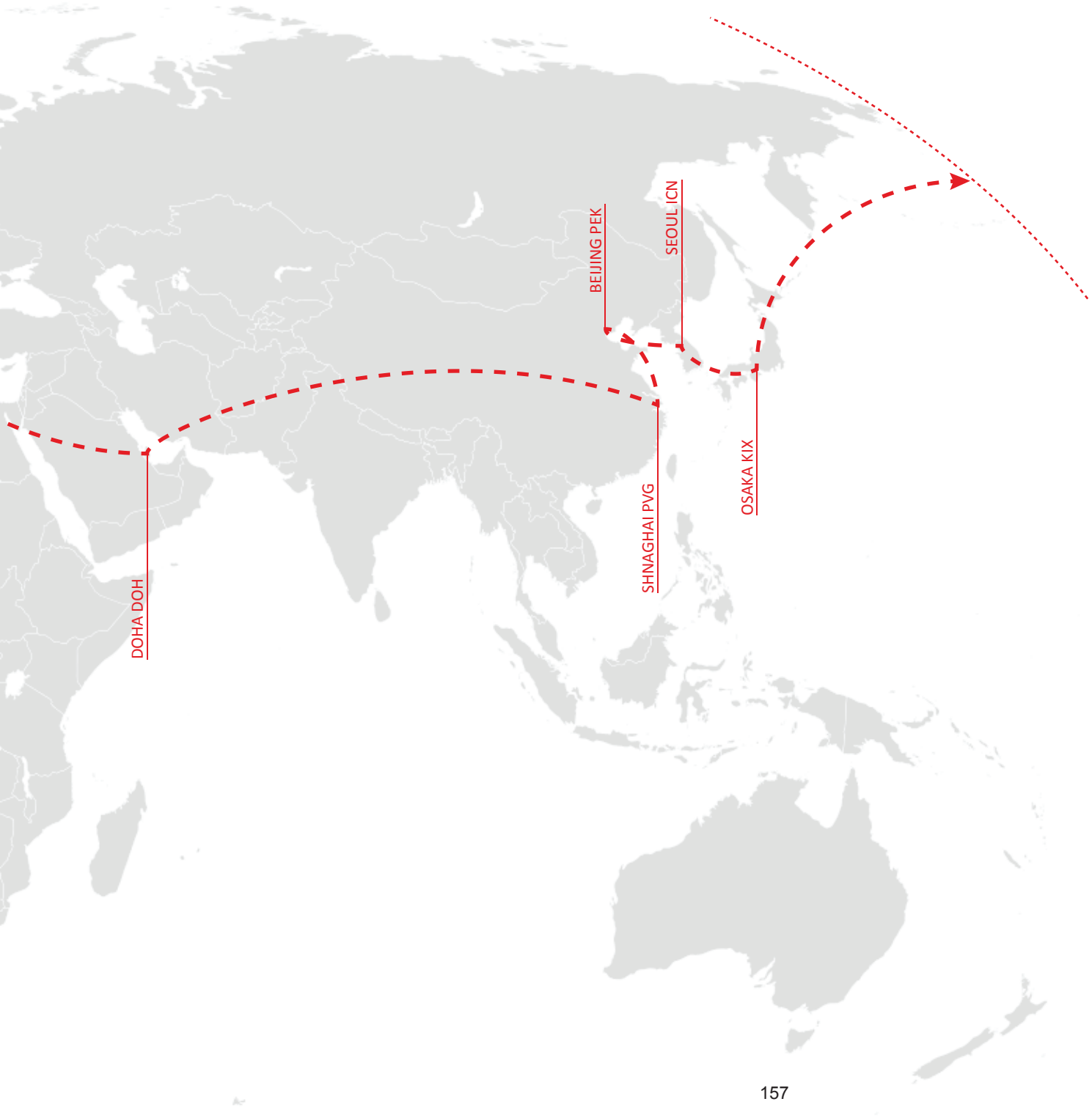
3. Around the World in 24 Days





Within all of us is a varying amount of space lint and star dust, the residue from our creation. Most are too busy to notice it, and it is stronger in some than others. It is strongest in those of us who fly and is responsible for an unconscious, subtle desire to slip into some wings and try for the elusive boundaries of our origin.[1]

~ K.O. Eckland



AROUND
...THE...
WORLD.
....IN....
24
..DAYS..

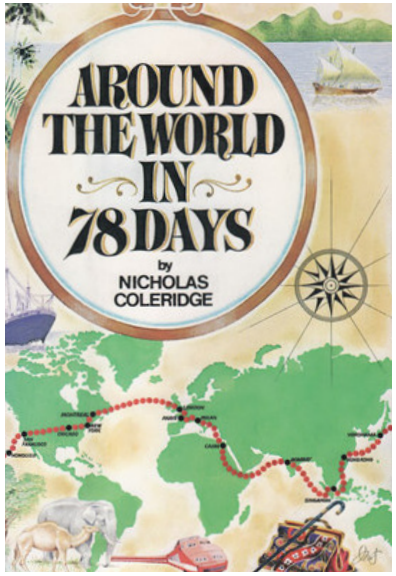
TERMINALS 28
AIRPORTS 19
DAYS 24

[3.3] *A graphic itinerary of my trip around the world.*

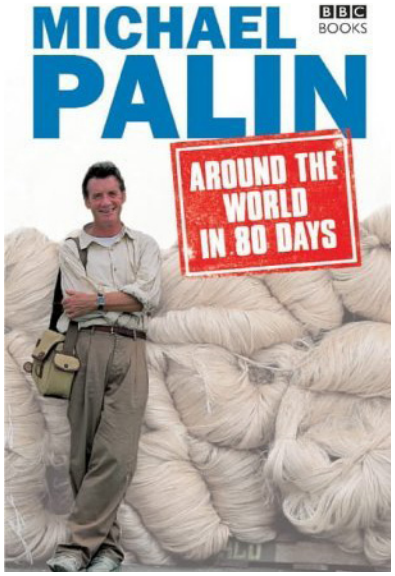
[3.4] Around the World in 80 Days *(1956)*
*A Victorian gentleman bets that he can beat the world's record for circling the globe.**

[3.5] A scene from the 1956 film adaptation of Verne's novel showing the main characters in a hot air balloon.

[3.6] A depiction of Nellie Bly on the cover of her self-authored book, "Round the World with Nellie Bly".



[3.7] Journalist Nicholas Coleridge's book detailing his travels around the world in 78 days.



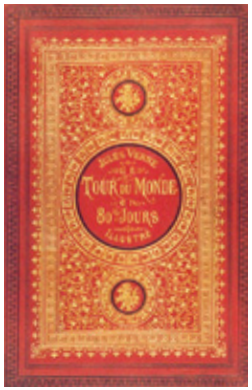
[3.8] The cover of Michael Palin's television travelogue chronicling his trip around the world.

Around the World in 80 Days

In Jules Verne's *Around the World in Eighty Days*, a wealthy Englishman by the name of Phileas Fogg attempts to circumnavigate the globe in 80 days, along with his trusty valet Passepartout. After many trials and tribulations, Phileas and Passepartout arrive back to their departure point just in time to win the wager of £20,000 put forth by his fellow Reform Club members.[2]

A number of film adaptations were made of the original book, the most famous of which was released in 1956. Unlike the original storyline, the 1956 film version included the use of a hot air balloon as a mode of transportation.[3] Dismissed in Verne's writings as an impossible idea, the hot air balloon theme ironically later became part of the story's mythology.

Beyond fictional adaptations, many people have actually tried to follow in Phileas Fogg's footsteps to successfully circumnavigate the globe within certain time constraints. In 1889, journalist Nellie Bly managed to circle the world in 72 days for her newspaper *New York World*.[4] Almost a century later, writer Nicholas Coleridge did the same in 78 days, and later wrote a book about his experiences.[5] In 1988, *Monty Python's* Michael Palin took a similar trip, without using aircraft, as part of a television travelogue for BBC.[6] He completed the journey in 79 days and 7 hours.



[3.9] The first edition cover of "Le Tour de Monde en 80 Jours", 1873.

Though my route and mode of transportation may have been different, the result was the same: a world seen and circumnavigated in a blink of an eye.

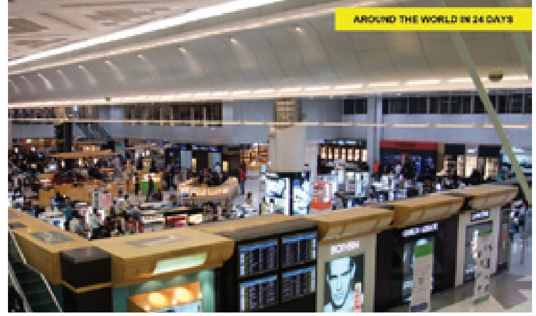
Postcards Before embarking on my trip, I set up an online blog to chronicle crucial details of my airport experiences. As a documentation tool, this online platform was invaluable. At the end of each day, I made a point of uploading photos and writing about the terminals I had seen that morning or afternoon. In making the blog public, I went on a mission to share it wherever and with whomever I could, including and especially with those who had recently experienced what I had. Thus, my version of the promotional postcard was born.

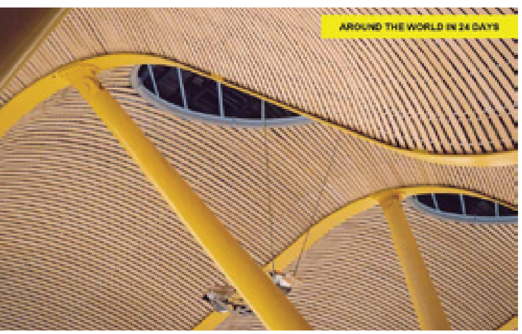
In addition to gathering valuable information on my own in a variety of ways (i.e. picture taking, sketching, plain observing, etc.), I also surveyed and interviewed passengers at each airport. The surveys, samples of which can be found in the Appendix section of this book, were designed to acquire an honest set of data from the very people airports are designed to serve. How else can an architect truly understand what is fundamentally needed for a positive and inspiring experience but by actually talking to those who pass through these buildings on a daily basis?

These pseudo-postcards, which sported images of airports on my list, were distributed to the passengers I surveyed and interviewed along my travels as a token of my appreciation (and perhaps a means of shameless self-promotion). Interestingly, the quotes by Norman Foster and Quentin Pickard, which appear on the backs of the postcards, seemed to encapsulate many of the views of those I interviewed, once again emphasizing the idea that airport architects should place far greater importance on the human factor in the design process in order to achieve sensitive and worthwhile results.

[3.10] Back of the first postcard type, with a quote from architect Norman Foster.
[3.11] Back of the second postcard type, with a quote from writer Quentin Pickard.

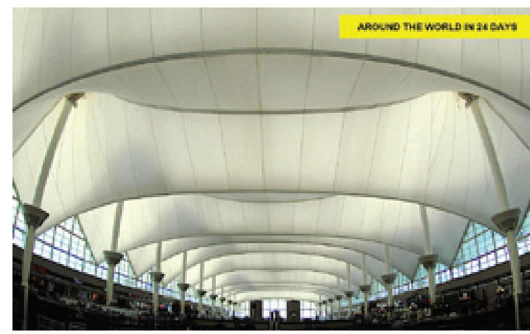
[3.12] Opposite: promotional postcards. From top to bottom, left to right: Toronto Pearson Airport T1, Washington Dulles Airport, New York JFK Airport T3, Madrid-Barajas Airport T4, Paris Charles de Gaulle Airport T2E (prior to collapse), London Heathrow Airport T5, London Stansted Airport, Amsterdam Schiphol Airport, Köln-Bonn Airport T2, Munich Airport T2, Doha Airport, Shanghai Pudong Airport T1, Beijing Capital Airport T3, Seoul Incheon Airport, Osaka Kansai Airport, Vancouver Airport, Portland Airport, Denver Airport, Chicago O'Hare Airport T1.

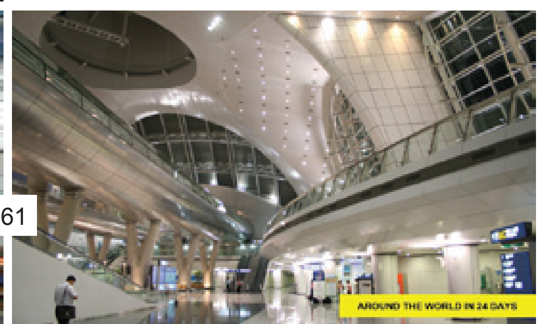


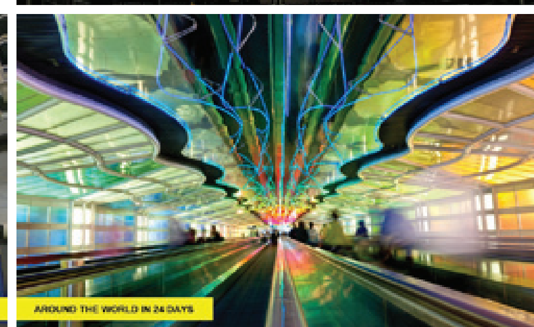


Depart | Arrive | Transfer | Visit

aroundtheworldin24days.tumblr.com







Good airport layout and building design should seek to remove ambiguity, to reduce travel length, to maintain a sense of progression toward the destination; ***It should wherever possible uplift the spirit.*** *Psychological needs are as important as physical ones.*[7]

~ *Quentin Pickard*
The Architects' Handbook

Toronto Pearson T1
Toronto, Ontario
SOM / Safdie / Adamson[8] | 2007[9]
Annu. Capacity: 21 million[9]
Area: 339,000 sq m[9]

DAY 1

YYZ T1

[3.13] *The sleek, double-height, brightly-lit gates concourse at Pearson T1.*

[3.14] Pearson T1 separates arriving and departing passengers to avoid cross-circulation.

[3.15] A roof skylight running along a side wall creates an intricate series of shadows below.

[3.16] Clear and effective signage makes wayfinding easy and straightforward.

[3.17] A view into restricted areas of the wing, open to passengers with certain gate numbers only.

Toronto Pearson T1

On September 3, 2011, I began my long journey by departing from Pearson International Airport in Toronto. Although I had been to this airport, and Terminal 1, on many occasions prior, there is something to be said for looking at a thing so familiar with an entirely fresh set of eyes. The new terminal is impressive in many ways, with its sleek interiors, simple and straightforward layout, well-lit spaces, and so on. It is a marvel of technology and efficiency, and rarely does your average passenger find something substantial to complain about. A trained eye, however, might see things a bit differently.

The most awkward part of any airport experience usually takes place in and around the security checkpoint. Quickly being ushered into a queue like a lamb to the slaughter is quite an unnerving experience. It is especially upsetting if loved ones are seeing you off, as was true in my case. As I mentioned in Chapter 2, besides the invasive security procedures that one must go through, the simple act of closing off a security zone both physically and visually will engender stress in both passengers and visitors. Very few airports, Pearson included, get this right.

Circulation and wayfinding was never an issue. Signs were clear, bright, and located in just the right places. In fact, everything felt just fine. And perhaps because everything felt *just* fine, nothing truly stood out as spectacular. My biggest complaint came with regards to the restricted zones that housed shops and retail for specific gate areas. For a person who had some time to waste, being unable to access more than half of the terminal's departure level was somewhat disappointing. Besides the occasional shop and fast food restaurant, there really wasn't much to do except sit around and wait for my flight. Coupled with the somewhat clinical lack of colour in an overly immaculate setting, loneliness threatens to take over even the most hardened traveller at Terminal 1.

Washington Dulles

In deciding upon which airports to visit on my trip, Dulles Airport was without question at the top of the list. I had been eager to see it for quite some time, particularly after having read about the mobile lounge concept the terminal employed in the 60's and early 70's. With a continuously increasing annual passenger flow, the airport has had to be retrofitted on multiple occasions in order to meet modern standards and passenger requirements. Unfortunately, this leaves the main terminal building feeling tremendously disjointed from its satellites with respect to program, circulation, and especially aesthetic.

Instead of concentrating on the satellite terminals, which are shed-like and somewhat oppressive buildings, I think it is important to focus more on describing the experience of the main terminal building as it stands today. The gestural nature of the swooping roof and angular façades gives it an incredible presence both on the exterior and the interior. I related to the sculptural nature of the design far more easily than the completely rectilinear interiors of the satellites, perhaps because its dynamism rekindled an excitement in my mind for the notion of flight itself. As a standalone building, its elegance and purity references a time when the airport experience had a lot more to do with the magic of flying and a lot less to do with commercialism, consumerism, and paranoia-fuelled third-party agendas.

Saarinen's complete elimination of a waiting area by virtue of his mobile lounges became impractical as a concept very quickly. Nonetheless, finding a way to isolate the boarding process from the departures concourse is something worth considering, as it will reduce congestion in crucial circulation areas. The downside of separating the gates concourse from the main terminal building naturally means that passengers will have to walk farther to reach their gates. At Dulles, this remains an unfortunate by-product of necessary expansions over the years.

[3.18] *Eero Saarinen was one of the first to exploit the sculptural qualities of concrete, particularly in airports.*

[3.19] *The clerestory windows of one of the satellites at IAD allow in a measure of direct sunlight.*

[3.20] *An interior view of the, now disused, mobile lounge docks in the main terminal building.*
[3.21] *A strangely-lit, underground corridor leading to AeroTrain station designed by SOM.*

[3.22] *The curved concrete roof form over the check-in hall at Dulles airport.*

It is in dialogue with pain that many beautiful things acquire their value. *Acquaintance with grief turns out to be one of the more unusual prerequisites of architectural appreciation. We might, quite aside from all other requirements, need to be a little sad before buildings can properly touch us.*[10]

~ *Alain de Botton*

The Architecture of Happiness

DAY 1

IAD

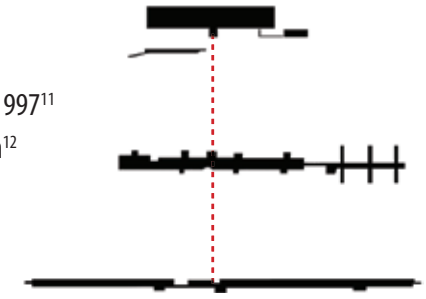
Washington Dulles

Dulles, Virginia

Eero Saarinen / SOM | 1962 / 1997[11]

Annu. Capacity: 24 million[12]

Area: 102,000 sq m[11]



That is the trouble with flying: ***We always have to return to airports.*** *Think of how much fun flying would be if we didn't have to return to airports.*[13]

~ *Henry Minizburg*
Why I Hate Flying: Tales for the Tormented Traveler

John F. Kennedy T2
Jamaica, New York
White & Mariani[14] | 1962[15]
Area: 19,000 sq m*

* Indicates area estimate from:
http://www.daftlogic.com.

DAY 1

JFK T2

[3.23] *The waffle slab ceiling with occasional fluorescent light panels at JFK T2.*

[3.24] A view of the congested circulation corridor located adjacent to retail and restaurants.
[3.25] The less-than-inspiring baggage claim hall at one level below grade.

[3.26] A glimpse into the departures hall of the terminal from the lower level arrivals section.

[3.27] Degrading exterior stucco finish next to the main exit doors.

New York John F. Kennedy T2

An important theme in this thesis deals with the rising degradation of many airports today, specifically those built before the 90's and specifically those in the United States. JFK's Terminal 2 in New York is a clear example of this phenomenon and, along with Chicago O'Hare's Terminal 2, ranks near the top on my list of the worst airports visited on my trip.

Arriving at JFK T2 is a depressing experience to say the least. There is no separation of departing and arriving circulation, making for a very frantic and congested disembarking process. The terminal's rectangular footprint has been organized so that retail and services exist primarily in the middle of the space, with eating and waiting areas lined up along the perimeter. This is highly problematic as it forces passengers to circulate to and from their gates along a narrow pathway between shops and tables, where cross-traffic occurs constantly. In essence, there is nothing wrong with locating core program in the centre, so long as there is ample space left for passengers to easily move about. This isn't the case here, however.

The architecture itself, while fairly lackluster, accomplishes what it needs to for the most part. Lighting levels are satisfactory, signage is relatively clear, and level changes are kept to a minimum. With that being said, it is one of the few airports on my list that maintains an open connection between the baggage claim area and check-in hall. In other words, the baggage claim hall is treated as a public zone, meaning that anyone, including family members, can walk in or out as they please. In a nation where airport security issues dominate breakfast table discussions, this surprise discovery certainly conflicts with standard talking points.

A dark and oppressive exit, combined with crumbling infrastructure at the curb, did nothing but add to the less-than-positive impression I had already formed.

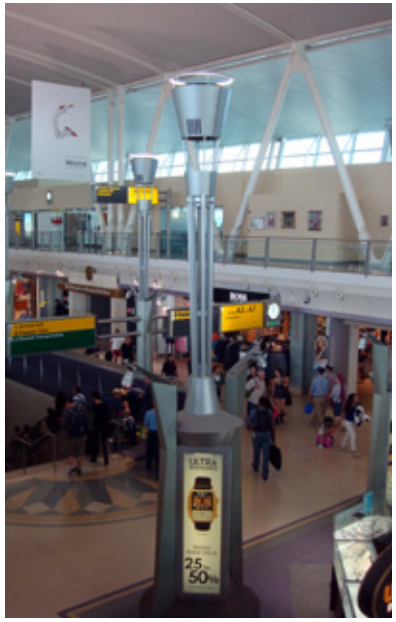
New York John F. Kennedy T4

Day 3 of my trip involved departing from JFK's much newer terminal by SOM: Terminal 4. In designing the terminal, it is clear that the architects followed very simple and standard strategies for the planometric layout as well as the terminal's sectional shape. T4 is gestural in form and seems to borrow directly from Saarinen's swooping roof design at Dulles, at least for a portion of its arrivals hall. Unlike at Dulles, however, the swoop is discontinued midway and appears awkward and out of place as a result. The departures level is far more intriguing aesthetically and mimics the roof found at Pearson Airport, skylights and all.

Terminal 4 at JFK is especially unique for the amount of floor area that it keeps open to the public. Security checks are located at either end of the main departures hall, meaning that passengers and visitors have access to a large section of retail and food outlets prior to the checkpoints. The concept of centralizing security as opposed to front-loading it is somewhat reminiscent of a past when passengers and loved ones could walk together practically to the gate. However, the idea presents problems as well, specifically with respect to circulation. Looking at one of the checkpoints from the departures level, I could hardly believe the congestion I was seeing. Locating security at the narrowest points of the terminal, at the apex of the piers, will always result in bottleneck situations.

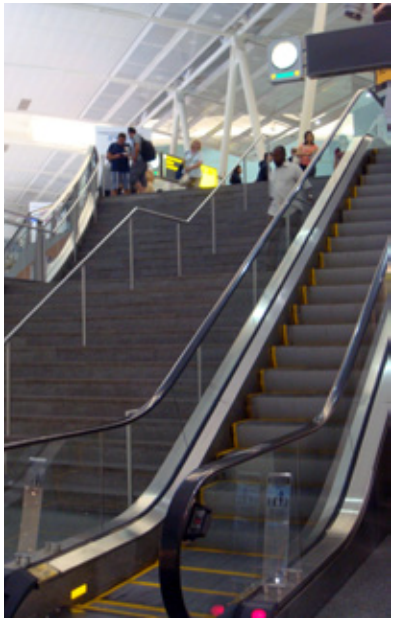
One of the main complaints I kept hearing from the passengers I surveyed at this terminal was that there just simply wasn't enough variety with respect to food or retail post-security. In addition to very low ceilings, coupled with an unnecessarily wide gates concourse, the lack of things to see and do once you reach your gate only reinforces the need for a balanced allocation of program throughout the terminal.

[3.28] *A view of the public retail level from check-in.*



[3.29] *Ornamental vine structures around light poles.*

[3.30] *Information panels located on the retail level, directly in front of the check-in stands.*



[3.31] *To reach the retail level and security, passengers experience a level change downward from check-in.*

[3.32] The curved roof form, reminiscent of the one at Dulles Airport, over the arrivals area at JFK T4.

DAY 3

Almost all U.S. airports are utterly barren of things to do. *The dirty little lunch counters are always choked with permanent sitters staring at their indigestible food... The traveler consigned to hours of tedious waiting can only clear a spot on the floor and sit on his baggage and, while oversmoking, drearily contemplate his sins.*[16]

~ Anonymous

Fortune Magazine, 1946

T4 JFK

John F. Kennedy T4

Jamaica, New York

SOM | 2001[17]

Annu. Capacity: 10-12 million[18]

Area: 139,000 sq m[17]

Nowadays a businessman can go from his office straight to the airport, get into his airplane and fly six hundred or seven hundred miles without taking off his hat. He probably will not even mention this flight, which a bare twenty-five years ago would have meant wearing a leather jacket and helmet and goggles and ***risking his neck every minute of the way.***[19]

~ *Percy Knauth*
Wind on My Wings

[3.33] *Segregated arrivals corridor at MAD Terminal 1.*

T1 MAD

DAY 4

Madrid-Barajas T1
Madrid, Spain
Luis Gutiérrez Soto | 1931[20]
Area: 90,000 sq m*

* Indicates area estimate from:
http://www.daftlogic.com.

[3.34] Passengers moving toward the declarations checkpoint. Congestion is bound to form in the circulation areas.
[3.35] A view of the baggage claim hall from the split-level arrivals corridor.

[3.36] Sleek and easy-to-read information panels on the lower floor arrivals section.

[3.37] Designated meeting points help to avoid confusion on the part of the passenger as well as the visitor.

Madrid-Barajas T1

A pleasant and welcoming airport environment is all that any passenger really wants to encounter after a long and tiring flight. Upon arriving at Madrid-Barajas Terminal 1, I myself felt quite exhausted and was dreading the prospect of an unpleasant arrivals process. Luckily, I had landed at one of Madrid-Barajas' better terminals, despite being one of its oldest.

The newly renovated T1 does an excellent job of separating arrivals and departures on the same level. Normally, locating mixed circulation on one level would be a recipe for disaster, but by creating a clear division (via the use of glazed corridors on the sides of the terminal) the use of space is optimized and circulation is made easy. The split-level approach to the bag claim hall was also unique and provided an interesting opportunity to view the carousels and the space from above. Bright colours and an unusual assortment of round hanging lights gave character to an area of a terminal that is all too often dark and devoid of intrigue. With that being said, despite all efforts to liven up the space through colour and artificial light, the complete lack of daylighting contributed to a feeling of being underground, which literally was not the case at all.

Unlike most modern terminals, many of those built in the 60's through to the 80's still employ low ceilings even on the check-in level. Today, this feels incredibly counterintuitive and makes for an uninspiring entrance area. Understandably, the architects that retrofitted the terminal to meet modern standards could only go so far with their interventions. In spite of the underwhelming existing architecture, everything else (including signage, information panels, the floor layout, etc.) works fairly well, demonstrating that any airport experience can be improved so long as the interests of the passenger are first and foremost in the mind of the architect during the design stage.

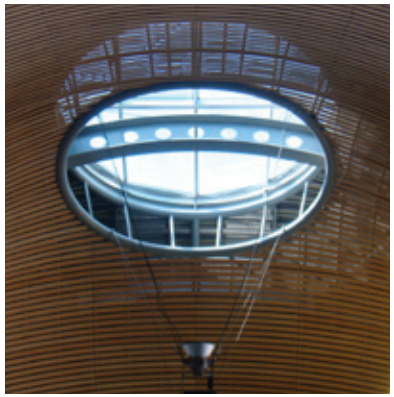
Madrid-Barajas T4

Before leaving the airport to enjoy a couple of days in Madrid, I took a shuttle bus to see the new Terminal 4 by Richard Rogers, which turned out to be a decision I would not regret in the least. Madrid-Barajas T4 is a far cry from the stereotypical, colourless terminal building. In fact, the use of colour throughout the terminal was a strategic proposition made by the architects not only as a way of highlighting the structural elegance of the building, but also as a wayfinding measure (i.e. colour-coding the steel columns gives passengers visual cues in moving to and from their gates).

Having no ticket to land at or fly out of this terminal sadly meant that I did not get to see and document areas beyond the security checkpoint. However, because the terminal is so well-designed and often open to below and above, I could clearly see a number of areas that I did not have direct access to, including the baggage claim hall. The departures hall is incredibly spacious and fairly well laid-out, promoting uninterrupted sightlines wherever possible. The terminal is well-lit both naturally and artificially in a way that reinforces the visual rhythm already set out by the structure itself.

Perhaps most impressive were the material and colour palettes chosen for the project. Not for a second did I get an institutional vibe from the interior, and this is because of the warm and natural elements used on the floor, walls, and roof. Bamboo strips clad the underside of the roof structure and are bent to follow its undulating form. The wavy roof stretches across the entire terminal building and establishes a structural and an aesthetic continuity from the exterior to the interior. A polished terrazzo floor with a subtle patterning compliments the strong colour of the underside of the roof and also contributes to an ease of circulation.

[3.38] *The undulating roof extends over the curb.*
[3.39] *Circular skylights allow in direct sunlight.*



[3.40] *A view the many levels of program at MAD T4, the lowest of which being the baggage claim and arrivals.*

[3.41] *The HVAC system has been integrated into the check-in stands to promote air circulation at the passenger level.*

[3.42] A view of the bamboo-clad, undulating roof structure, complete with colour-coded supports, over the departures hall of Terminal 4.

To design means forcing ourselves to ***unlearn what we believe we already know,*** *patiently to take apart the mechanisms behind our reflexes and to acknowledge the mystery and stupefying complexity of everyday gestures like switching off a light or turning on a tap.*[21]

~ *Alain de Botton*

The Architecture of Happiness

DAY 4

T4 MAD

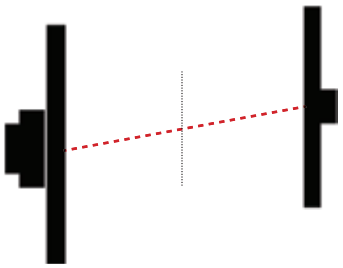
Madrid-Barajas T4

Madrid, Spain

Richard Rogers | 2006[22]

Annu. Capacity: 35 million[22]

Area: 785,000 sq m[22]



Journeys are the midwives of thought. *There is an almost quaint correlation between what is in front of our eyes and the thoughts we are able to have in our heads: large thoughts at times requiring large views, new thoughts new places. The mind may be reluctant to think properly when thinking is all it is supposed to do.*[23]

~ *Alain de Botton*
The Art of Travel

Madrid-Barajas T2
Madrid, Spain
Luis Gutiérrez Soto | 1953[20]
Area: 55,000 sq m*

* Indicates area estimate from:
http://www.daftlogic.com.

DAY 7

MAD T2

[3.43] Full-height glazing in waiting areas allows for uninterrupted views out onto the tarmac.

[3.44] An antiquated, though not unpleasant, section of the gates concourse.

[3.45] The newer portion of the terminal sports a high ceiling but, surprisingly, no skylights.

[3.46] The concourse occasionally splits into two levels, with VIP lounges above circulation corridors.

Madrid-Barajas T2

I began the seventh day of my travels by departing from Terminal 2 at Madrid-Barajas Airport. No solid information exists about when exactly this airport was most recently retrofitted, but it looked to me like it must have been during the pre-modular era of the 80's. The terminal sports a fairly rigid layout with fixed check-in desks and retail and food services. While this isn't necessarily a terrible thing in the present context of the terminal, it certainly makes the prospect of future expansions quite difficult.

Parts of the terminal have been retrofitted on multiple occasions, as evidenced by sudden changes in ceiling height about halfway down the gates concourse. The newer portion of the terminal is grand and spacious, but seems somewhat dull otherwise, particularly with regards to interior lighting. In all likelihood, this has to do with the complete absence of overhead skylights, which normally would be an optimal design solution for a concourse of such width.

The triple-height space of the hall occasionally seems far too removed from the human scale, particularly at waiting areas, where no attempt is made to create a more intimate setting. On the other hand, due to the high ceiling, passengers are treated with incredible views out toward the tarmac and up toward the sky.

I recall being quite bothered by the poorly integrated addition to the existing gates concourse simply because of the very apparent discontinuity of everything from materiality, sectional shape, and style. The architect likely did not have much say in how much of the terminal he could actually retrofit. Even so, this very apparent clash of new and old reinforces the need to approach airport design, including airport renovation, from a more holistic perspective.

Paris Charles de Gaulle T2F

Terminal 2F and 2E, both designed by Paul Andreu, bear a striking resemblance to one another in footprint, layout, and form. Prior to the collapse of T2E and its subsequent reconstruction, you would have had a hard time distinguishing between the two at all in some areas. Sadly, the portion of Terminal 2F that deviates the most from its counterpart, the gates concourse, was off limits to me. Despite this, I saw enough of the main arrivals and departures levels to form some fairly solid opinions about the architecture.

The use of concrete as part of the aesthetic of a terminal building gives it a monolithic quality that no other material can come close to doing. At the same time, the physical and visual attributes of concrete project a sense of weight above the passenger (if used as part of the roof structure) that can sometimes be overwhelming and unnecessary. In the case of T2F, the incredibly spacious nature of the departures hall interior does well to counter the visual heaviness of the concrete, but does little to solve the second major issue related to an extensive use of sculptural concrete: reduced daylighting opportunities.

The occasional strip of punched openings does not do enough to let in an abundance of natural light, which is what this terminal desperately needs. Coupled with an exaggerated use of concrete, the lack of daylighting and colour made for a somewhat cold and almost Brutalist environment in the most traversed of spaces. I thought at the time that walking through the terminal compared to walking on the street on the gloomiest of days, which is fairly ironic as the sun shone brightly that morning. Looking past the security area and into the far better-lit and visually open gates concourse made me wonder why Andreu chose not to incorporate more glass into the check-in hall, since it's certainly possible to create visual boundaries between spaces without compromising the quality of an experience.

[3.47] *A complex web of infrastructure is visible from the main terminal building.*

[3.48] *A view of Andreu's fully-glazed triangular structure overtop the gates concourse.*

[3.49] *A similar concrete aesthetic used to exist at its sister terminal, T2E, before collapsing due to weight.*

[3.50] *The terminal, as viewed from the lower level. It was surprisingly empty considering its enormous size.*

DAY 7

[3.51] The enormous check-in hall of T2F. A lack of daylighting results in dark interiors.

Nowhere was the airport's charm more concentrated *than on the screens placed at intervals across the terminal. They suggested the ease with which we might embark for a country where the call to prayer rang out over shuttered whitewashed houses, where we understood nothing of the language and no one knew our identities.*[24]

~ *Alain de Botton*

A Week at the Airport: A Heathrow Diary

2F CDG

Charles de Gaulle T2F

Paris, France

Paul Andreu | 1998[25]

Annu. Capacity: 13 million[25]

Area: 130,000 sq m[25]

When I'm working on a problem, I never think about beauty. I think only how to solve the problem. But when I have finished, ***if the solution is not beautiful, I know it is wrong.***[26]

~ ***Buckminster Fuller***

[3.52] The gentle curvature of the terminal in plan is only perceivable when viewed from the very end of the concourse.

2E CDG

DAY 7

Charles de Gaulle T2E

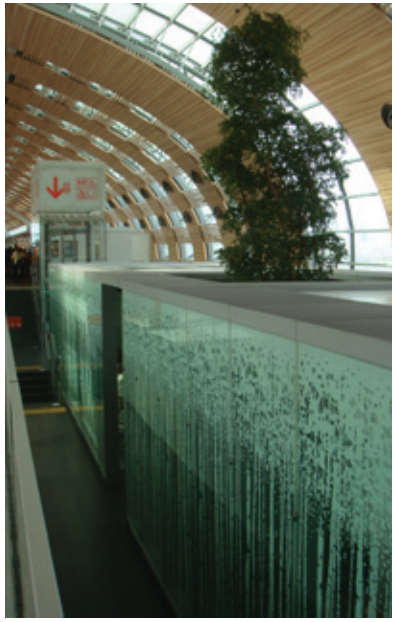
Paris, France

Paul Andreu | 2003[27]

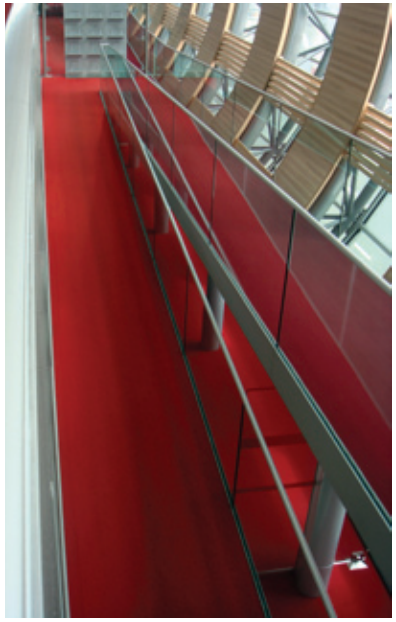
Annu. Capacity: 11 million[27]

Area: 220,000 sq m[27]

[3.53] A nature-themed aesthetic surrounds a smoking lounge located at mid-level.



[3.54] The new, post-collapse, structure and materiality makes for a far warmer series of spaces.



[3.55] Boarding ramps prevent congestion and chaos on the main level of the gates concourse.

[3.56] The warm tones of the wood cladding work far better than the cold presence of a concrete structure.

Paris Charles de Gaulle T2E

In 2004, not long after it was officially opened to the public, Terminal 2E at Charles de Gaulle partially collapsed, killing six people.[28] The new structure, opened in 2008, is formally very similar to the old, but expressly uses a system of structural steel and glazing as opposed to poured concrete for its outer shell. In making the switch from a purely concrete structure to a steel one with interior wood cladding, the exterior shell seems lighter and less oppressive than before. Also, using wood infuses nature into the experience, in the same way that bamboo cladding does at Madrid-Barajas T4.

[3.57] The previous version of CDG's T2E used structural concrete for its outer shell.

Aside from the gates concourse, the rest of the terminal resembles T2F aesthetically and programmatically. And while these areas are very interesting as well, the gates concourse is far more vibrant and dynamic in nature and deserves a more detailed description. Carpeting a terminal's entire floor area is fairly unconventional, although in this case it seems to work fairly well. The alternating light and dark red pattern infuses colour into the concourse, matching nicely with the seating and the wood cladding. On the other hand, carpet tends to slow one down when trying to make a break for your gate and I personally believe it should be avoided as much as possible, especially along the central circulation spine.

The most intriguing and useful tactic employed at the terminal involves the boarding ramps installed along the perimeter by the gates. The presence of such ramps immediately clears up congestion in the waiting area during the boarding process and also makes it a lot simpler for disembarking passengers to quickly shift down to the lower arrivals level, again as a means of avoiding cross-circulation. This clever approach to boarding inspired the use of a similar strategy in my own design.

London Heathrow T4

It was still day 7 of my trip when I finally arrived in London at Heathrow's Terminal 4. My exhaustion no doubt contributed to the disappointment I felt upon entering the terminal building, but it seems equally plausible that the poor architecture contributed to it the most. Of all the baggage claim areas I had seen up to that point and would see afterwards, nothing could compare to the factory-like setting of Terminal 4's. Panels hanging loosely from the ceiling, fluorescent lighting blinding one's way, a confusing maze of carousels, and linoleum tile that looked like it belonged on the cutting room floor of a local butcher's all combined to form a terribly depressing arrival experience.

Above in the check-in hall, the situation fared little better. As mentioned in Chapter 2, one of the most inflexible strategies for organizing a departures hall is to fix check-in desks in a manner perpendicular to the flow of traffic. Unfortunately, this is precisely what has been done at T4. And, though I did not arrive during peak time, I could clearly see that the risk of congestion would have been high. Madrid-Barajas integrates the departures hall directly into the gates concourse, without making any distinction. Normally, in modern terminal design, the main terminal area housing the departures and arrivals halls is designed to jut out from the linear gates concourse as a way of clearly delineating between pre- and post-security zones, as well as a way to create forward momentum.

At night time, while the space was sufficiently lit, albeit with a strange yellowish glow, the lack of skylights and minimal perimeter glazing made me wonder what it would feel like during the day. As a check-in hall, it distinctly resembled the one at Madrid-Barajas T1, which also sports a similarly low ceiling with no skylights. Ultimately, both present less than optimal conditions for departing passengers, and in T4's case, for arriving passengers as well.

[3.58] *The factory-like and fluorescently-lit baggage claim hall at Heathrow's Terminal 4.*

[3.59] *The signage, designed by Mijksenaar, is effective.*
[3.60] *A view down the length of the check-in hall.*

[3.61] *An underground corridor connects the terminal to the people-mover station.*

DAY 7

[3.62] Check-in stands line the wall at T4, creating a risk of congestion during peak hours.

The devil himself *had probably redesigned Hell in light of information he had gained from observing airport layouts.*[29]

~ Anthony Price
The Memory Trap

T4 LHR

London Heathrow T4
London, England
Scott, Brownrigg and Turner[30] | 1986[31]
Annu. Capacity: 10 million[31]
Area: 106,000 sq m[31]

Despite one's exhaustion, ***one's senses are fully awake, registering everything --*** *the light, the signage, the floor polish, the skin tones, the metallic sounds, the advertisements -- as sharply as if one were on drugs, or a newborn baby, or Tolstoy.*[32]

~ *Alain de Botton*

A Week at the Airport: A Heathrow Diary

London Heathrow T5
London, England
Richard Rogers | 2008[33]
Annu. Capacity: 36 million[33]
Area: 465,000 sq m[33]

DAY 7

LHR T5

[3.63] *The elegant curvature of the roof overtop the check-in hall at Heathrow's Terminal 5.*

[3.64] A view from the upper-level curbside showing the curtainwall façade of Terminal 5.
[3.65] Tensile canopies provide a measure of protection from the elements at pick-up and drop-off points.

[3.66] Signage is large, clear, and effective.

[3.67] A large pin joint connection helps support the roof.

London Heathrow T5

Before calling it quits for the day, I made my way over to the new Terminal 5 by Richard Rogers. Just like at Madrid-Barajas T4, I had no flights in or out of this terminal and was limited to walking around in public areas only. Nonetheless, I managed to see and document the front half of the main terminal building, including the departures hall and arrivals area. Most impressive were the structural attributes of the terminal, specifically some massive pin connections used in the roof support system.

One of the most successful strategies employed by the architects was to set back the terminal so that passengers and visitors could experience a processional approach to the front doors. More importantly, this move also prevents crowding along the front façade and completely separates vehicles and infrastructural elements from the passenger terminal. The setback allows for architects and landscape architects to create a visually appealing open space that can easily incorporate greenery and water features. The accessible exterior space at T5 is entirely hardscaped (aside from a grid of trees) and perhaps could have benefitted from some softer landscaping to give it a less rigid and more natural feel.

The interior of the terminal was reminiscent of Pearson's T1 with its gently curving roof form and alternating strips of panels and glass. The flexible layout also referenced Rogers' earlier design at Madrid-Barajas, which emphasizes open areas with freestanding elements for an easily modifiable floor plan. Standing in the departures hall, I noticed that the arc of the roof seemed somewhat low for the width of the space. A smaller radius in proportion to the size of the terminal might have been worthwhile to consider, as opposed to the visual heaviness that the sectional shape currently lends itself to.

London Stansted

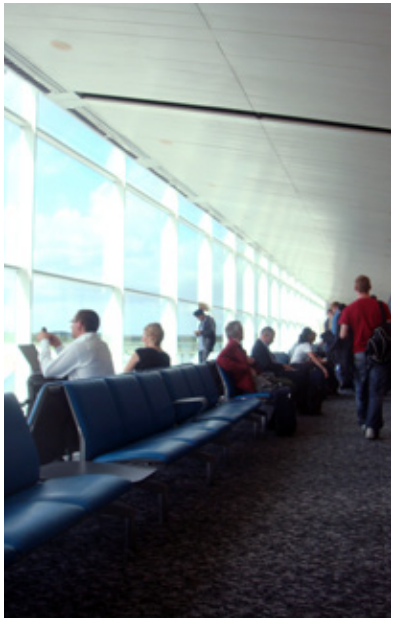
Day 10 of my trip began at Stansted Airport, located northeast of London and designed by Norman Foster in the early 90's. I had been eager to visit this airport ever since I had heard about its modular design concept many years prior. As mentioned in Chapter 1, Stansted was one of the first airports to reject a gestural aesthetic in favour of a more utilitarian and repetitive framework, as a means of endowing the architecture with a capacity to expand.

In 2007, roughly 5,900 square metres of program was added to the main terminal building,[34] which included an extended security zone and proportionally more retail. The expansion was necessary in the face of increasing passenger numbers and was easily added onto the existing modular structure. Interestingly, Stansted's satellite buildings have never followed in the main terminal's footsteps as far as prefabrication and modularity go. While the main building acts only as an intermediary between the passenger and the gate, it is the satellites that house waiting areas and gate docks. So, in a sense, it is somewhat ironic that a modular approach was not used in, arguably, the most likely parts of the terminal to actually need expansion later on.

The most frustrating thing about Stansted Airport, besides the low lighting levels, is the confusing maze of retail you are forced to navigate through once past security. I suspect that the obstacle course layout was designed this way purposefully so as to entice passengers to buy as much as possible before their flights. This is an utterly dangerous approach, especially in terminals with satellite designs, as passengers risk prolonging their stay in the main terminal building and missing their flights. Trains to the satellite buildings run every few minutes, but no indication is given of the maximum time it takes to reach specific gates, resulting in passengers either hopping onto the people-movers too early or, worse, much too late.

[3.68] *The sea of retail beyond security is reminiscent of an obstacle course and can be quite frustrating to navigate.*

[3.69] *The extension of the modular roof system over the curb provides cover from the elements.*



[3.70] *The completely different and very conventional aesthetic of one of STN's satellite terminals.*

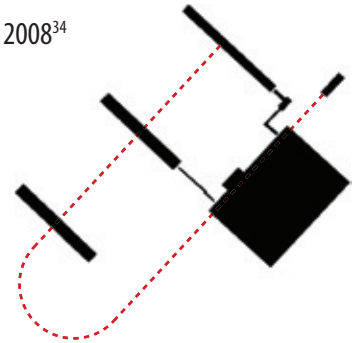
DAY 10

[3.71] The famous skylights add to the beauty of the ceiling aesthetic, but do little to adequately illuminate the spaces below.

If we find poetry in the service station and motel, if we are drawn to the airport or train carriage, it is perhaps because, ***in spite of their architectural compromises and discomforts,*** *we implicitly feel that these isolated places offer us a material setting for an alternative to the selfish ease, habits and confinement of the ordinary, rooted world.*[35]

~ *Alain de Botton*
The Art of Travel

London Stansted
Stansted, England
Foster[36] / Pascall Watson[34] | 1991[36] / 2008[34]
Annu. Capacity: 18 million[37]
Area: 56,000 sq m[36]



STN

Everything has changed. The flying changed.
The airports have changed.[38]

~ *Eydie Gorme*

Amsterdam Schiphol
Amsterdam, Netherlands
Bentham Crouwel | 1993[39]
Annu. Capacity: 60-65 million[39]
Area: 600,000 sq m[39]

DAY 10/12

AMS

[3.72] *A view of the arrivals area of the airport, beside the fully-integrated train station.*

[3.73] Schiphol offers a pleasant check-in experience, despite the somewhat outdated ceiling aesthetic.

[3.74] Schiphol Plaza is located pre-security and looks like a typical mall, though retail isn't forced upon the passenger.
[3.75] The gates concourse features an unconventional assortment of retail and restaurant spaces.

Amsterdam Schiphol

In addition to seeing its world-class signage designed by wayfinding firm Mijksenaar,[40] I was eager to experience Schiphol Plaza (a built-in shopping centre) at Amsterdam's Schiphol Airport. I have my personal reservations about the concept of expanding a terminal's footprint in order to add more retail, but after seeing the Plaza, I came to the conclusion that Schiphol is one of the few airports where that sort of thing works fairly well, primarily because it is not forced upon the passenger at any point. As opposed to Stansted, for instance, passengers are not required to go through a retail zone in order to reach their gates. Options should always be given where feasible; removing choice from the passenger has psychological consequences and can only increase stress levels.

The terminal area beyond the security checkpoint was modern, well-designed, and pleasant. However, aside from Schiphol Plaza, the most unique aspect of the terminal had to be the train station located on the main level. Very few airports, even in Europe, integrate rail infrastructure into their designs so completely and seemingly effortlessly. Generally, connections to infrastructural routes take place below grade, which often makes for an unwelcoming and dull experience for those arriving.

Schiphol Airport has gone through many renovations over the years and this is plainly obvious. There is nothing specifically impractical or unattractive about any of the spaces pre- or post-security. However, as a result of the constant changes and expansions that have taken place over time, the airport lacks an architectural cohesiveness that could help to simplify and de-clutter it both spatially and aesthetically. The character of the gates concourse, for instance, is entirely different than that of the main terminal hall, and in so being conflicts with the unique sense of identity that is projected at the airport's front doors.

Köln-Bonn T2

Before flying off to Munich, I made a brief stopover at Köln-Bonn's Terminal 2, designed by Jahn/Murphy and opened in 2000. Other than the old departures terminal of Doha International, this would be one of the smallest terminals (at 69,000 square metres) that I would have a chance to visit on my trip. I specifically added this airport to my list for its intriguing use of non-traditional pictograms as part of the wayfinding system.

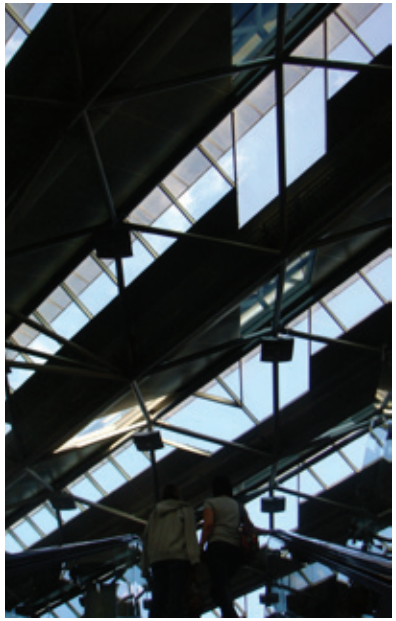
[3.76] Unconventional signage at T2.

Graphic designer Toan Vu-Huu created a unique set of pictograms for Terminal 2's signage that completely breaks with convention.[41] The vibrant and clear symbols contribute to the terminal's visual identity almost as much as the architecture itself does. The use of bright colours also offsets the greyish colour palette of the structure and cladding, giving the terminal a vibrancy and dynamism that it likely would not have otherwise. With that being said, standards in signage are there for a reason; passengers have been conditioned to more easily identify symbols that have been around for some time and also appear in various other situations outside of the realm of the airport.

The architecture of the airport is consistent, pure, and sleek throughout, as is generally the case with terminals designed and constructed from scratch. And again, similar to most newly-built terminals, the structural skin acts more like a shell rather than anything else, leaving the floor plate clear and open to any necessary layout modifications. The lower level resembles the upper, and only differs in terms of function. Curtainwall glass graces the full length of the perimeter, ensuring that every corner of every space will receive some measure of natural light. For its size and capacity, the design lends to a pleasurable passenger experience in general.

[3.77] Charming, brightly-lit bars are scattered throughout the terminal, providing it with much needed colour.

[3.78] Atrium spaces reveal the full four-level height of the terminal building.



[3.79] Skylights and metal panels clad the ceiling.

[3.80] A view of the freestanding retail next to check-in.

[3.81] The sleek and simple baggage claim hall of CGN T2.

I think ***it is a pity to lose the romantic side of flying*** *and simply to accept it as a common means of transport, although that end is what we have all ostensibly been striving to attain.*[42]

~ *Amy Johnson*
Sky Roads of the World

DAY 12

T2 CGN

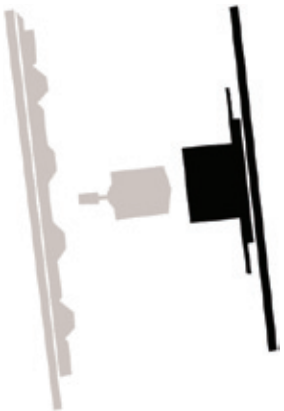
Köln-Bonn T2
Köln, Germany
Murphy/Jahn | 2000[43]
Annu. Capacity: 6 million[44]
Area: 69,000 sq m[43]

DAY 12/14

Both flight and design involve unseen forces, obey certain rules and for their realisation depend totally on the ***distillation of highly complex systems into a single vision.***[45]

~ *Norman Foster*
The Airport of the Future

Munich Int'l T1
Munich, Germany
Busse, Blees, Büch, Kampmann | 1992[46]
Annu. Capacity: 20 million[47]
Area: 198,000 sq m[47]



Munich Int'l T2
Munich, Germany
Koch + Partner | 2003[48]
Annu. Capacity: 20-25 million[47]
Area: 271,000 sq m[47]

MUC T1 T2

[3.82] *The intricate structure of the check-in hall of Terminal 2.*

[3.83] Angled baggage claim carousels in plan promote a forward movement toward the customs checkpoint of T1.
[3.84] A seemingly endless, underground, neon-lit corridor connects the two terminals together.

[3.85] A view of the Munich Airport Centre (MAC), an outdoor space located between T1 and T2.

[3.86] A series of skylights along the gates concourse of Terminal 2 allow in ample natural light from above.

Munich International T1 / T2

I realized shortly after arriving at Munich Airport on day 12 that I had reached the halfway point of my journey. Up until then I had seen only Western airports, per se, and was now about to make my way eastward to explore what the Orient had to offer. Before doing so, however, I would have the opportunity to experience arriving into Terminal 1 and departing from Terminal 2 at Munich International Airport.

Nothing of note really stood out for me in T1 or T2 besides the painfully long below-grade corridor that stretches across one end of Terminal 1 to the other. This corridor, which also acts as an underground passageway to Terminal 2, is generally devoid of program and anything of true aesthetic value. Besides looking at the neon lights lined-up along the sidewall, there really isn't much for passengers to do except keep moving forward and praying for the scene to end at some point. The rest of the terminal (from an arriving passenger's perspective) was unremarkable, though not at all unpleasant, and certainly did not exude the same institutional vibe that the corridor level did.

The Munich Airport Centre (MAC), located in the open area between the two terminals, was definitely the highlight of my airport experience here. The MAC consists of a series of buildings and open spaces that have some relation to the rest of the airport. It is a hub for shopping, eating, lounging, and simply wasting time before one's flight. The intricacy of the architecture and the landscaping enrich this outdoor square and provide an excellent environment for relaxation with one's family or friends prior to passing through security. Unfortunately, as beneficial as access to greenspace is for a fulfilling and calming passenger experience, nothing akin or even close to the calibre of the MAC exists post-security, which is a shame for both passengers and employees alike.

Doha International

Of all the airports visited on my trip, Doha was the only one located in the Middle East. Being given such a short amount of time to transfer over to my next plane (less than 1 hour), I had no opportunity to take pictures, and barely had a chance to do any documentation at all. As a result, my description and analysis of Doha Airport will be entirely based upon memory, which should be legitimate considering that this is the case for most passengers anyway.

Doha Airport currently operates two terminal buildings, one designated for arrivals and the other for both departures and transfers. As one of the few major international airports to still use an open apron concept, passengers are continuously transported to and from the terminals via shuttle busses. Upon arriving in the Departures Terminal, the first thing I noticed was the incredibly antiquated feel of the interior. Low T-bar ceilings, no skylights, and generic floor and wall patterns characterized most of the retail and waiting areas, which is not surprising considering that the terminal was originally built in the late 50's. The existing terminal buildings are set to be replaced by the New Doha International Airport building in 2013, a necessary move that designers hope will solve current issues of overcrowding.[49]

Beyond poorly executed signage, the Departures Terminal is famous for its excessive amount of high-end retail on the lower level. Passengers are forced to walk through many of these areas to reach their gates, mimicking a tactic that is used at museum gift shops. Most of the items are nowhere near affordable for the average passenger and the showy nature of it all left me feeling somewhat disappointed in the airport as a whole. Nothing, other than perhaps the Arabic signs and passenger's clothes, even hints that you are in Qatar, let alone the Middle East. This is a lost opportunity to showcase what truly makes the region unique as opposed to the things that serve only to reinforce negative stereotypes.

[3.87] *Retail at Doha Airport stretches across the entire length of the lower level.*

[3.88] *There are no separate waiting areas at Doha Airport; seats are clustered in one enormous space.*

[3.89] *Signage at Doha is occasionally confusing, one of the reasons being the lack of contrast between languages.*

[3.90] *The old terminal building at Doha is antiquated in form and function and will soon be torn down.*

There's nothing like an airport for
bringing you down to earth.[50]

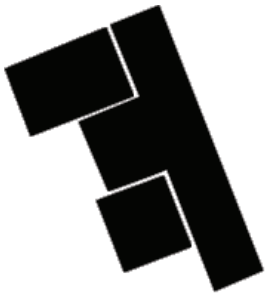
~ Richard Gordon
Doctor in the Swim

DAY 15

DOH

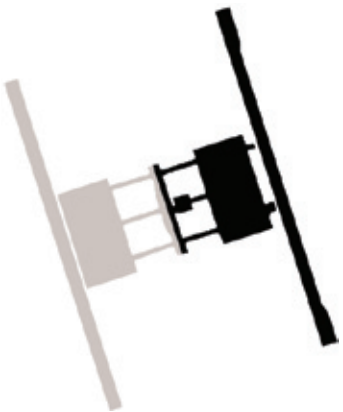
Doha International
Doha, Qatar | 1959[51]
Annu. Capacity: 12 million[52]
Area: 70,000 sq m*

* Indicates area estimate from:
http://www.daftlogic.com.



And I wondered, with mounting anxiety,
"What am I supposed to do here?
What am I supposed to think?"[53]

~ *Alain de Botton*
The Art of Travel



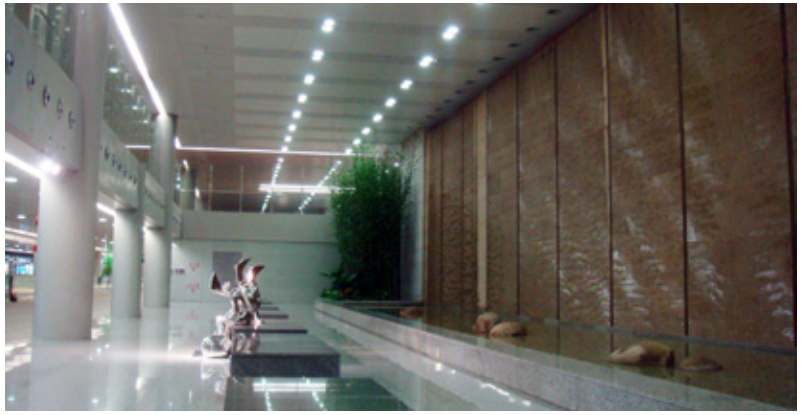
Shanghai Pudong T2
Pudong, China
ECADI | 2007[54]
Annu. Capacity: 40 million[54]
Area: 480,000 sq m[54]

DAY 15

PVG T2

[3.91] *The check-in hall of PVG T2 is too large for a passenger to relate to at the human scale.*

[3.92] *Human-like sculptures located in front of a water feature along the gates concourse.*



[3.93] *The completely rectilinear features of a typical waiting area. The lack of dynamism makes the space bland.*
[3.94] *The low ceilings and conventional aesthetic of the concourse does little to inspire the passenger.*

Shanghai Pudong T2

Before embarking on my journey, I tried to mentally and physically prepare myself as best I could for the challenging times ahead. This included training myself to overcome the exhaustion that would surely set in after a long series of flights. Specifically, I predicted that the leg from Munich to Doha to Shanghai to Beijing would not be easy, and this was indeed the case. By the time I reached Shanghai Pudong's Terminal 2, I felt about ready to collapse and could not even fathom documenting my experience through photos, sketching, or writing.

I'm not quite sure if it was the architecture that contributed to this, or perhaps the spontaneous reunion that took place with Professor Lloyd Hunt in the check-in hall, but I immediately felt rejuvenated as soon as I began to walk around and truly take in my surroundings. Terminal 2 sports a large, wavy roof system with alternating wood and translucent panel sections over the departures hall. During the daytime, diffuse light filters through the translucent portions of the roof and into the spaces below, creating an almost ethereal glow. Like Terminal 3 at Beijing Capital Airport, the roof seems higher and larger than necessary if measured proportionally against the floor area. A spacious departures hall should certainly be the norm for any airport design, but this is yet another example of one that is too far removed from the human scale.

As far as gates concourses go, the one at Terminal 2 is fairly conventional in plan and in section, meaning that the ceiling is too low over the main circulation space and that no provisions have been made for natural light to enter the spaces from above. In addition to unnecessarily carpeting the entire floor area of the concourse, its worst feature was a very limited selection of food outlets. Though not uncommon, it is especially unfortunate when one remembers that more than anything else.

Beijing Capital T3

Opened in 2008 as a tribute to the Summer Olympics in Beijing, Terminal 3 is a marvel of architecture and technology. Considered one of Norman Foster's best works, it also is one of his largest, by far. The terminal measures 1,300,000 square metres in floor area and has an 800-metre long departures hall,[55] the largest in the world. With an annual capacity of 50 million passengers, Terminal 3 was the biggest, busiest, and most sophisticated airport I would have a chance to see on my trip.

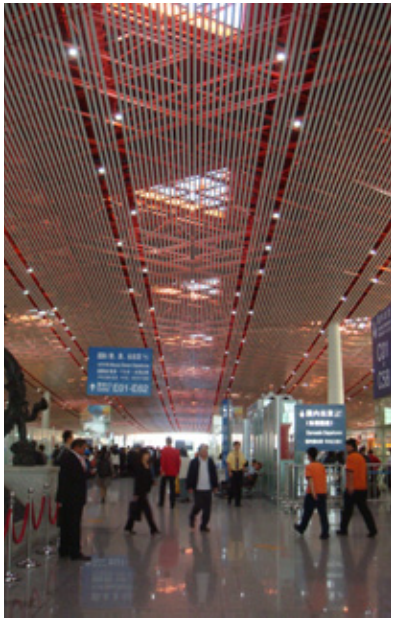
Although arriving into Beijing's T3 was incredibly thrilling in and of itself, departing from the terminal was truly the focal point of the experience. The sheer size of it had the power to render me speechless and feeling very small, as I'm sure was the case for most passengers. The terminal is beautiful, vibrant, majestic, complex, and entirely overwhelming at the same time. Like Pudong's T2, its enormity is difficult to relate to at the human scale -- it seems rather a thing to be admired from afar. The metaphor of flight, as much as Foster might prefer to deny, is ingrained in the terminal's form, both in plan and in section. In this way, it is much more dynamic than Stansted airport, for instance, and also far more engaging for the passenger as an architectural form.

Many challenges present themselves with a structure of this physical magnitude, including and especially the way in which natural light is able to filter through and adequately illuminate the interior spaces. Ultimately, I felt that the environment of the terminal was somewhat dark, and even dull, despite the use of vibrant colour. In fact, the strength of the colour was diminished by the very lack of adequate daylighting. The repeated triangular skylights were too small to have a substantial effect on the lighting levels and the floor-to-ceiling glass on the perimeter did little in terms of allowing light into the deep recesses of the terminal.

[3.95] *Passengers walk over bridges to the check-in hall. The terminal's shear size is overwhelming.*

[3.96] *Interesting light and shadow patterns reflect onto the ceiling, creating an ethereal effect.*

[3.97] *A view of a typical waiting area. Retail located along the middle sometimes limits the amount of seating.*



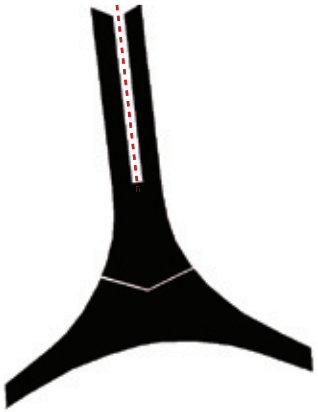
[3.98] *Operable triangular skylights allow in natural light and improve air circulation.*

DAY 15/18

It seemed an advantage to be traveling alone. Our responses to the world are crucially moulded by the company we keep, for ***we temper our curiosity to fit in with the expectations of others.***[56]

~ *Alain de Botton*
The Art of Travel

Beijing Capital T3
Beijing, China
Foster and Partners | 2008[57]
Annu. Capacity: 50 million[57]
Area: 1,300,000 sq m[57]

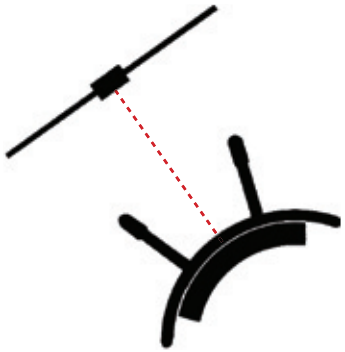


T3 PEK

[3.99] *The departures level sits at grade, with arrivals one level below. The size and layout of the structure prevents natural light from reaching into every corner.*

I see that ***it is by no means useless to travel,***
if a man wants to see something new.[58]

~ ***Phileas Fogg***
Around the World in 80 Days



Seoul Incheon
Seoul, South Korea
Fentress Bradburn | 2001[59]
Annu. Capacity: 44 million[59]
Area: 496,000 sq m[59]

DAY 18

ICN

[3.1.1] *The triple-height concourse at ICN is packed with retail on both sides and on multiple levels.*

[3.1.2] Structural glazing is used to cover a series of escalators between the arrivals and departures levels.

[3.1.3] Digital panels showcase natural themes.
[3.1.4] A surprisingly bland transfer corridor.

[3.1.5] The trusses of the check-in hall seem excessive in size and distract from the elegant sectional shape.

Seoul Incheon

After departing from Beijing (en route to Osaka) I made a short stopover at Seoul's Incheon Airport. The terminal, designed in the early 2000's by Fentress Architects, reminded me to some extent of Pearson Airport in terms of its structure, sectional shape, colour palette, and even floor layout. The departures hall sports a curved roof supported by a series of HSS mega-trusses spanning the width of space. The occasional strip of skylights breaks the monotony of the repetitive and somewhat heavy structure and cladding, and provides much needed natural light for the check-in areas below.

Something that struck me at Incheon was the excessive amount of retail scattered throughout the airport. Unlike at Schiphol, passengers have no choice but navigate through retail-ridden corridors in order to reach their gates. This aggressive marketing strategy removes choice from the passenger with respect to the amount of retail he or she wishes to be exposed to throughout the departures process. Retail and restaurants took up every available section of floor space, besides that intended for waiting areas or services. Not only is this overwhelming for the passenger, it also distracts from the architecture and lessens the symbolism of the experience.

Excess is a word that can be used to describe many aspects of the airport, beyond just the inordinate amount of retail that exists. Though the waiting areas, once you finally reach them, are pleasant and unassuming, the rest of the airport seems to want to show off wherever possible. An excessive amount of signage, an excessive use of glass in certain areas, excessively large structural elements (that can be discerned as such by eye alone), and so on, reflect a tendency of those who designed and manage the airport to try much too hard to impress the passenger on the most superficial of levels.

Osaka Kansai

Kansai Airport, designed by Renzo Piano in the early 1990's, sits on a man-made island in the bay of Osaka. The island itself is said to be sinking at a rate of 2-4 centimetres per year, and as a result, adjustable columns have had to be installed in the airport to keep it level.[60] A second man-made island has recently been created, with plans for a new terminal building in the works. To ensure stability and prevent sinking, the piles for the second island have been driven far deeper into the soil than what was the case the first time around.

Kansai is one of the longest linear terminals in the world, and therefore uses a people-mover train to transport passengers to and from their gates. The central terminal building consists of the departures and arrivals halls, as well as multiple levels of retail and administration spaces. A security checkpoint is informally designated for each wing of the airport, and sits at the crux of the main terminal building and the gates concourses. From my experience, the process was fast, efficient, friendly, and bore no major architectural compromises.

The gates concourses differ quite dramatically from the main terminal building in terms of aesthetic and even structure. The uppermost level of the departures hall is shaped like an airfoil to promote efficient air circulation. This theme continues into the wings of the terminal, though at a much larger scale. The structure above the waiting areas looks very much like an airship hanger, and as a result they seem spacious, visually open, and continuous. The use of colour-coding with the terminal seating is a subtle wayfinding measure that allows passengers to establish visual sightlines toward their gates. My one and only concern with the terminal was a lack of variety in terms of food. Vending machines are wonderful, but perhaps should not be the one and only option for hungry passengers.

[3.1.6] *Kansai Airport's check-in hall is shaped like an airfoil to promote good air circulation.*

[3.1.7] *A view into the arrivals section of the airport. The main terminal building has four levels in total.*

[3.1.8] *Passengers making their way through bag claim.*

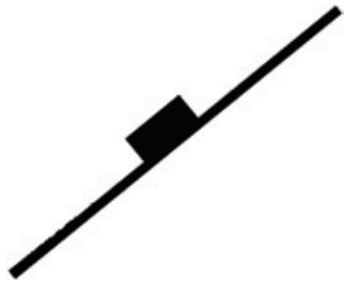
[3.1.9] *A view from the end of the gates concourse.*

DAY 18/20

I saw the world.
I learnt of new cultures.
I flew across an ocean.
I wore women's clothing.
Made a friend.[61]

~ Phileas Fogg
Around the World in 80 Days

Osaka Kansai
Osaka, Japan
Renzo Piano | 1994[62]
Annu. Capacity: 17 million[63]
Area: 303,000 sq m[62]



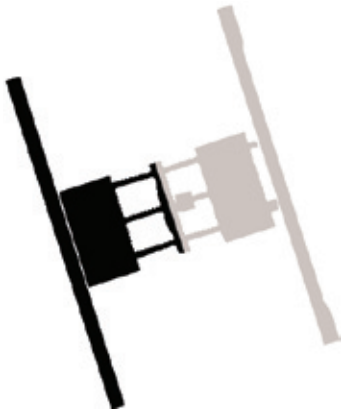
KIX

[3.1.10] *The colour of the seating at Kansai differs for each gate and acts as a navigational aid.*

In a world full of chaos and irregularity, the terminal seemed ***a worthy and intriguing refuge of elegance and logic.*** *It was the imaginative centre of contemporary culture.*[64]

~ *Alain de Botton*

A Week at the Airport: A Heathrow Diary



Shanghai Pudong T1

Pudong, China

Paul Andreu | 1999[65]

Annu. Capacity: 20 million[65]

Area: 220,000 sq m[65]

DAY 20

PVG T1

[3.1.11] *Perspective view down the length of the concourse.*

[3.1.12] The blue roof structure of Pudong's T1 works both in tension and compression.

[3.1.13] Retail is concentrated along the middle.
[3.1.14] The angled façade allows glimpses downward.

[3.1.15] A view of the structural façade at the end of the gates concourse.

Shanghai Pudong T1

En route back to North America, I made one last stopover at Pudong Airport Terminal 1. By far my favourite of the two terminals, T1 was designed by Paul Andreu in the late 90's. The most notable and intriguing feature of the building is its roof structure, which is comprised of a series of tension cables (supported by vertical poles anchored to the ceiling) that stretch across the width of the concourse. The vibrant blue cladding of the roof, along with yellowish illumination at the base of the poles, gives the ceiling a starry night aesthetic.

Since I simply transferred from one gate to another, I did not have a chance to see and document the main check-in or arrivals halls. Regardless, it is the unique form and organizational clarity of the gates concourse that truly makes the terminal stand out from all others. The layout is fairly simple and repetitive; the circulation spine stretches along the middle of the concourse, whereas program is located directly adjacent to it on either side. The difficulty with this scenario involves an underutilization of the floor space that exists behind the retail and food stalls lining the edge. Occasionally, these sections along the perimeter provide a glimpse to the arrivals level below, a strategy that could have been more interesting if applied adjacent to the waiting areas as well, or rather exclusively.

The worst feature of this terminal has to be the confusing and poorly executed signage throughout. As mentioned in Chapter 2, the type is often far too condensed and convoluted and the contrast (white on dark blue) is sometimes ineffective. For a foreign passenger, the multitude of Chinese characters squeezed in with incorrectly translated English text can make wayfinding somewhat of a challenge. Luckily, the simplicity and straightforward nature of the floor layout effectively compensates for this shortcoming.

Vancouver International

While some airports are seen as non-places in the sense that there is no overarching association made by the architecture to the city that the airport serves, others embrace the very notion of establishing a sense of place as a means of introducing passengers to their new surroundings. The former strategy, though conducive to relinquishing one's allegiances to a given place or people, can often make for a cold and clinical environment that lacks in character. The latter, introduced in sensible locations (i.e. concentrated more in the arrivals section), can help reinforce the notion of the airport as a gateway to a new city, country, or even continent.

Vancouver Airport tries to establish a sense of place for both departing and arriving passengers via its use of Native and Canadian artwork, local vegetation, and local materiality. At least, it does so in areas with the most traffic like the baggage claim zone and arrivals section pre- and post-customs. The rest of the terminal, especially when it comes to the waiting areas, is somewhat lackluster. Low ceilings, a poor quality of interior light, and unappealing colours and materials render these places somewhat dreadful. This is not to say that all of the waiting areas at the airport are equally uninspiring, but that the ones I experienced were some of the least pleasant of all the airports I had seen up to that point.

Recently, the airport introduced an excellent customs clearance program that makes the passport check a quick and efficient process for Canadian citizens. Passengers now have the option of 'self-checking' at electronic kiosks that run along the edge of the customs hall. With the advent of this technology, congestion is reduced to the absolute minimum at customs, relieving the stresses and anxieties of all passengers involved. Setting up a similar process for international passengers will hopefully be the next step.

[3.1.16] *Native art is exhibited throughout the terminal. Arriving passengers will see this piece at customs.*

[3.1.17] *Fluorescent tubes have been attached to structural trees, displaying the design's playful side.*

[3.1.18] *Natural materials are used in the atrium space over the baggage claim hall.*

[3.1.19] *A view of the dark and dingy environment in one of the gate areas.*

[3.1.20] *This glazed corridor, elegant in its simplicity, allows in plenty of natural light.*

An airport should be a celebratory structure. *It is a celebration of flight and a celebration of place. It should combine a strong visual identity with a humanistic sense of clarity, so that the experience of air travel is uplifting, secure, welcoming and efficient. Airports are the gateways to cities and nations and are the windows on the world.*[66]

~ *Norman Foster*

The Airport of the Future

DAY 20/22

YVR

Vancouver Int'l

Richmond, British Columbia

Stantec | 2007[67]

Annu. Capacity: 17 million[68]

Area: 135,100 sq m[68]

DAY 22

Travelers are always discoverers, especially those who travel by air. *There are no signposts in the air to show a man has passed that way before. There are no channels marked. The flier breaks each second into new uncharted seas.*[69]

~ *Anne Morrow Lindbergh*
North to the Orient

Portland Int'l
Portland, Oregon
Zimmer Gunsul Frasca[70] | 1960s[71] / 2000[70]
Annu. Capacity: 14 million[72]
Area: 125,000 sq m[73]

PDX

[3.1.21] *Travellators sit flush against the sidewall in a wing that only allocates one side at a time for waiting areas.*

[3.1.22] A view of the bulky space frame structure of the roof above the security checkpoint.

[3.1.23] Skylights and the occasional plant add a feeling of warmth to the space.
[3.1.24] Unattractive carpeting takes up the entire floor space of the terminal.

Portland International

Prior to my trip, I had no specific urge or reason to see Portland Airport. At the same time, one of my goals was to document terminals of every calibre and size (within the scope of international airports). Additionally, I was particularly interested in visiting American airports, as many of them exhibit the very conditions and issues that this thesis tries to address.

Transferring through Portland was a very straightforward and simple process. My arrival and departure gates were located almost side-by-side, on the same wing, so I really only had to walk about 50 metres to get from one to the other. But of course, I had a job to do and it involved seeing and documenting as much of the airport as I possibly could in the relatively short period of time I had at my disposal. Unfortunately, with security located at the apex of the wing and the departures and arrivals halls, I was limited how much ground I could realistically cover.

What was obvious was that the terminal makes good use of what little space it has. For instance, because of the narrow width of the gates concourse, only one side at a time is used for gate docks and waiting areas. The other is generally taken up by circulation and travellators, which often sit directly against the wall. Frequent skylights allow natural light into the circulation corridor, and vegetation scattered throughout the wing offsets its tendency to appear somewhat clinical in nature.

The most striking portion of the terminal is the roof structure that covers the security checkpoint. The space frame seems unnecessarily bulky, with some elements likely being superfluous. This massive web of structure takes away from the elegant simplicity of the rest of the terminal and could have been avoided with the use of a different type of truss system. This, along with a poorly chosen carpet colour and pattern (among other things) diminishes the quality of the passenger experience.

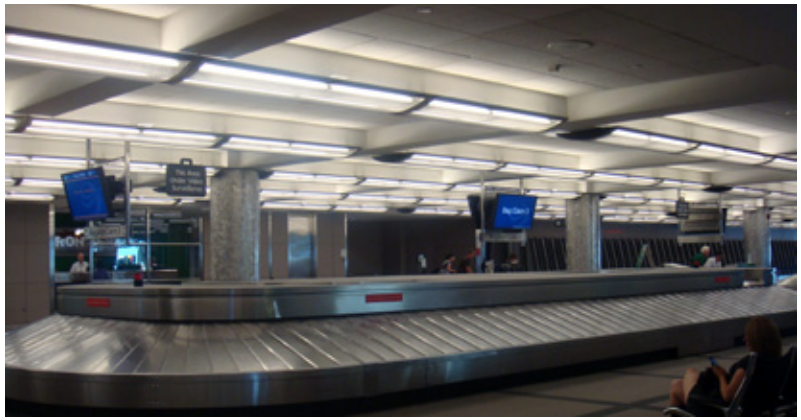
Denver International

Situated 37 kilometres from the downtown core,[74] Denver airport was designed by Fentress Bradburn Architects and opened to the public in 1995. The tensile roof structure that stretches overtop the main terminal building has given the airport an iconic presence within the desert landscape that surrounds it. One of the few airports in the world to use a tensile structure for practical as well as aesthetic purposes, Denver was a must see on my list.

The satellite buildings at the airport reminded me of the ones at Washington Dulles and as such did not stand out in too many positive ways. The main terminal building, however, was much more interesting from an architectural perspective. One of the most successful aspects about the tensile roof is that, in addition to allowing in diffuse light via the translucent Teflon-coated fibreglass material, direct light can also enter the spaces below via skylights located at the peaks of the 'mountains' (intended to be reminiscent of the Rockies).[75] This gestural shape also makes for an interesting shadow play along the length of the roof form.

The least friendly portion of my experience at Denver occurred at the security checkpoint. Like other areas of the two-level terminal building, the screening zone was completely open to view from above, which left me feeling rather uncomfortable and exposed. The complete lack of a boundary, whether physical or visual in nature, led to a congested and chaotic scene. Locating the checkpoint immediately next to the outdoor terrace is also somewhat unwise and especially bothersome for passengers during peak time. Whatever peace and tranquillity one might normally enjoy in such an outdoor space quickly disappears as a result of what takes place on the interior. However, the worst feature of the airport is undoubtedly its 1960's-style, claustrophobic, and garishly-lit baggage claim hall, which does nothing but add to stresses arriving passengers already feel.

[3.1.25] *Clerestory windows above the check-in stands allow light into the space.*
[3.1.26] *The antiquated architecture of Denver Airport's baggage claim hall is incredibly uninspiring.*



[3.1.27] *The interior of one of the satellites showing a completely independent aesthetic.*

[3.1.28] *The tensile roof structure is most elegant when viewed in isolation. Here it is seen from the exterior.*

[3.1.29] *Structural poles support the Teflon-coated fabric of the roof.*

DAY 22

[The steel columns] were endowed with ***a subcategory of beauty we might refer to as elegance,*** *present wherever architecture has the modesty not to draw attention to the difficulties it has surmounted.*[76]

~ *Alain de Botton*

A Week at the Airport: A Heathrow Diary

DEN

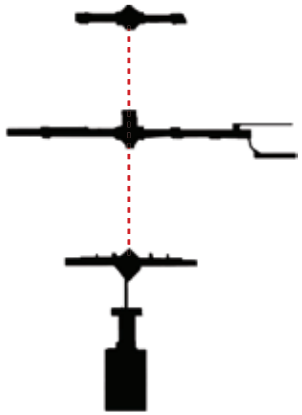
Denver Int'l

Denver, Colorado

Fentress Bradburn | 1995[77]

Annu. Capacity: 52 million[77]

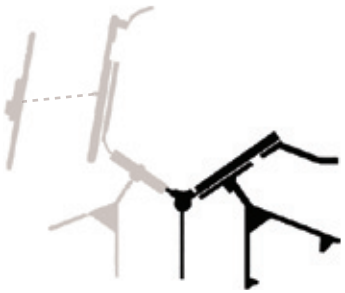
Area: 511,000 sq m[77]



Now am I fled.
My soul is in the sky.
Tongue, lose thy light.
Moon, take thy flight.[78]

~ *William Shakespeare*
A Midsummer Night's Dream

Chicago O'Hare T3
Chicago, Illinois
C. F. Murphy and Associates | 1959[79]
Annu. Capacity: 67 million (total)[80]
Area: 70,000 sq*



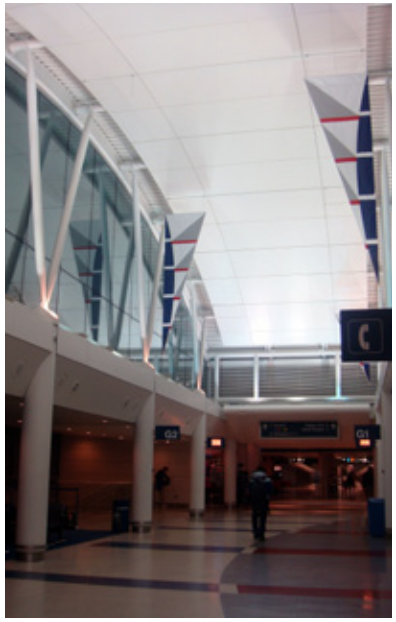
DAY 22/24

ORD T3

* Indicates area estimate from: http://www.daftlogic.com.

[3.1.30] *The central arcade of Terminal 3 sits atop the main circulation spine.*

[3.1.31] The clerestory glazing along one of the piers allows natural light to enter into the spaces below.



[3.1.32] Unusual and antiquated architectural features can be found in the rotunda between T2 and T3.

[3.1.33] A view of the corridor that connects back to T2.

[3.1.34] An unglazed, arcade-like roof stretches along the length of one of the piers.

Chicago O'Hare T3

On the evening of the 22nd day of my trip, I arrived at Chicago O'Hare's Terminal 3. The second terminal to be built at O'Hare, it has undergone a number of renovations over the past 50 years in response to changing airport standards. The unique Y-shape of the terminal means that more planes can dock around the perimeter as compared to the limited possibilities of a linear footprint. It also means that proportionally more usable floor space is available for program such as retail, restaurants, services, and waiting areas.

The initial spine of the terminal is arcade-like, allowing in natural light from above and the side, while also creating a double-height space along the circulation corridor. It exudes a pleasant atmosphere that contrasts the single-height concourse lengths of Terminal 2. The spacious section along the middle does not translate into the side waiting areas, however, leading to the creation of cramped, dark, and oppressive environments along the perimeter. As many passengers look forward to relaxing in these areas prior to take off, this scenario likely leads to some disappointment on their part.

One of the terminal piers exhibits a similar, arcade-like sectional shape, although does not use glass as part of the arced roof portion. Unfortunately, with no light entering the space from above, and barely any from the side, it begins to feel as if you're walking down some kind of underground tunnel. The other terminal pier fairs better in this respect, as it has made provisions for natural light to enter via arced clerestory windows.

The retrofits that have occurred at the terminal over the years have left it feeling semi-modern in some areas, and yet antiquated in others. This disjointedness can be a consequence of undertaking renovation projects with such limited scopes.

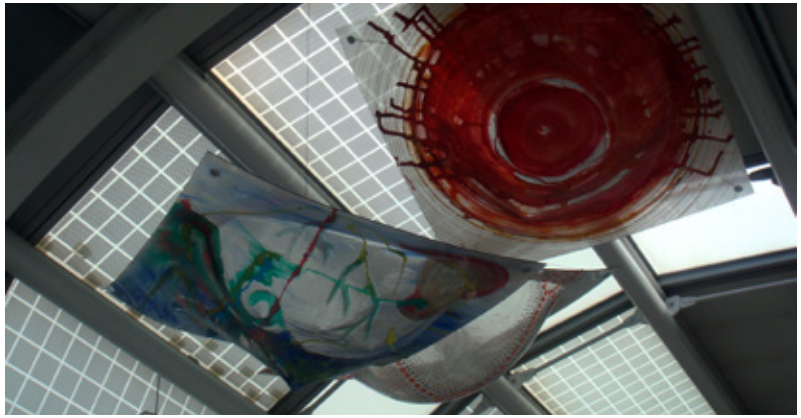
Chicago O'Hare T1

O'Hare's Terminal 1 is undoubtedly the most iconic of the three terminals. Designed by Helmut Jahn and opened to the public in 1989, the United Airlines Terminal was the first to apply the arcade aesthetic to a main terminal building and its satellite.[81] Jahn's design is also famous for the underground light tunnel that uses a series of travellators to move passengers to and from the satellite building. Many times, connector corridors do little to inspire the imagination of passengers moving through them. Regardless of what one may think of the extensive use of neon and fluorescent lights and colours, adjectives like boring and desolate simply do not apply here.

Sadly, the weather did not cooperate with me the day I went to visit Jahn's terminal. The dark and gloomy skies gave little credit to the architecture, making it seem dull when it is in fact exactly the opposite. Steel can be a harsh material to use, especially exclusively, and will particularly stand out as such on darker days. The AESS is beautiful, to be sure, but the avoidance of colour and warmer materiality can become cold and difficult to relate to. The infusion of nature, whether directly through the inclusion of vegetation or indirectly through the use of natural materials, can humanize an airport experience and provide a calming effect on passengers.

Art is exhibited throughout the terminal in the form of dinosaurs, hanging sculptures, paintings, and so on. In the past, arcades have occasionally been transformed into exhibition spaces and some, like the Crystal Palace in London, were designed with that very purpose in mind.[82] The shape of Jahn's terminal and the repetitive qualities of the structure make it conducive for showing art. As I mentioned in Chapter 2, it is my belief that art should never trump architecture in a typology such as this. At Terminal 1, art is effortlessly integrated into the architecture, and thus never takes the spotlight away from what is most important.

[3.1.35] *Glass artwork hangs from the ceiling. Fritted glazing prevents excessive heat gain during sunny days.*
[3.1.36] *The light tunnel, complete with neon tubing and eclectic music, connects the main terminal to the satellite.*



[3.1.37] *The arcade-like space stretches across the length of the main terminal building.*

[3.1.38] *A curved corridor connects T1 back to T2.*

[3.1.39] *The AESS and extensive glazing used at T1 is reminiscent of the Crystal Palace in London.*

DAY 24

T1 ORD

Rather than using form as quotations as orthodox duplications of a historic style, we ***seek conceptual relationships*** *to response of a building to site and to context, entry and procession, spatiality, ornamentation, symbolic associations of historic forms.*[83]

~ *Helmut Jahn*

Helmut Jahn: A Yale School of Architecture Exhibition

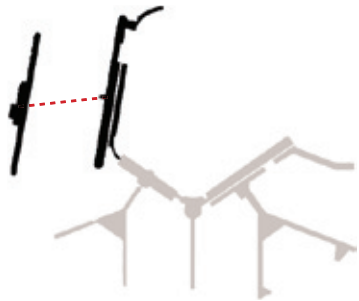
Chicago O'Hare T1

Chicago, Illinois

Helmut Jahn | 1987[84]

Annu. Capacity: 67 million (total)[80]

Area: 110,000 sq m[84]



* Indicates area estimate from: http://www.daftlogic.com.

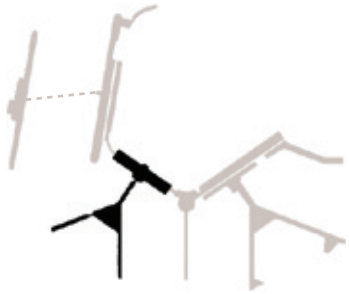
[3.1.40] As a result of the narrow width of the concourse, there is an inherent risk for congestion to form.

It can hardly be a coincidence that no language on Earth has ever produced the phrase, 'as pretty as an airport.' ***Airports are ugly. Some are very ugly.*** *Some attain a degree of ugliness that can only be the result of a special effort.*[85]

~ *Douglas Adams*
The Long Dark Tea-Time of the Soul

T2 ORD

DAY 24



Chicago O'Hare T2
Chicago, Illinois
C. F. Murphy and Associates | 1959[79]
Annu. Capacity: 67 million (total)[80]
Area: 39,000 sq m*

* Indicates area estimate from: http://www.daftlogic.com.

[3.1.41] *The double-height space of T2's check-in hall. The architecture resembles the kind found at T1 and T3.*

[3.1.42] *A section of the gates concourse showing a low ceiling and outdated finishes.*

Chicago O'Hare T2

To preface my description of Terminal 2, it is important to note that my design proposal retrofits the existing terminal with what, I hope, is a far more holistic, flexible, and responsive architectural language. Why did I choose to do this at T2 as opposed to another terminal at another airport? As unfortunate as it sounds, O'Hare's Terminal 2 represents many things that I think are wrong with today's airports, particularly those that have been left to degrade in the face of new capacity and quality demands.

My flight back to where I began my journey was, incredibly, the only one of the 19 that was cancelled. As a result of this, I had approximately 6 extra hours to spend at Terminal 2 before my rescheduled flight, which gave me ample time to thoroughly survey my surroundings. T2 was the first terminal to be built at O'Hare and this is clearly evidenced by its antiquated interiors, despite the many renovations that have taken place here over the last few decades. The check-in hall is the terminal's best feature, although even it is lackluster and devoid of natural light. As for the rest of the terminal, and in particular the concourses, I recall having difficulty finding anything positive to document.

Low ceilings, no natural light, garish artificial lighting, outdated and unattractive materiality, an uncomfortably small security zone, improperly illuminated and confusing signage (to the point that key letters and symbols were missing), lack of choice in terms of retail and food, narrow and congested circulation corridors, waiting areas with no windows, uncomfortable seating, cross-circulation between departing and arriving passengers, no art or entertainment to speak of, and on, and on, and on. T2 is an example of an airport terminal that has failed to adapt to present demands and has no inherent ability to adapt to future ones, which is exactly why this thesis proposes its redesign.

Toronto Pearson T1

It was Day 24 of my trip and I had finally arrived back at Pearson Airport's Terminal 1; the journey had ended in exactly the same spot it had begun. The knowledge of what had taken place and all that I had seen in less than a month's time left me in a daze of sorts. The terminals visited, the people spoken to, the experiences had, would all contribute in some way or another to solidifying a viewpoint -- a belief about the direction airport design must take in order to remain relevant today and, more importantly, tomorrow.

Standing on the moving walkway, for the first time in 24 days, I looked forward to finally stepping off of it. The real world was quickly closing in on me, a thought that left me feeling both relieved and saddened. Despite the many flights, trips to and from terminals, checking in and out of hotels, and so on, time seemed to stand still for me. My trip was as much a learning experience as it was an escape from things that bear so little substance and yet must be dealt with on a daily basis. Never in my life had I felt so free, as cliché as it sounds. From the moment I stepped into a terminal, I knew that there was no going back. The airport, if designed as it should be, will help relinquish, even if only for a while, those ties that hold you back from believing that you can and will reach your fullest potential.

The architecture of arrival at Pearson exuded a bittersweet quality, likely on purpose. A gentle hand, manifest in soft material and light, guided me back to that which was comfortably familiar. The atmosphere was conducive for thought and reflection, a quality that every airport should try and emulate. When passengers feel as if every moment of their experience has been catered toward their physical and psychological needs, that is when airport architecture surpasses the status of inanimate object and succeeds in connecting with them in the most fundamental and sincere way.

[3.1.43] *Artwork is used to add colour and dynamism to spaces that would be somewhat static otherwise.*

[3.1.44] *Despite a lack of natural light, the spacious baggage claim hall is warm and inviting.*

[3.1.45] *View of corridor leading to baggage claim hall. Travellators speed up the process.*

DAY 24

Once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, ***and there you will always long to return.***[86]

~ Leonardo da Vinci

T1 YYZ

Toronto Pearson T1
Toronto, Ontario
SOM / Safdie / Adamson[8] | 2007[9]
Annu. Capacity: 21 million[9]
Area: 339,000 sq m[9]

[3.1.46] *A view down the length of the psychedelic corridor of the United Airlines Terminal at O'Hare.*

In Retrospect

When I first began working on this thesis, I had no idea that I would end up embarking on a journey that would take me around the world in less than a month's time. In retrospect, it was the best possible decision I could have made because it allowed me to truly perceive airport terminals from the perspective of the passenger, and not just as an outsider or from memory alone. Credit for the suggestion has to go to my supervisor Terri, for without her encouragement to take this trip, my thesis would have lacked a certain degree of first-hand understanding and perhaps even validity.

To truly comprehend what needs to be done in any given situation, architects must be able to place themselves in the shoes of those they are designing for. This often means experiencing buildings and processes as a layman in order to make accurate judgements about what works and what doesn't or at least could be improved. In surveying passengers, I tried not to influence them in any way that could compromise the sincerity of their responses. No topic should be off limits to architects and no response should be irrelevant. If someone told me that their biggest complaint had to do with toilets not flushing properly, instead of treating the response as a frivolous one, it served to reinforce the reality that today's airports are often lackluster and do not engender more intellectual discussion.

Beyond noting better and worse approaches to the design of various airport areas, this trip solidified my suspicion that many modern airports currently provide the lowest common denominator of quality for the passengers that move through them with respect to the spatial and social conditions they encounter. As I've noted, American airports have fallen behind the most and are in desperate need of revitalization and modernization on a level that pervades every aspect of the terminal experience. This reality, for everyone's sake, should no longer be ignored.

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[4.1] *A vintage postcard from the 60's depicting heavy air traffic over Chicago O'Hare Airport.*

Preface

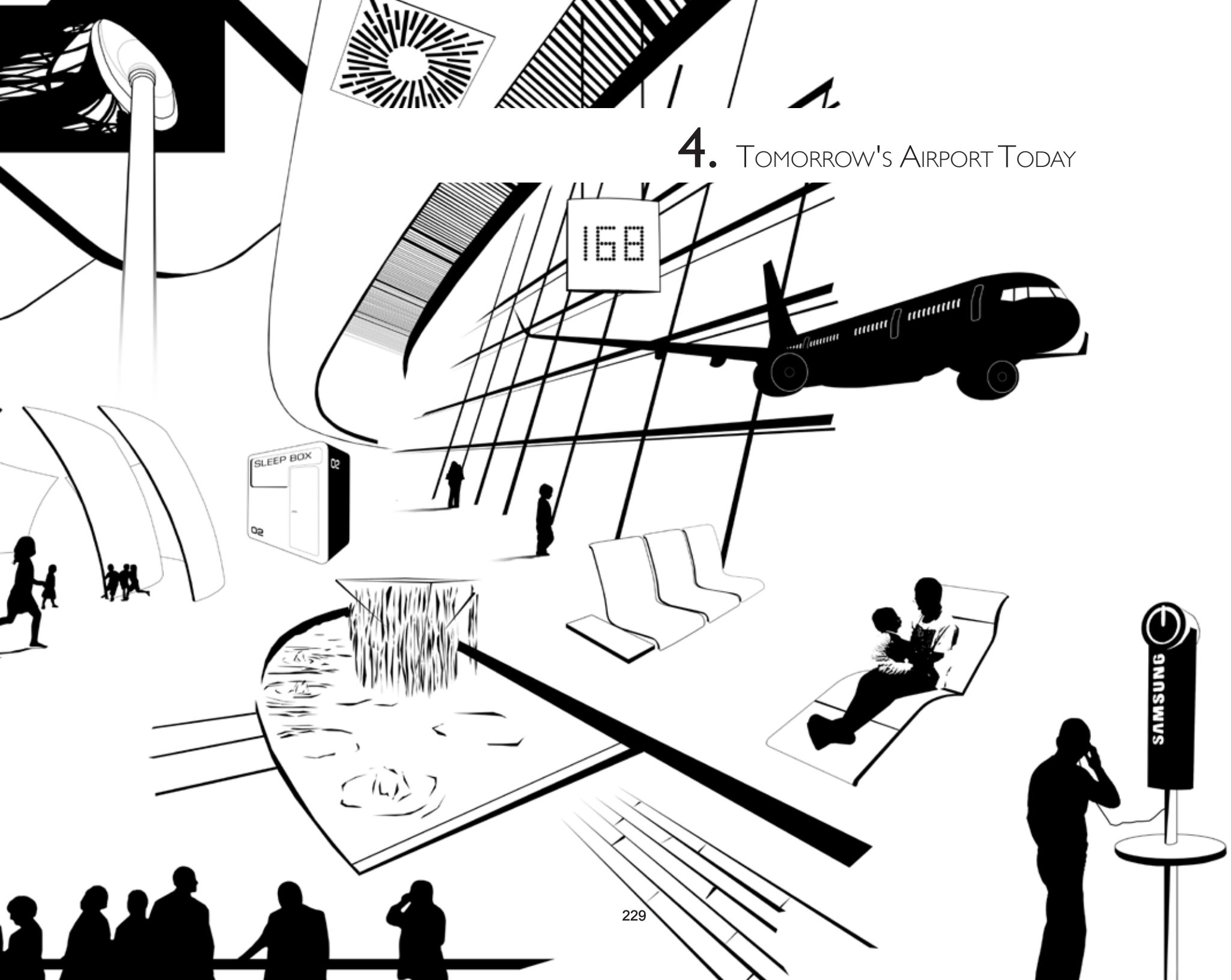
My final design proposal, also a competition entry, is a culmination of two year's worth of research, analysis, observation, and distillation. It is a conceptual vision based on a set of conclusions reached regarding what the airport of the near future should be, feel, and look like from the perspective of those who inhabit it on a daily basis. One of the difficulties of the question relates to the extent of the architect's role in the creation of a pleasant and stress-free environment for the passenger. Are there things, like components of the security process, that lie outside of our realm of influence? Of course. Does this mean that architecture should be forgotten about in the most crucial of places? Of course not. As architects, we must believe that our craft can in some way better the worst of situations. If we abandon that ideal, then what is the point of designing anything at all?

The airport of the future must reflect, absorb, and improve upon the airport of the past, and the airport of today. When dealing with a design question of such incredible complexity and nuance, the only appropriate and responsible approach seems to be a holistic one. For a holistic airport is an integrated, responsive, and ever-adaptive organism that should, at any given moment in the airport experience, fulfil its basic functional mandate, and equally importantly, cater to the needs of the people it is designed to serve.

Chicago O'Hare's New Terminal 2 intends to do this and more, because revelling in goals met should not be a precursor for stagnation, but rather a moment in time to be followed by the setting of new goals and ambitions. Clarity, simplicity, and functionality form its basic design tenants. Compelling gestural forms and public observation decks embody the essence of flight as measured against the human scale. Greenspace, transparency, water, and light complete the picture to form an entirely unique way of envisioning a new, and once old, architecture of air travel.

[4.2] *A collage of the typical airport experience.*

4. Tomorrow's Airport Today



[4.3] The departures hall at O'Hare Terminal 2 was grand, spacious, and brightly-lit.

[4.6] The below-grade arrivals area at Terminal 2. Service kiosks run along the length of the space.

[4.4] A view of the check-in hall at Terminal 2. The layout worked well for the passenger numbers at the time.

[4.7] A view of the departures hall showing an information desk, seating, and telephone booths.

[4.5] A view of the area directly past the security checkpoint showing luggage checks being performed.

[4.8] The security process at O'Hare's Terminal 2 was, and is still today, completely transparent.

[4.9] *A promotional advertisement for the 'new' Terminals 2 and 3 at O'Hare Airport from the 1960's.*

Then O'Hare Airport, and its original Terminal 2, started operating commercial flights in 1962, around the same time that the Golden Age of air travel was beginning to capture the public's imagination. Over the course of the next few years, O'Hare would transform into a bustling airport, catering to roughly 20 million passengers annually by 1965.[1] Despite its rapid rate of growth, the airport managed to maintain high standards in terms of the quality of the passenger experience. Alongside its historical counterparts in New York, Los Angeles, and Washington, Chicago O'Hare quickly became the epitome of style, elegance, and luxury.

Back in those days, a quality experience at the airport was a source of pride for all those involved in its design, maintenance, and daily operations. In fact, an attractive and well-functioning airport was a source of pride for an entire nation. It was a symbol of all that people aspired to be and become -- a collection of ambitions and dreams manifest into tectonic form. Its purpose was kept clear and simple and so was the means by which to achieve it, all without the use of high-tech signs or gadgetry. Granted, there were far fewer passengers travelling through the airport then than there are now. The difference is that the O'Hare of the 60's, unlike the O'Hare of 2012, was designed to accommodate and cater to all those who did.

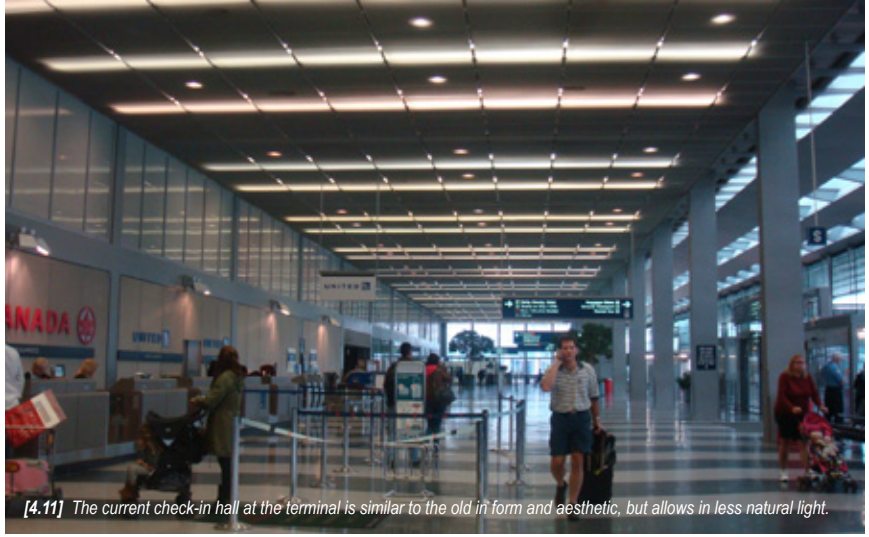
Unlike Saarinen's Dulles, which was opened to the public that same year, the architecture of O'Hare's T2 was fairly traditional and did not rely on gestural forms to convey ideas of flight. Nonetheless, there was an elegant logic behind its layout that allowed passengers to fluidly move to and from their planes with minimized stress and hassle. A simple and holistic approach to the layout of security, retail, services, and gate areas, the presence of views wherever feasible, consistent maintenance, and an emphasis on quality rather than quantity ensured a relatively straightforward and pleasant experience for both passengers and visitors alike.

Now The Terminal 2 of today at O'Hare Airport looks very much like the Terminal 2 of the 60's and 70's, without much exception. Miniscule renovation projects have been undertaken over the years that have mostly focused on updating the interior finishes.[2] Structurally, planometrically, sectionally, and programmatically, the terminal remains more or less the same, despite annual capacity increases. It is a remnant of the past, one that is unfit to meet the needs of the 21st century traveller.

T2 is experiencing degradation in multiple ways that directly impact the stress levels of the passenger. Beyond just its outdated aesthetic, lights are missing, seats are broken, walls and floors are damaged, and so on. And while the check-in area is still somewhat respectable in appearance and function, it is what occurs after the security checkpoint that gives cause for concern. Gate areas are generally far too small and easily become crowded as a result. Couple this with the fact that no provisions have been made to separate departing and arriving passengers, and disaster ensues. Windows are also few and far between, and tend to be missing where one would think they would be needed the most (i.e. at the gates).

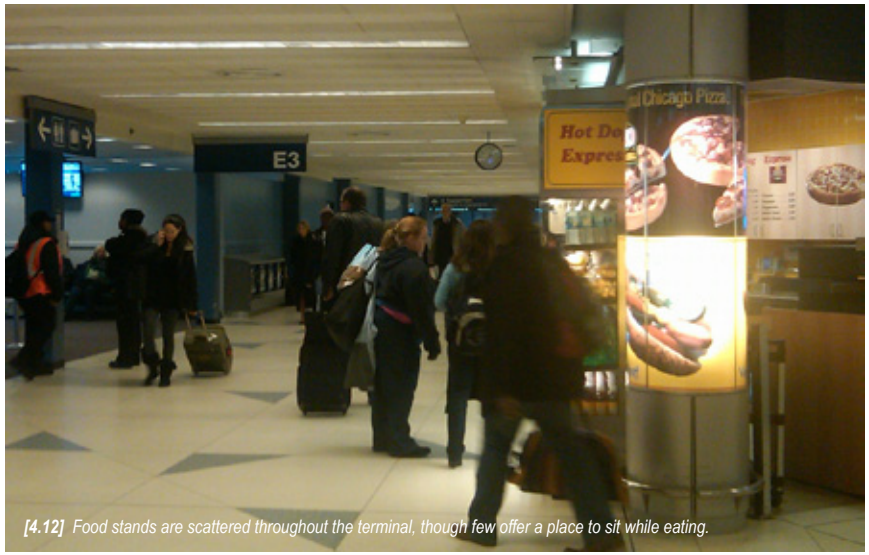
Some of these issues have already been touched upon in Chapter 3, but it is nonetheless important to emphasize why a retrofit for Terminal 2 is so necessary at this point in time. T2 represents the worst side of the airport experience; a side that all too often is most prevalent at American airports. My design tries to work within the logistical framework that currently exists at O'Hare Airport, all the while proposing something fresh and forward-thinking. It tries to recapture the atmosphere of hope and excitement that has been overshadowed by third-party agendas and the cruel realities of economic instability. In the best of times, a longing for change is sometimes hard to come by. In the worst of times, it is that longing and no other that motivates achievement and legitimate progress.

[4.10] *Today's Terminal 2 looks more or less like it did when it was opened to the public in 1962.*



[4.11] The current check-in hall at the terminal is similar to the old in form and aesthetic, but allows in less natural light.

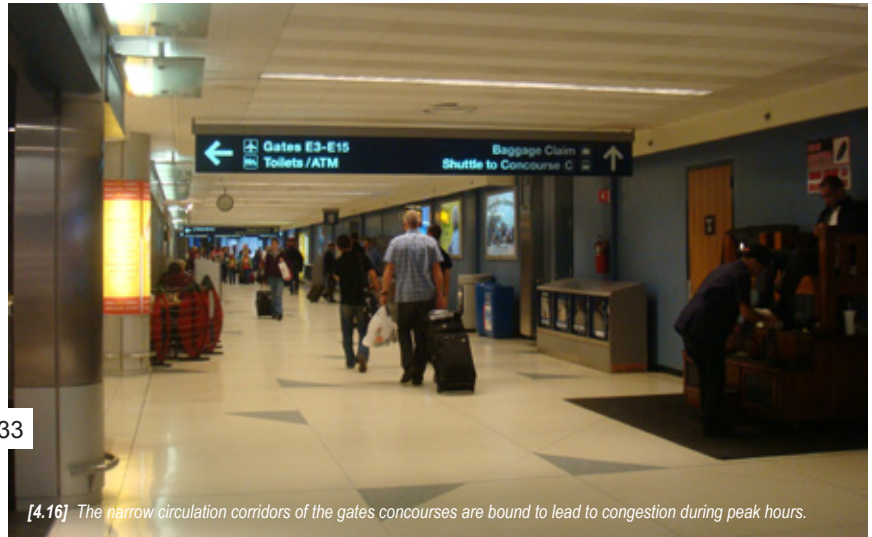
[4.14] Low ceilings and windowless stretches of corridor leave passengers feeling disappointed and uninspired.



[4.12] Food stands are scattered throughout the terminal, though few offer a place to sit while eating.

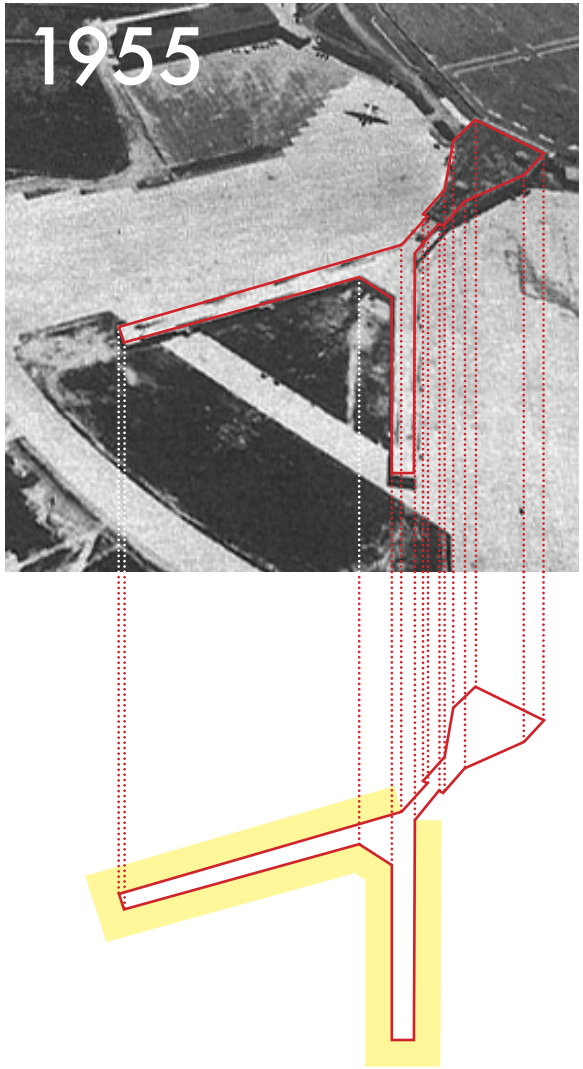
[4.15] Degradation and a general lack of maintenance leads to discomfort and disappointment.

[4.13] The outdated aesthetic of the floor tiles leaves much room for improvement.

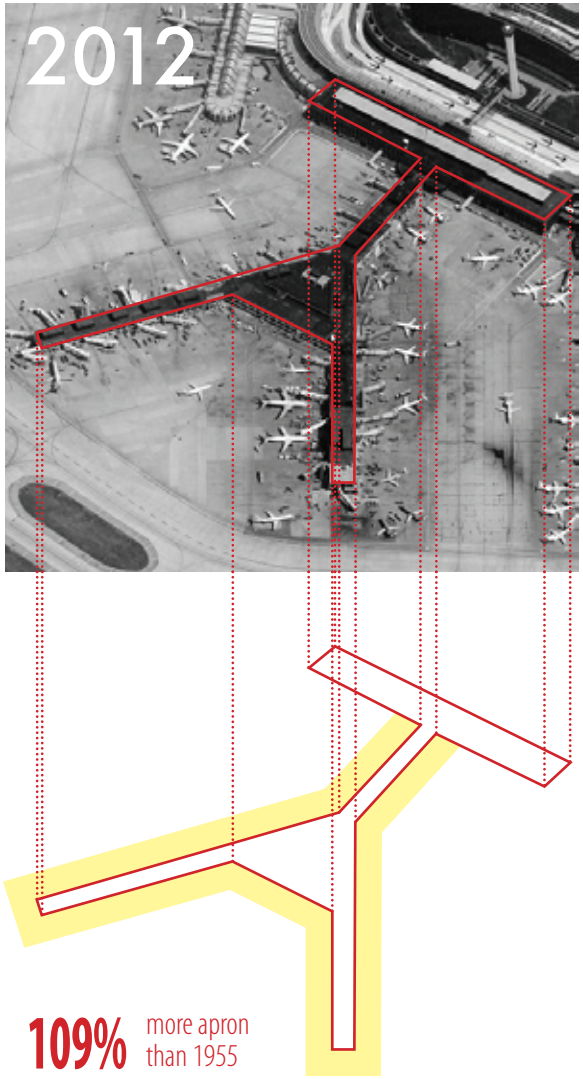


[4.16] The narrow circulation corridors of the gates concourses are bound to lead to congestion during peak hours.

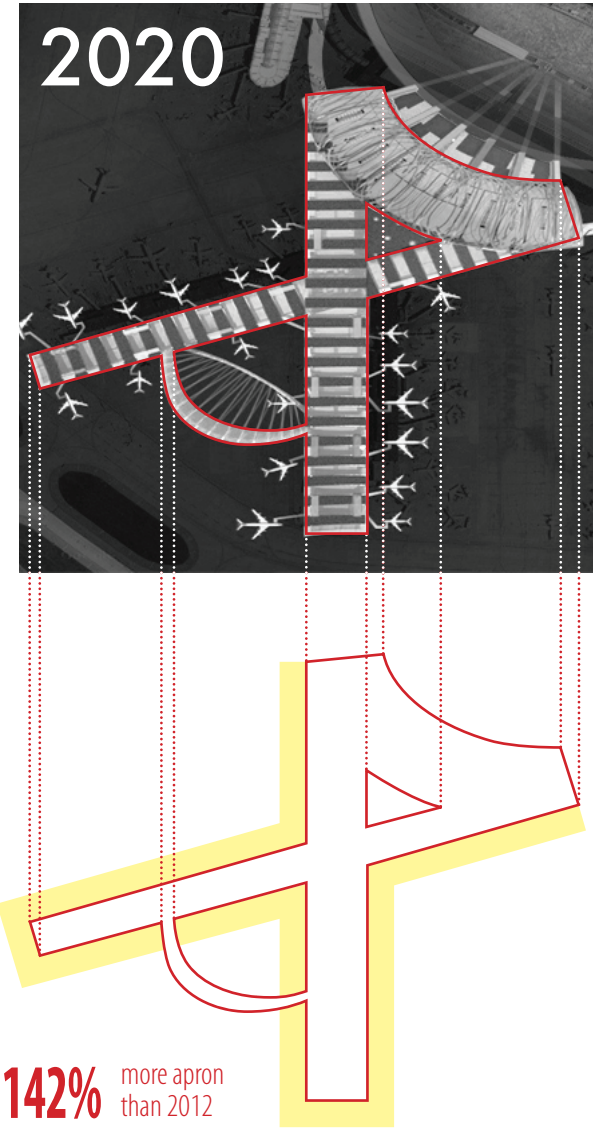
[4.17] *An aerial view of T1 upon completion. A similar shape was envisioned for T2.*



[4.18] *An aerial view of the existing Terminal 2, showing an enlarged check-in hall.*

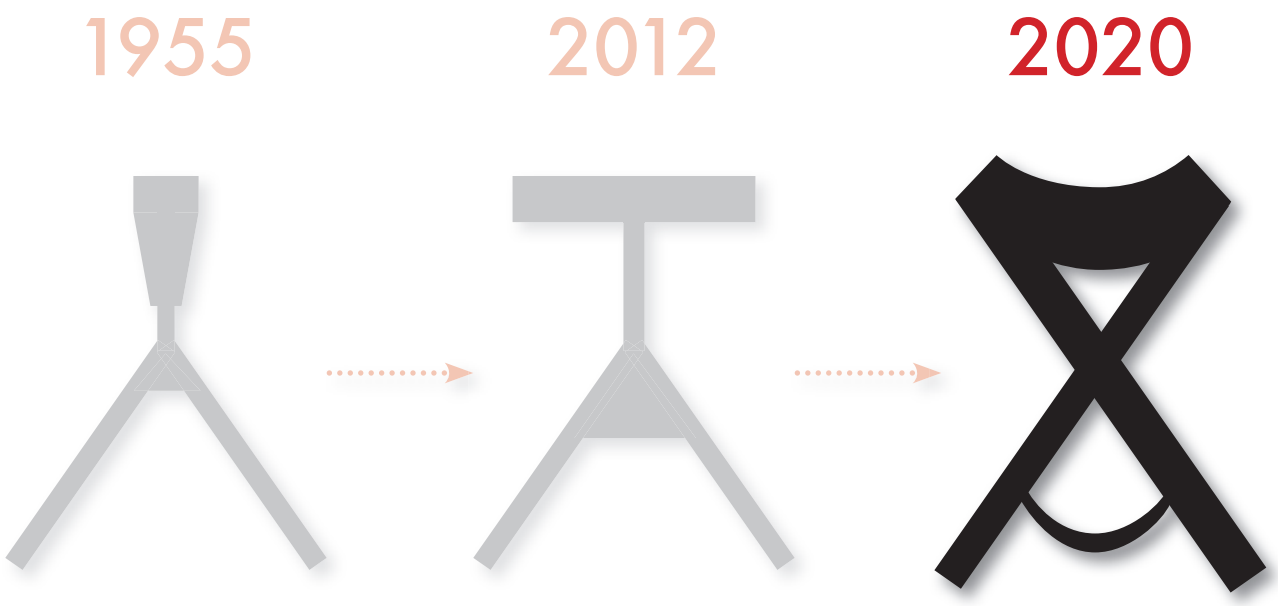


[4.19] *The next generation T2 capitalizes on the benefits of an x-shaped footprint.*



(n.) ***a·pron*** *a hard-surfaced area on an airfield used for manoeuvring or parking aircraft*[3]

Introducing ...



the new terminal two

... at Chicago O'Hare International Airport

Site Integration

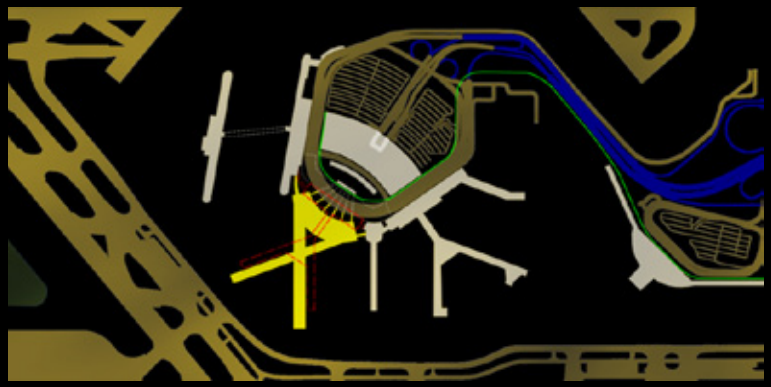
Chicago's O'Hare Airport is comprised of four terminal buildings and is located approximately 27 kilometres northwest of the downtown core.[4] Three older terminals, including Terminal 2, are arrayed in a circular fashion around a series of parking lots and infrastructural lines, while the fourth sits just East of Terminal 3 in its own infrastructural loop. The pre-existing site conditions and boundaries meant that a logical approach would define the basic shape, orientation, size, and location of new terminal building, as well as the relationship to its surroundings.

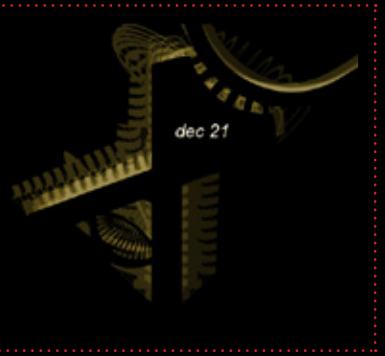
[4.20] *The existing underground pedestrian tunnel that connects T2 to the train station.*

The New Terminal 2 connects back to T1 and T3 via second-level pedestrian bridges, existing building typologies (train station, parking garage, and Hilton hotel), and existing infrastructural lines, including the I-90 and train and subway lines that lead the passenger directly to and from Chicago's downtown core. The current Terminal 2 links to the train station via an underground, windowless, pedestrian tunnel. One of the goals of my design was to maintain all program areas, including circulation corridors, above grade so as to ensure ample exposure to natural light. The exterior, covered, pedestrian walkways arrayed along the front façade of the proposed building separate circulation and allow both departing and arriving passengers to experience the gardens and water features at curbside.

The footprint of the New T2 follows the basic outline of the old, however, converts the existing y-shape to an x-shape in order to create a physical and visual continuity between the check-in hall and the gates. The wings of this new x-shaped footprint also allow for the creation of an open-air courtyard immediately past security.

[4.21] ***Location Plan, nts*** ~ *O'Hare Airport is located 27 kilometres northwest of Chicago's downtown core.*
[4.22] ***Site Plan, nts*** ~ *The New Terminal 2 sits in place of the old and connects back to T1 and T3.*

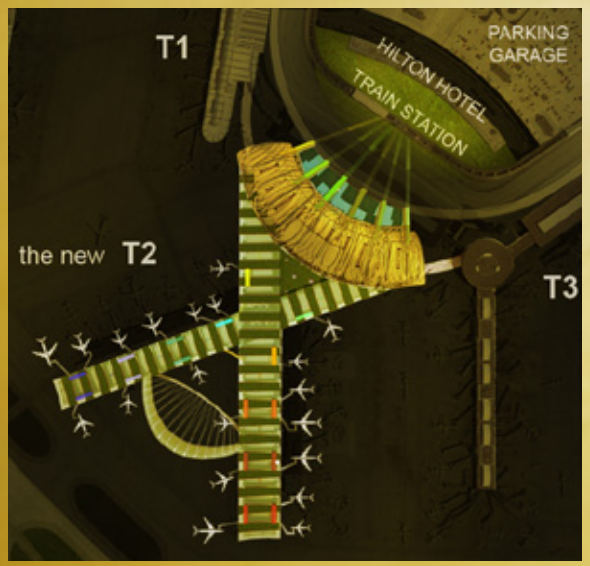




[4.23] ***Winter Shadow Study, nts***

[4.24] ***Summer Shadow Study, nts***

THE NEW



[4.25] Roof Plan, nts ~ *The New T2 connects to existing infrastructure via above-grade pedestrian bridges and walkways.*

TERMINAL 2

[4.26] *An aerial view of the new terminal shows how effortlessly it connects back to existing infrastructure.*

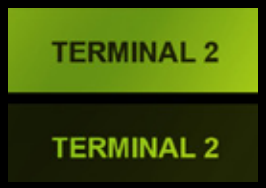
[4.27] *Water features and lush vegetation greet both departing and arriving passengers at the New T2.*

Curbside

The approach to a terminal from the pedestrian perspective can be as important and interesting as the interior experience of the space. It is the first opportunity for the airport to assert its presence and exude either a welcoming or an off-putting vibe. As a child, my excitement levels would rise significantly upon approach, knowing that each passing moment meant being one step closer to taking off. This ritualistic facet to the curbside experience should be exploited whenever possible for practical, aesthetic, and psychological benefits.

[4.28] *T2 uses a frosted glass negative effect.*

In the proposed scheme, a significant setback, with glazed pedestrian bridges overtop grade-level fountains, creates a pleasant and processional aesthetic at curbside. The hierarchical nature of the departures and arrivals process, specifically with respect to the discrepancy in the quality of the curbside experience, is a reoccurring theme at many airports around the world. By locating greenery and water features at grade in this setback scenario, arriving passengers receive the same exposure and opportunity for viewing that the upper-level departing passengers do.



[4.29] *Day/night time illumination.*

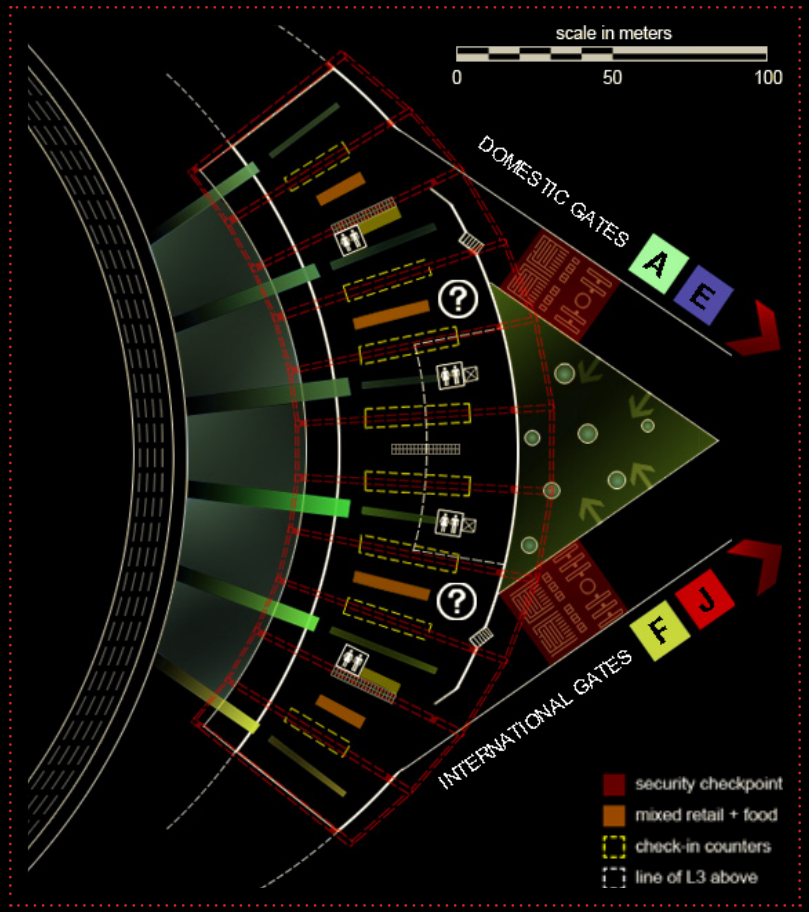
The pedestrian bridges are clad in fritted, coloured glass, with clear elements used only for the terminal designation. During the day, the colour of the glass is plainly visible, emphasizing the clear lettering. At night, the illuminated walkways project light most strongly through the clear portion, once again emphasizing the designation. The varying colours on the bridges are part of a colour-coding system that repeats on the interior for wayfinding purposes. This will be expanded upon in a later section.

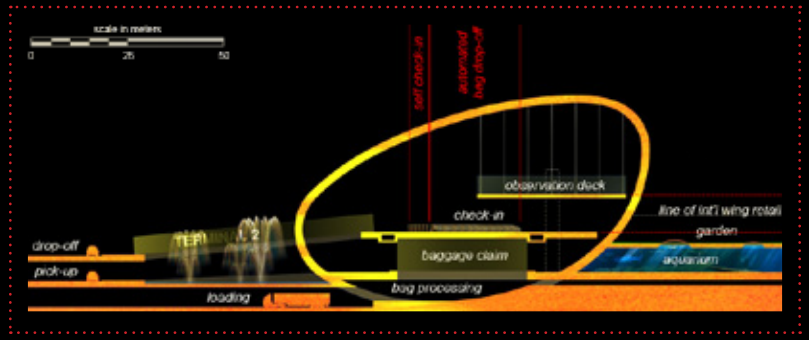
Check-in Upon entering the terminal, passengers are treated to a spacious, visually open, structurally intriguing, and well-lit environment. A grand departures hall makes for a simpler, clearer, and more effective check-in process, allowing passengers to easily spot and move toward airline counters and bag drop points.

Maintaining sightlines is a reoccurring theme throughout the project and is directly linked to the notion of designing holistically. In order to create a sensitive and responsive airport, all aspects of the architecture must aid the passenger through the process of departing, transferring, or arriving. In the departures hall, this approach is evidenced in plan by the fact that the freestanding check-in desks sit aligned with the flow of traffic, creating a clear pathway from entrance to security. Traffic is diverted to two wings (one domestic and one international) to reduce congestion and orient passengers to their correct gates early on in the process. The security checkpoints themselves are left open, akin to the strategy used at Madrid-Barajas T4, in an attempt to ease the anxieties of passengers partially brought on by the closed-off nature of traditional security zones. An enclosed checkpoint inevitably increases stress levels by virtue of the fact that it instils a sense of unease and weariness on the part of the passenger. Exposing the security process does not undermine it; on the contrary, it likely reduces tensions by allowing passengers to feel less overwhelmed and better prepared for what is to come.

The curved nature of the check-in hall in both plan and section is gestural and adds a dynamic quality to the space, one that is later mimicked on the pedestrian bridge. A third-level observation deck provides clear views to the courtyard, as well as a close-up look at the diagrid structure (clad on the interior with bamboo strips and on the exterior with curtainwall glazing). And lastly, a combination of direct and diffuse light filters into the space, giving the departures hall an ethereal feel.

[4.30] Plan of Check-In (L2), nts ~ *Aligning the check-in desks to the flow of traffic reduces congestion.*





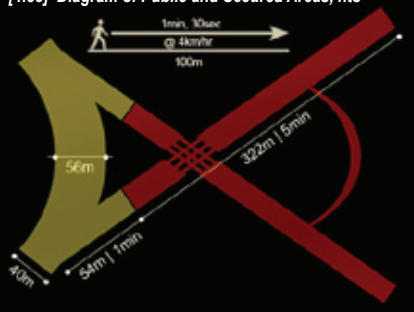
[4.31] Section through Check-In and Baggage Claim, nts ~ *A third-level observation deck overlooks the garden.*

[4.32] *The check-in hall is grand and spacious, exuding a powerful presence at the very beginning of the terminal experience.*

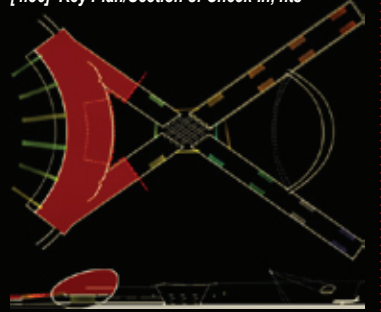
[4.33] *The check-in hall designates a number of areas for automatic bag drop-off.*

[4.34] *Self check-in is now the primary method of attaining a ticket.*

[4.35] ***Diagram of Public and Secured Areas, nts***



[4.36] ***Key Plan/Section of Check-In, nts***



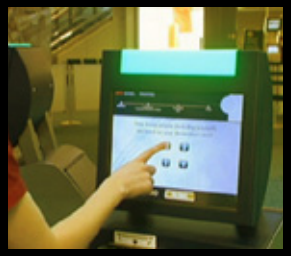
[4.37] *Passengers waiting to be processed at customs enjoy the best views of the aquarium and its various sea creatures.*

Customs

Aside from the security clearance process, one of the most stressful and least anticipated experiences at an airport takes place at the customs checkpoint upon arrival. All too often, these areas are underdeveloped and do little to cater to the needs of passengers waiting in queues. As mentioned previously, the experience of arrival is seldom seen as relevant or integral to the image of an airport from either the designer's or client's point of view. With increasing passenger numbers at international airports, it has become necessary to explicitly separate arriving and departing circulation, meaning that the architect now must design for two experiences instead of simply one. Along with the greater emphasis that airports have historically put on the experience of departing, the design of the customs, bag claim, and arrivals halls have all too often been left by the wayside.

As opposed to the standard below-grade, windowless customs hall that tends to exist at many airports today, the one at the New Terminal 2 reflects and integrates themes of water, light, transparency, and colour association. A full-height aquarium flanks the interior side of the customs hall, while the opposite façade continues to provide uninterrupted views to the exterior via floor-to-ceiling glass. The aquarium contributes to the creation of a calm and serene environment in an area where such a thing is not at all easy to achieve.

To facilitate faster passenger processing, the design proposes the integration of an automated border clearance system. This new and proven technology will prevent congestion and unnecessarily long wait times for domestic or frequent flyers, adding to the peaceful atmosphere already established by the presence of the aquarium.



[4.38] *Automated border clearance speeds up the passport control process.*

Baggage Claim

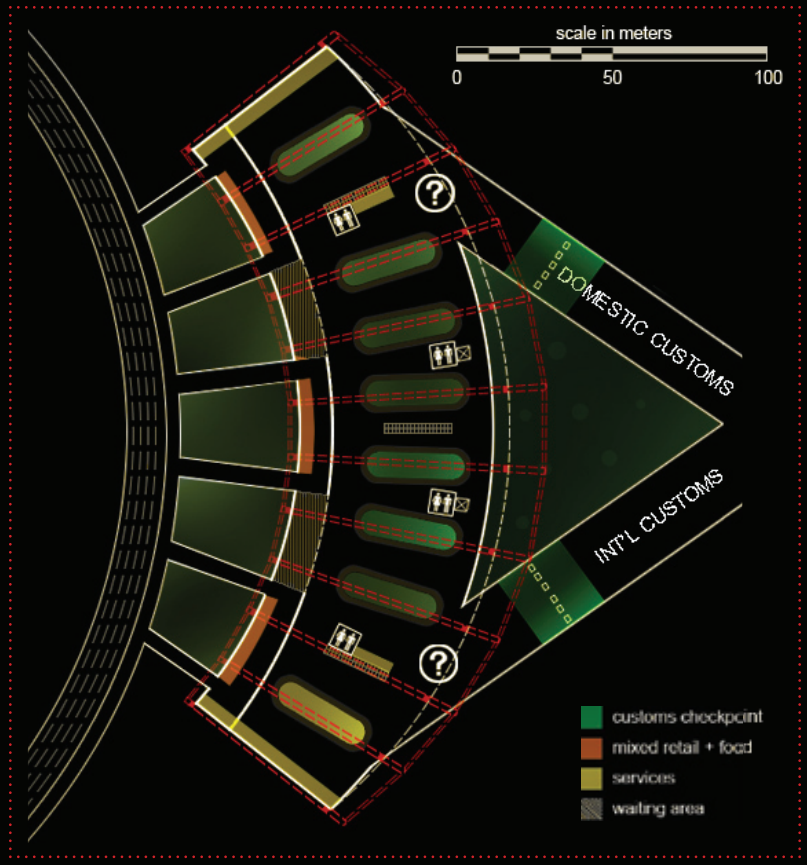
Post-customs, passengers immediately enter the baggage claim hall, which features eight carousels arrayed equidistantly along the length of the space. Its footprint mirrors the curving shape of the check-in level fairly closely, again strategically aligning programmatic elements to the flow of traffic in order to prevent congestion and cross-circulation. The aquatic theme continues into the hall from the customs zone, with the aquarium flanking the inner edge of the space.

The most unique feature of the design consists of the open-to-below nature of the carousels that allow passengers glimpses into the lower-floor baggage processing hall. This space, normally hidden away from the average passenger, exhibits the factory-like features of the baggage handling system and is open to view for anyone who cares to take a look. The theme of transparency that exists throughout the airport continues here, offering an intriguing look at the complex and efficient logistical processes involved in reuniting bags with their owners.

Natural light enters the space from the floor-to-ceiling glass that runs along the front façade of the hall, as well as glazed openings on the ceiling. The strips of glass floor that occur in between the carousels let in diffuse light from above and also allow passengers glimpses to the check-in level from the bag claim hall and vice versa. Like in the customs area, the light that filters through the aquarium gives an ethereal glow to the interior, one that slowly dissipates as passengers reach the more brightly-lit waiting areas.

Upon exiting the hall, passengers enter designated waiting areas for reuniting with family and friends. With access to an assortment of food and service kiosks, passengers can wrap up their airport experience in easy fashion before exiting onto a green and welcoming curbside.

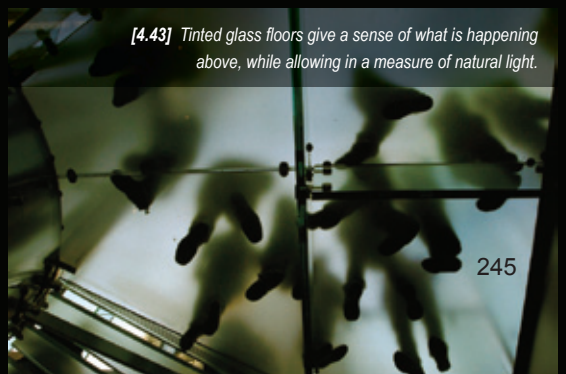
[4.39] Plan of Baggage Claim (L1), nts ~ *An aquarium runs along the inner edge of the bag claim hall.*



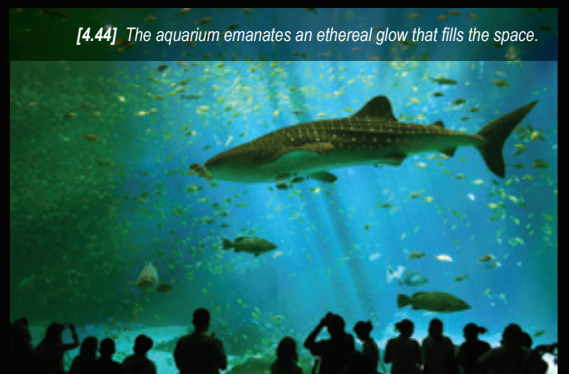
[4.40] Section through Bag Carousel, nts ~ *The carousel is open-to-below, providing views into bag processing.*

[4.41] *In addition to the use of clear signage, colour is projected onto the luggage carousels in correspondence with their respective gates.*

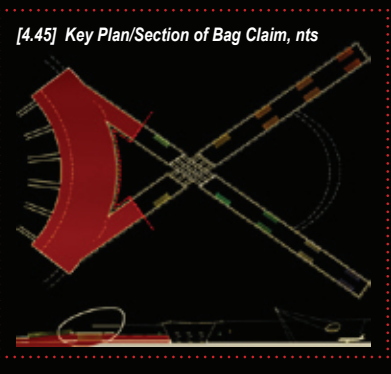
[4.42] *The bag processing area is rarely visible to passengers. The New T2 provides an intriguing look into this factory-like environment.*



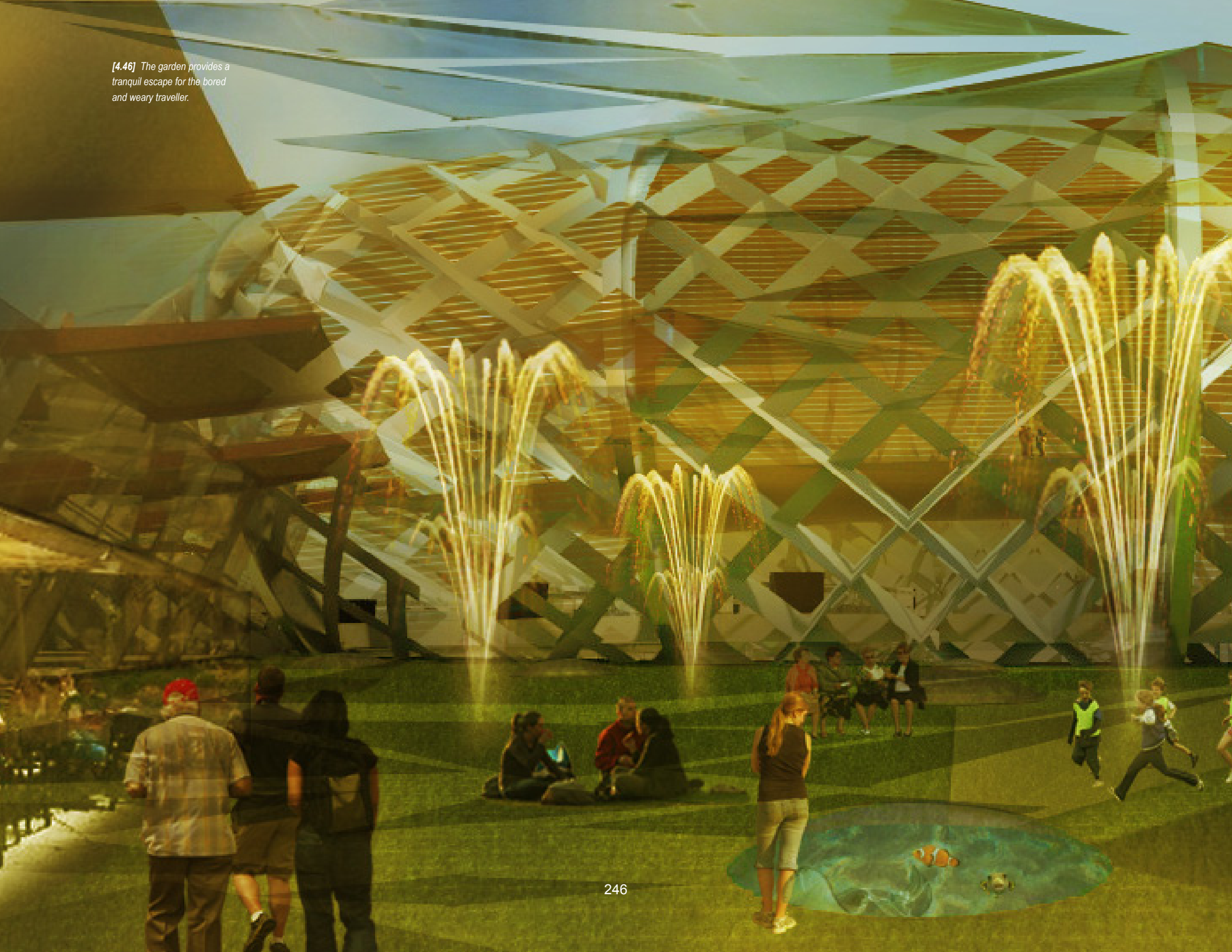
[4.43] *Tinted glass floors give a sense of what is happening above, while allowing in a measure of natural light.*



[4.44] *The aquarium emanates an ethereal glow that fills the space.*



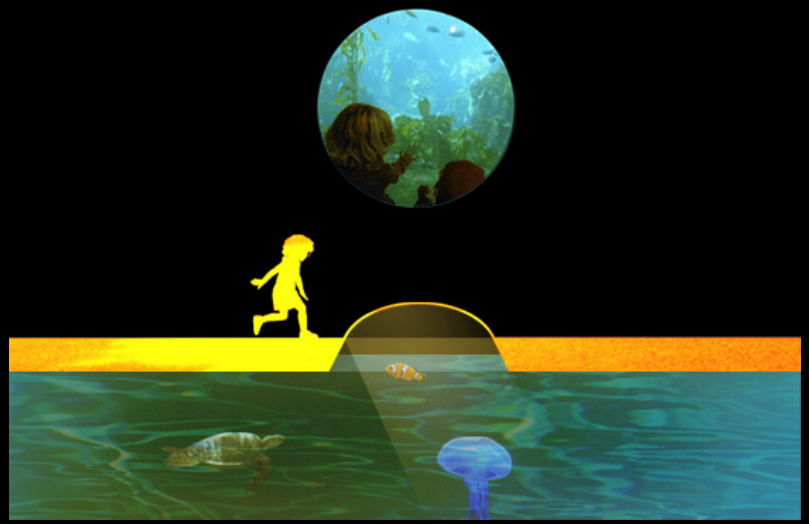
[4.45] Key Plan/Section of Bag Claim, nts



[4.46] *The garden provides a tranquil escape for the bored and weary traveller.*

Garden Visible from the check-in hall, security area, and the first few gates, the open-air garden is flanked by the main departures hall and both the international and domestic wings of the terminal. Accessible directly past security from the gates concourses, this greenspace offers a place of repose and relaxation for departing passengers prior to take-off. Restaurant patios, shaded by the cantilevering roofs, run along the edge of the flanking façades, while a semi-intensive green roof system (with integrated portholes and fountain features) takes up the remainder of the space.

Portholes comprised of curved glass provide views into the aquarium space below, while also allowing in a measure of light, as described earlier. For children and parents alike, the natural and fun atmosphere created in the exterior garden space can provide a much-needed escape from the efficiency-driven aspects of the departure process. In order for any terminal to be successful on a human level and cater to human needs, nature must play a vital role in the passenger experience.



[4.47] *Portholes on the garden level allow views into the aquarium, and the many sea creatures, below.*

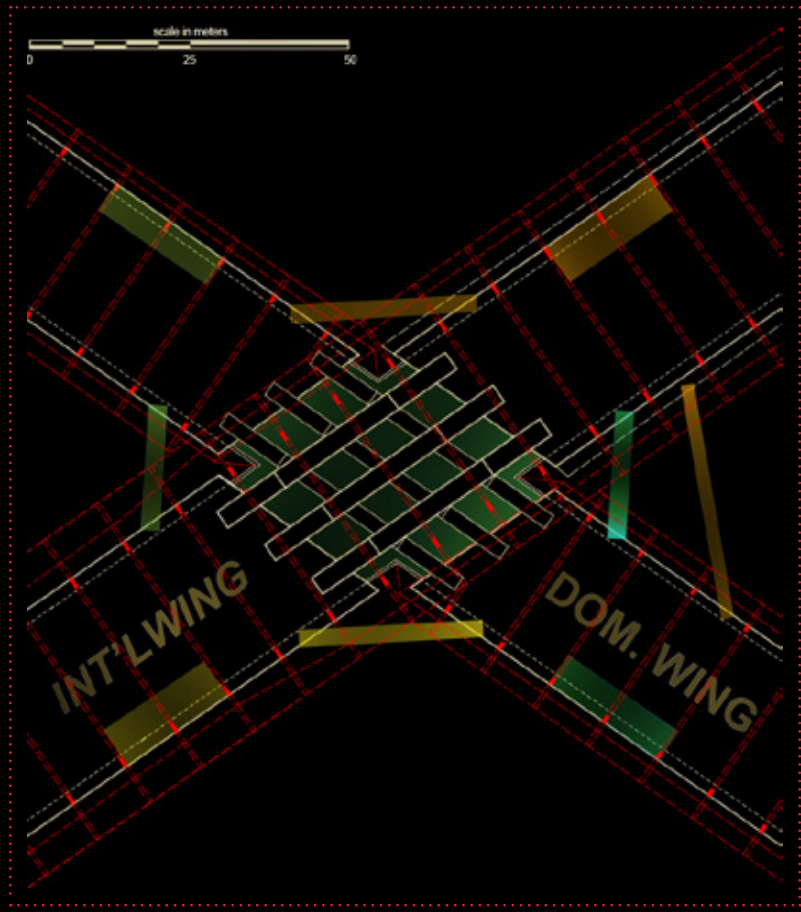
Intersection

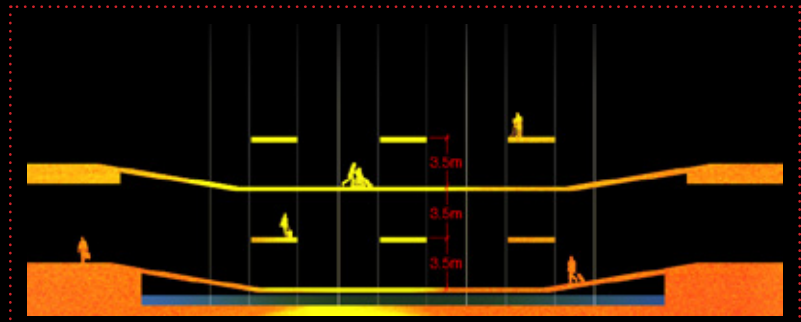
Dividing international and domestic passengers into two separate wings represents more of a logistical and symbolic gesture rather than a permanent measure. In other words, passengers from either wing have the option of accessing the other via glass bridges and travellators located before and after the intersection point. A strong benefit of separating these groups of passengers is the avoidance of congestion and cross-circulation at this crucial juncture, which forms one of the focal points of the project.

In order to avoid cross-traffic, a weaving system of suspended ramps and platforms connects the respective concourse ends together. Ramps are low-sloped, easily navigable, and wide, allowing passengers to traverse the intersection at their own pace. The reflecting pool located directly below the platforms on the arrivals level continues the water theme of the aquarium and adds to surreal atmosphere of the space. Alternating bands of light and shadow complete the scene, creating a visually stunning aesthetic on the interior.

As is the case elsewhere in the terminal, signage is clear, simple, and always visible along circulation routes. Based on the model exhibited at Schiphol Airport, signage at the New Terminal 2 uses a combination of standard type, text, and pictograms to convey the location of program. Continuing the colour-coding tradition of the design proposal, signs depict gates with their respective colours and numbers, allowing passengers to easily identify where they are located along the concourse. In addition to the visually unobstructed nature of the concourses, the signage also indicates walking distances to gates at given locations. A strategy again borrowed from Schiphol, the conveying of distances simply adds to the inherently intuitive nature of the wayfinding, a thing made possible by virtue of a logical, sensitive, and holistic design approach.

[4.48] Plan of Intersection, nts *~ The intersection point of the two wings is an interesting architectural moment.*





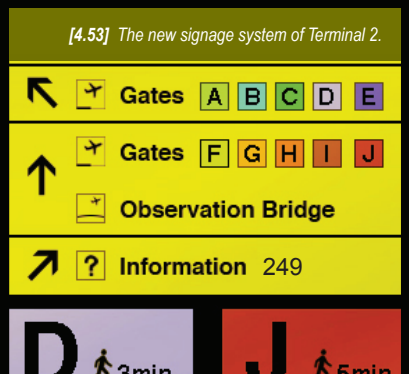
[4.49] Section through Intersection, nts *~ A weaving theme manifest in ramps prevents cross-circulation.*

[4.50] *Crossing the intersection is one of the most surreal experiences at the New T2.*

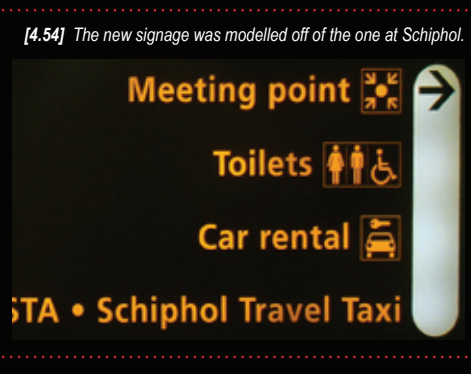
[4.51] *A standard weaving pattern was the inspiration behind the intersection design.*

[4.52] ***Relativity*** *~ M.C. Escher*
The interweaving ramps resemble Escher's stairs.

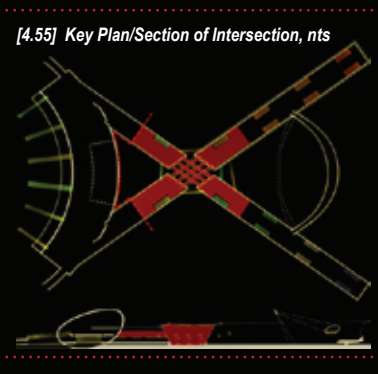
[4.53] *The new signage system of Terminal 2.*



[4.54] *The new signage was modelled off of the one at Schiphol.*

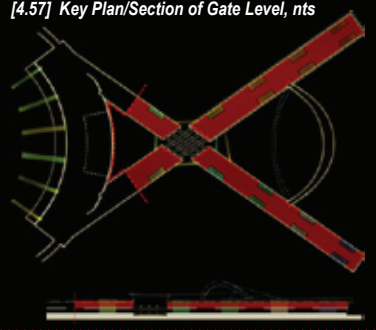


[4.55] ***Key Plan/Section of Intersection, nts***

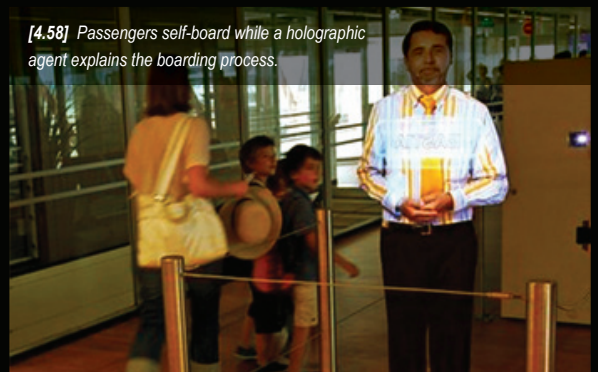


[4.56] *The gates concourse is spacious and visually unobstructed, allowing passengers to see to the farthest gate.*

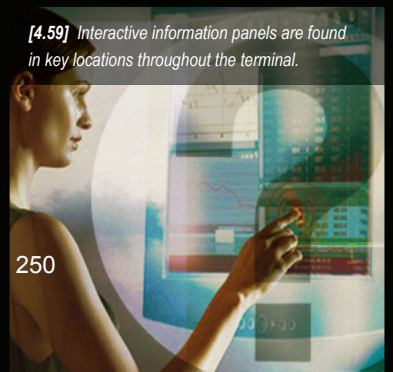
[4.57] ***Key Plan/Section of Gate Level, nts***



[4.58] *Passengers self-board while a holographic agent explains the boarding process.*

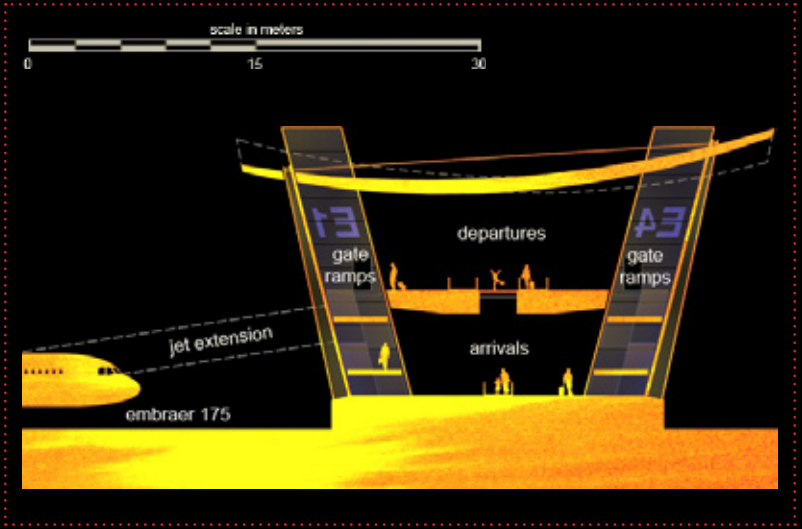


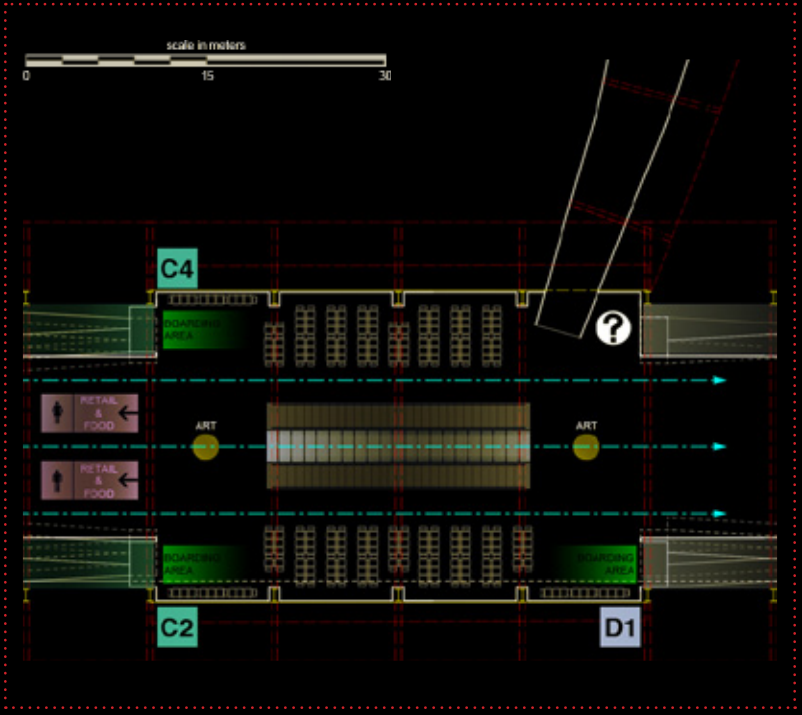
[4.59] *Interactive information panels are found in key locations throughout the terminal.*



[4.60] *A scene from the movie Minority Report showing a digital information panel embedded in glass. A similar technique can be used to display flight information at the gates.*

[4.61] Section through Gate Concourse, nts ~ *Jet extensions occur at the midway point between floors.*





[4.62] Plan of Gates Concourse (L2), nts ~ *Seating occurs along the side while circulation runs down the middle.*

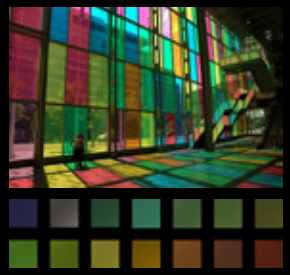
Gates Concourse

Gate areas in both wings are designed to minimize congestion and confusion wherever possible. Departing passengers occupy the upper level, while arriving passengers occupy the lower, ensuring that no cross-circulation can occur at any time. As will be elaborated upon in the next section, a series of boarding ramps located within the glazed gate boxes lead passengers to and from their planes in a straightforward and orderly fashion.

In a far cry from the current situation at O'Hare's T2, both the departing and arriving levels feature double-height spaces and allow in ample amounts of daylight via a cable-net system of curtainwall glazing on either side and skylight strips above. Architecturally exposed wide-flange columns provide vertical support for a gently curving roof structure that cantilevers over the angled façades. Aside from some seating and basic amenities, the arrivals level holds minimal program, meaning that it does not need to be as wide as the departures level. An angled façade adjusts for the increased seating and program area on the upper level, aligns passenger views with planes, and creates a dynamism that matches the language of the gestural roof form.

Gate seating is located along the façade and between boarding areas as a means of freeing up the central circulation spine of the concourse. While retail, restaurants, and services are available in kiosk fashion, the majority of their more permanent counterparts are located on the third level of the international wing, which is fully accessible from the domestic wing. A series of tinted glass floor strips, flanked by moving walkways, allow natural light into the centre of the arrivals level and create a visual connection between floors. Glulam roof beams, bamboo roof cladding, terrazzo flooring, and uninterrupted views to the exterior work together to create a natural, warm, and pleasant atmosphere for passengers waiting to board.

Boarding The boarding process at the New Terminal 2 has been distilled to its most basic form so as to avoid congestion at the gates on either level. A virtual boarding agent and an electronic self-check system speeds up the boarding process and removes the need for additional staff wherever feasible. Dual, independent boarding ramps are isolated within coloured-glass boxes and lead to jet extensions located at the mid-level point. As referenced previously, cross-pollination, with respect to departing and arriving passengers, is avoided by the strict allocation of passengers to either L1 (arrivals) or L2 (departures).



[4.63] *The Montreal Convention Centre uses multi-coloured glass. At T2, a range of colours is used to designate gates.*

Coloured glass is used exclusively for the gate boxes as part of an overall wayfinding scheme, with a different colour assigned to each gate. The full range of colour from blue to red is used throughout the terminal and is also employed with glass at pedestrian bridges and baggage carousels. Gate numbers are imprinted directly onto the glazing in large type both on the interior for passengers and on the exterior for pilots taxiing on the apron.

The cantilevered roof system directs water away from the curtain wall façade, ensuring unfiltered views out onto the tarmac from the interior. The exterior face of the glass is reflective by virtue of embedded thin-film photovoltaics, creating a two-way mirror scenario between passengers in the terminal and those still on their planes. Akin to the intrigue experienced with the curbside approach, the de-boarding process becomes visually drawn-out and more interesting, with the terminal revealing its interior aesthetic only upon physical entry.

[4.64] *Passengers board and disembark from their planes on dual, independent interior ramps.*

[4.65] *Planes occasionally taxi beneath the bridge to reach their gates, providing magnificent views for passengers.*

Observation Bridge

The terminal experience culminates with the passenger observation bridge located at the mid-point of the two wings. From their vantage point on the bridge, passengers can watch planes taxi beneath the megastructure to reach interior gates, as well as take off directly into the sunset. The decision to include a pedestrian bridge in the design hinged upon the desire to create an observation platform entirely separate from the gate areas, removing passengers from that more traditional terminal environment and placing them at the very centre of the action (occasionally above the planes themselves).

[4.66] Gateshead Millennium Bridge *~ Santiago Calatrava (2001)*

The structural and formal elements of the bridge mimic those found in the check-in hall, albeit function at a much more intimate scale. The diagrid structure and occasional openings in the interior cladding allow passengers glimpses of the terminal, tarmac, and planes in almost every direction. The gestural lift of the bridge is fixed in place by tension cables attached back to a massive steel arch secured to the ground at the inside edges of the gates concourses. The arch, inspired by the Gateshead Millennium Bridge, acts as a physical and visual counterweight to the bridge, providing the necessary height for taxiing planes and easily integrating into the pre-established aesthetic.

[4.67] *Cable detail at the Anzac Bridge in Sydney.*

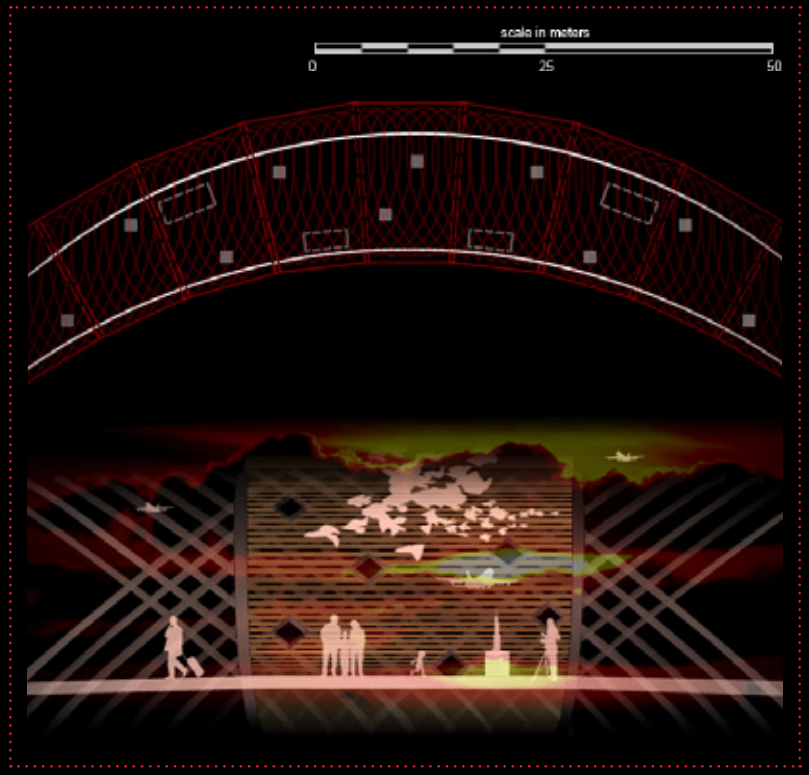
Intricate and simple detailing can contribute to the elegance of a design as much as the parti or gesture itself. The penetrating cable detail found in the arch, along with the fairly thin tension cables, suggests an ease of support for the most massive of elements. This illusion is one of many surreal moments that exist throughout the terminal experience.

Bridge (cont.) The interior of the pedestrian bridge acts as an observation platform, gallery space, and simply a place of repose. Exhibits line the length of the bridge, while intricate shadows line the floor, creating a surreal interior environment that works to physically and psychologically transport passengers away from the hustle and bustle of the gates concourses.

The wood cladding that lines the interior, along with a continuation of the terrazzo flooring from the wings, infuses warmth and nature into the space and relates to the passenger on a more human level. The lookout points are strategically strewn around the bridge's envelope to provide the most interesting views for passengers, including ones directly down onto planes below. In designing for a scenario where the passenger has a completely unique vantage point such as this, the magnitude of the terminal experience is bound to increase tenfold. If one of the goals of the New T2 is to try to recapture the beauty and romanticism of flight, the pedestrian bridge tries to epitomize this aim.

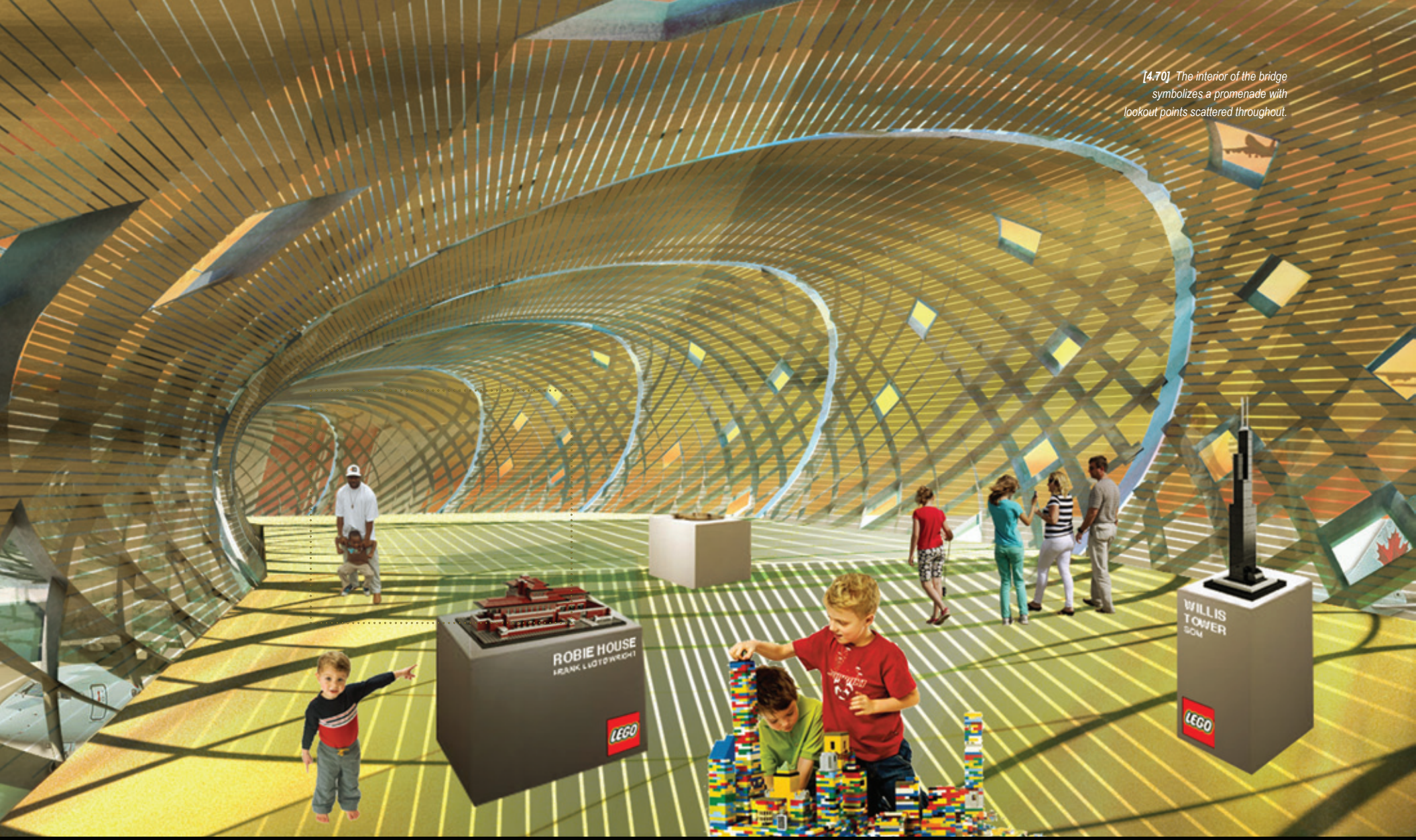
The design proposal uses two distinct tactics to try and establish a sense of place for the terminal: the use of local vegetation for its extensive green roof system and the inclusion of artwork from local museums. Borrowing from the theme that already exists at Helmut Jahn's Terminal 1, the New T2 features a series of skeletal dinosaur replicas in a number of terminal areas. The replicas, which hail from Chicago's Field Museum of Natural History,[5] are interesting, educational, and integrate well into the existing aesthetic of the steel and glulam ribbing. A second exhibit is located primarily on the pedestrian bridge and features Lego Architecture's Local Landmarks Collection, including the Willis Tower and Robie House.[6] For fun, and as a time-waster, kids and parents alike can try to rebuild the models in designated Lego play areas located along the bridge.

[4.68] Partial Plan/Section of Bridge, nts ~ *Lookout points are strategically created along the bridge's envelope.*

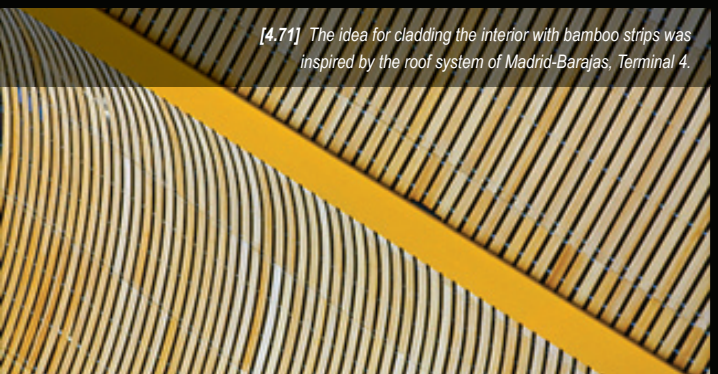


[4.69] Section through Bridge Mid-Point, nts ~ *Passengers can view planes taxi beneath the bridge to gates.*

[4.70] *The interior of the bridge symbolizes a promenade with lookout points scattered throughout.*

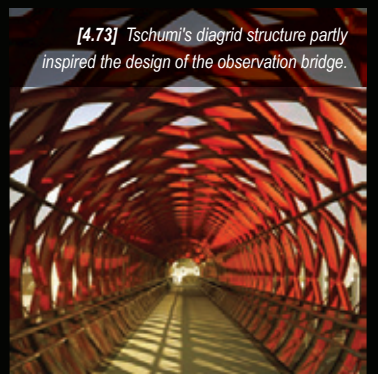


[4.71] *The idea for cladding the interior with bamboo strips was inspired by the roof system of Madrid-Barajas, Terminal 4.*

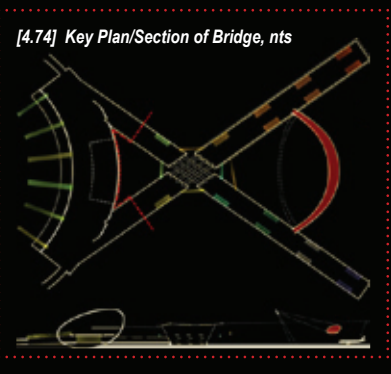


[4.72] La Roche-sur-Yon Footbridge *~ Bernard Tschumi (2010)*

[4.73] *Tschumi's diagrid structure partly inspired the design of the observation bridge.*



[4.74] Key Plan/Section of Bridge, nts



[4.75] *A view of the retail level, showing restaurants, shops, lounges, and a lookout point over the intersection.*

Retail Level

The amount and location of retail can either make or break a passenger's time at the airport. Architects must thoughtfully approach the question of where to place retail so as to enhance and not detract from the overall experience. For instance, all too often, passengers are faced with very little choice as to where and what they can eat beyond security. By creating an entire third concourse level dedicated to retail, restaurants, and services, the New Terminal 2 offers a plethora of options for everything from dining to lounging, all without ever forcing program or advertising on the passenger.

A 33-metre wide retail level (L3) transforms the international wing into a shopper's, eater's, and sleeper's paradise. The coloured-glass boxes, which demarcate gates below, are utilized as lounge, gallery, and children's spaces on this floor. A perfect place to spend time prior to take off, the retail level is designed to cater to the needs of all departing and transferring passengers, whether alone or with family, young or elderly, frequent flyer or not. As with most areas of the terminal, the perimeter of the floor plate remains open, offering uninterrupted views to the tarmac and the sky.

Designated sleeping areas are located every so often on the level, giving passengers with longer layovers a chance to recuperate before their next flight. For roughly 15 USD per hour,[7] passengers can rent one of the many available SLEEPBOXES and relax in a peaceful and soundproof environment. Select passengers can take advantage of a number of VIP lounges, while others can plane-watch in comfortable public lounges.

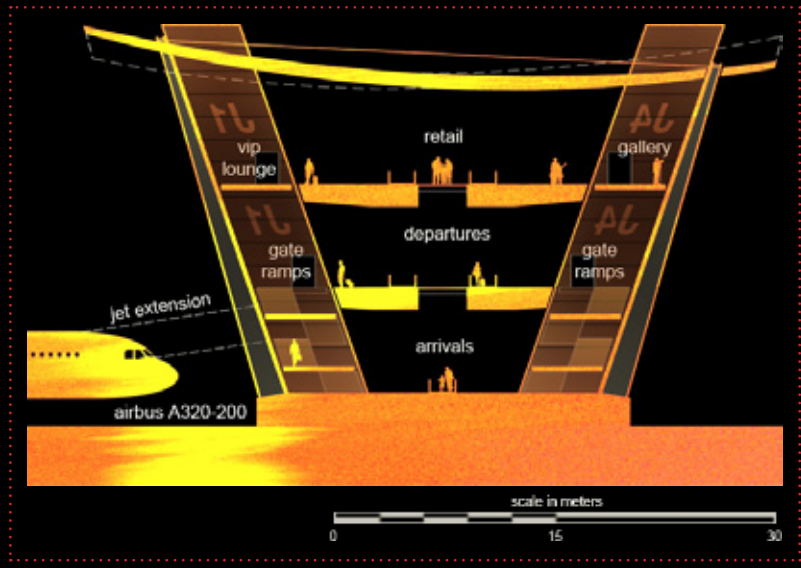
[4.76] SLEEPBOX *~ Arch Group (2011)*

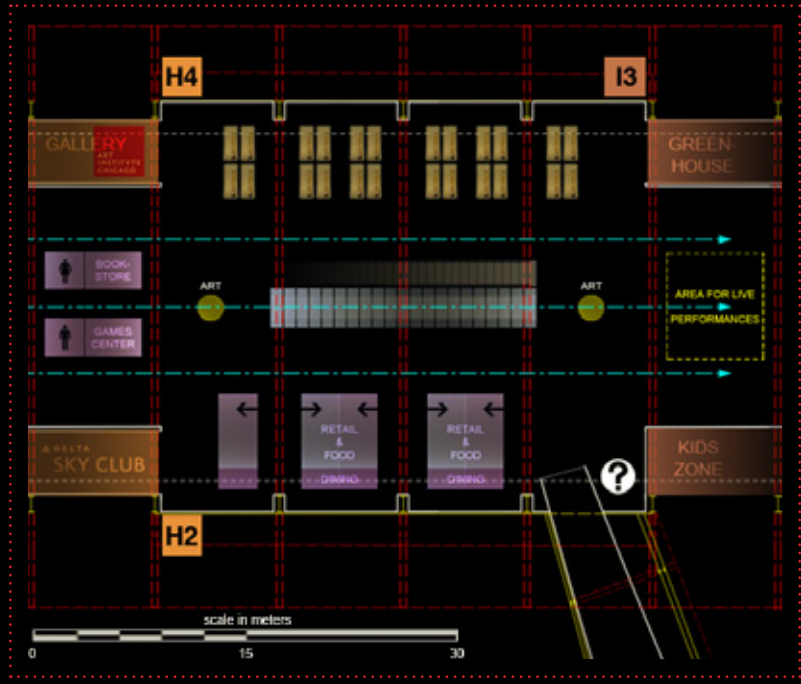
Retail (cont.) Fully accessible to all departing and transferring passengers, including those flying domestically from the other wing, the retail level does not impose itself on the passenger against his or her will. In other words, the choice to visit the level is exactly that: a choice. Should passengers wish to simply walk to their gates without being bombarded by third-party advertisers, they can easily do so as the plan is flexible and provides a number of options for routes.

The retail level begins immediately beyond the intersection point of the two wings and continues to the end of the international gates concourse. Sectionally, it mimics the shape of the domestic wing, albeit has been proportionally enlarged to facilitate for the presence of a third level. Moving walkways run along the middle of the space, flanking glass floors that allow light and views down into the levels below. Similar to what occurs in the domestic wing, the roof form incrementally changes in section, cradling to reach its highest points over the exterior garden and final gates. This gesture adds to the dynamism that already exists by virtue of the curved roof form and angled façades and gives the impression that the airport itself is in motion.

Besides the special programming that occurs within the glazed boxes, a multitude of retail, restaurants, and services line the edges of the concourse. Always set back from the window to ensure that passengers can look out on to the tarmac at all times, these program elements are freestanding, meaning that they can easily be dismantled and moved at any time. Designated areas for art and live performances are located throughout the level along, but never in obstruction of, circulation corridors and sightlines. A loosely programmed observation area acts as a public lounge of sorts, providing a comfortable environment for passengers of all types and ages to enjoy.

[4.77] Section through Int'l Wing, nts ~ *The glazed gate boxes on the retail level contain lounges and galleries.*





[4.78] Plan of Retail Level (L3), nts ~ *The level features a wide variety of retail, restaurants, and services.*

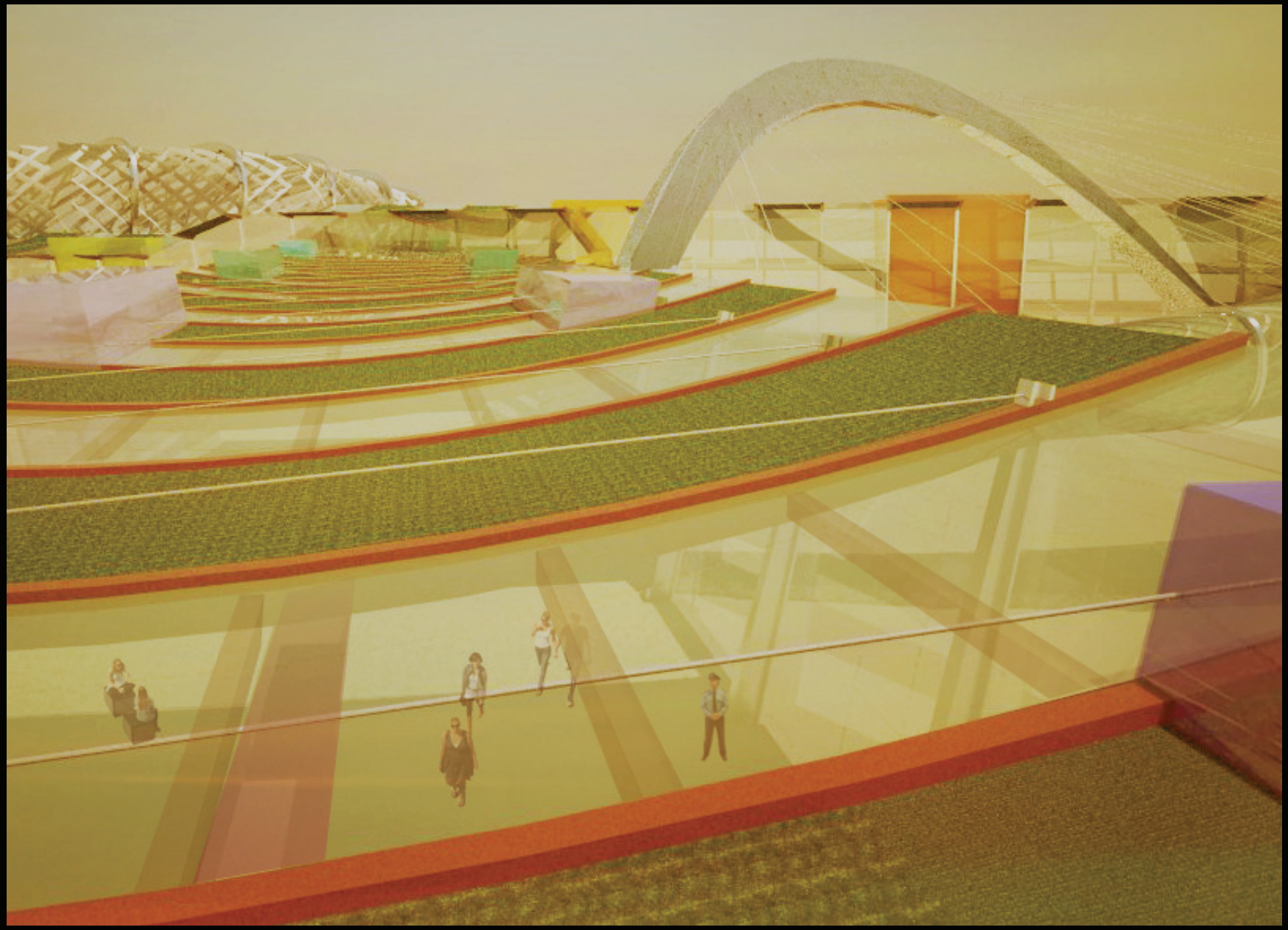
[4.79] *One end of the retail level is loosely-programmed and acts as a observation deck for plane-watching.*

[4.80] Crystal Bridges Museum of American Art ~ *Safdie (2011) Curved glulam beams provide roof support, as well as a natural feel.*

[4.81] *The retail level features designated areas for live performances.*

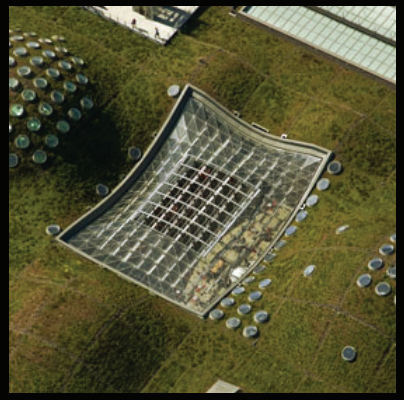
[4.82] *Kid's zones are scattered about throughout the retail level.*

[4.83] Key Plan/Section of Retail Level, nts



[4.84] *An extensive green roof system, alternating with bands of skylights, covers the full length of each gate concourse.*

[4.85] California Acad. of Sciences *~ Piano (2008)*
[4.86] *Local shrubs like the Russian Arborvitae and Dwarf Bush Honeysuckle establish a sense of place.*



[4.87] Time Warner Center *~ SOM (2004)*
Cable-net systems provide lateral and vertical stability.

[4.88] View of Curtain Wall from Arrivals Level *~ A curtain wall allows for unfiltered views out onto the tarmac.*

Sustainability

As was briefly touched upon in Chapter 2, designing for sustainability in a typology as massive and complex as an airport is no easy task and presents somewhat of a conundrum for architects and environmental planners. Green measures can easily be added and adapted to the designs of existing airports, but with such rapid increases in capacity every year, at what point do these strategies no longer benefit users and the environment in the long term?

The environmentally-friendly measures proposed at the New Terminal 2 integrate fully into the architecture, utilizing the massive expanses of curtainwall and roof structure to their advantage. These measures are overt and, in so being, effective simply because they rely upon the natural solar and rain cycles of Chicago's humid climate to work.

To power people-mover systems within the airport, reduce energy costs, and keep unwanted internal heat gains to a minimum, thin-film photovoltaics are integrated into the cable-net glazing system that lines the perimeter of the terminal. As a result, travellators, escalators, elevators, and various automatic machines (like self check-in systems) no longer rely on energy supplied from the grid but rather on energy gathered from the photovoltaics.

[4.89] *Thin-film photovoltaics power the people-movers.*

In order to keep interior and exterior environments cool and refreshed, an extensive green roof system integrates into the roof structure of the wings. Benefits include the mitigation of the urban heat-island effect, controlling stormwater run-off, creating an aesthetically pleasing exterior terminal environment, and reducing sound reflection and transmission,[8] which is a particularly essential goal in an airport context.

Notes

1 “History of O'Hare International Airport,” Chicago Department of Aviation, accessed June 24, 2012, http://www.ohare.com/About/History/Default.aspx.

2 Vincent Sobotka, “By plane or by ego: O'Hare modernization likely to dive,” *Digital Journal,* January 27, 2011, accessed June 24, 2012, http://digitaljournal.com/article/302951.

3 *Oxford Dictionaries*, s.v. "apron," accessed June 24, 2012, http://oxforddictionaries.com/definition/apron?region=us.

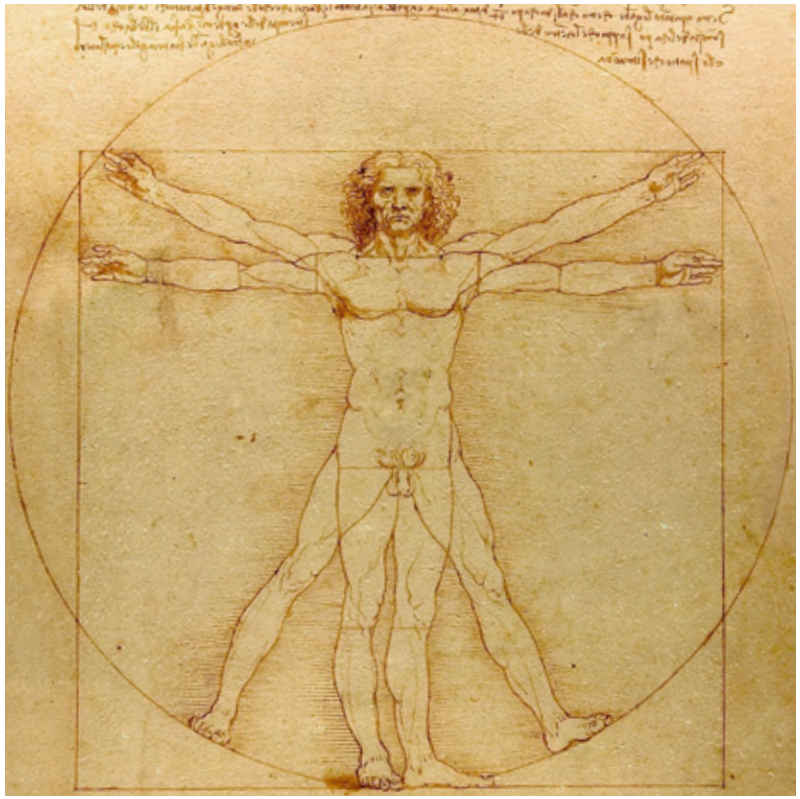
4 “Chicago O'Hare (ORD) Airport,” iFly.com, accessed June 24, 2012, http://www.ifly.com/chicago-ohare-international-airport.

5 Bradley Keoun, “Replica Of Dinosaur Fossil Gives O'hare Passengers Monstrous Welcome,” *Chicago Tribune,* January 20, 2000, accessed June 21, 2012, http://articles.chicagotribune.com/2000-01-20/news/0001200303_1_dinosaur-skeleton-brachiosaurus-love-dinosaurs.

6 Tom Ravenscroft, “The LEGO Architecture range (Landmark, Architect and Discovery Series) recreate some of the world's most iconic buildings using the world's most famous plastic bricks,” *Architecture @ Suite 101,* November 17, 2009, accessed June 24, 2012, http://suite101.com/article/lego-architecture-a170657.

7 Tim Hume and Eoghan Macguire, “Airports' tiniest hotels: Sleeping in a box,” *CNNTravel,* June 19, 2012, accessed June 21, 2012, http://www.cnn.com/2012/06/19/travel/airport-microhotels/index.html.

8 “Green Roof Benefits,” Green Roofs for Healthy Cities, modified on January 26, 2012, http://www.greenroofs.org/index.php/about-green-roofs/2577-aboutgrnroofs.



[5.1] Vitruvian Man *~ Leonardo da Vinci (1487)*

Preface

In Pythagorean tradition, the square represents the physical world, while the circle relates to the spiritual realm that exists in and around all things.[1] The human body, with its perfect natural proportions and capacity for consciousness, was thought to symbolize the joining of these two worlds -- a coalescence of matter and soul. Leonardo da Vinci's *Vitruvian Man* depicted Pythagoras' perfect man[2] as existing most comfortably, and completely, at the intersection of this physical and spiritual plain. It is here that his material and psychological needs could be fulfilled, thereby allowing him to reach his highest potential as a creature of both flesh and blood and mind and thought.

What this means to say is that unless architects work to try and fulfil the practical as well as psychological needs of passengers in airports, and do so as fully as possible in both directions, the experience will always be lacking in some way. A holistic approach to airport design, one that caters to these two aspects of human existence, inherently reduces the stress level of the passenger, encouraging him or her to better appreciate the architecture and the higher meanings it manifests.

The modern context of the airport has diminished the value of the passenger experience to such an extent that it almost seems an impossible thing to reverse. This being the case, today's architect must try ten times harder to recapture the ideals that have vanished, or have been overshadowed by the unfortunate realities of the times, and insist on having a say in all aspects of the design process. We cannot sit idly by as paranoia, greed, and apathy threaten to take over the sacred aspects of the airport experience. We cannot continue to fall back on our principles because we feel, wrongly, that we have no choice. To make the airport experience better, and indeed to make the world better, we must overcome the fear of action and comfort of inaction and push forward with determination and resiliency.

[5.2] *A plane takes off on a runway.*

5. Conclusion


D

the theory that parts of a whole are in intimate interconnection, such that they cannot exist or be understood independently of the whole[3]

derived from the Greek "holos", meaning ***whole***[4]

(n.) ***ho·lism***

[5.3] *A holistic approach was taken in designing most areas of the proposed renovation, including the check-in hall.*

A Holistic Approach

This thesis has looked at the past, present, and future of airport design with a specific focus on the passenger experience. It has examined the origins of flight and the means by which it gave rise to airport architecture over time. It has distilled airport design to its fundamental state at every point along the terminal experience in order to better understand and explain what makes for a successful airport. It has depicted a personal journey that has taken me to opposite ends of the globe in search of various approaches and answers. And ultimately, it has culminated in a proposal that stems from the only design approach deemed feasible: a holistic one.

Holistic design infers taking an all-encompassing approach to the design of every space in a project. Nowhere is such an approach more applicable and necessary than in airport design -- the inherent complexity and potential richness of the passenger experience demands it. Architects must design to fulfil the main functions of every space first and foremost. At the same time, they must go above and beyond fulfilling generic aims and introduce comfort and beauty into the equation in a way that compliments and reinforces the main purpose of the airport: to circulate passengers and luggage to and from planes in the most efficient and effortless manner possible.

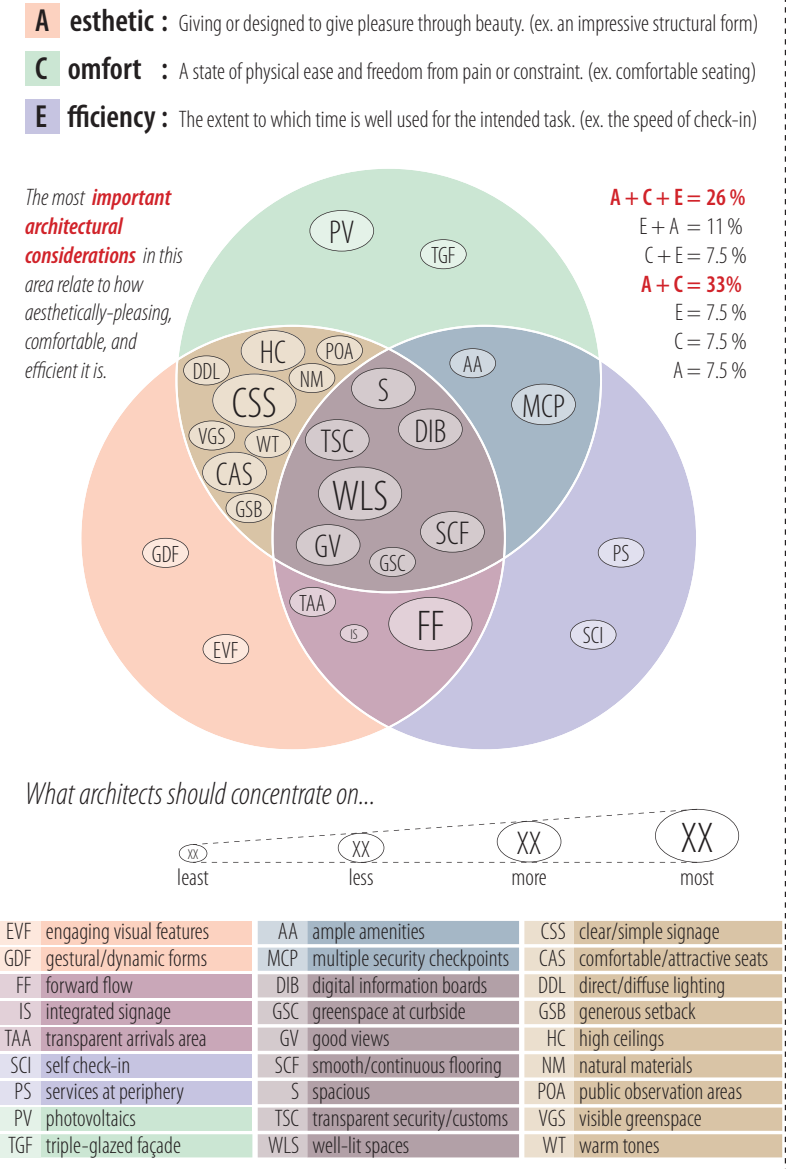
Secondary architectural elements can be treated independently from one another, but must still relate back to the greater architecture on some level so as to establish an overall character for the airport and its spaces. Fluidity in form and function naturally reduces passenger stress, making the experience of the airport coherent and intuitive as opposed to choppy and disorganized. The pleasantness of one's experience will ultimately hinge on how successfully the narrative of the terminal translates into techtonic form.

Departures and Arrivals Halls

Based on fact, observation, documentation, and intuition, I have proposed what I believe to be the best solutions, or rather set of guidelines, to the thesis question: How can we improve, modernize, and rejuvenate the passenger experience so that the airport itself can fulfil its basic functions without sacrificing the essence of what it symbolizes? In grouping a number of terminal areas together for this final analysis, I hope to provide a clear sense of how these approaches manifested themselves in the final design and how essential they were to creating the ideal passenger experience that has already been emphasized on so many occasions throughout this thesis.

Creating a generous setback in front of the terminal will alleviate congestion, offer opportunities to introduce greenspace, and create a sense of procession towards the entrance. This approach emphasizes the importance and novelty of what is to come and gives character and a sense of identity to the terminal at the onset. A spacious, bright, and grand check-in hall is most practical and efficient and will impress as well as excite. With well-designed and well-placed signage, a continuous and forward-moving circulation flow, and a common sense location and distribution of security checkpoints, the check-in hall should intuitively respond to what passengers and their loved ones need at any given moment. Retail, restaurants, observation decks, and kiss and cry areas should, if possible, be relegated to a different floor to prevent added congestion and flow stoppages.

Security and customs zones should be as transparent as feasible both physically and visually so as to alleviate passenger stress and maintain sightlines down the length of the gates concourse. And lastly, locating the baggage claim hall and arrivals areas above grade will allow for ample light penetration and give the arrivals process the significance it deserves in the greater context of the airport experience.

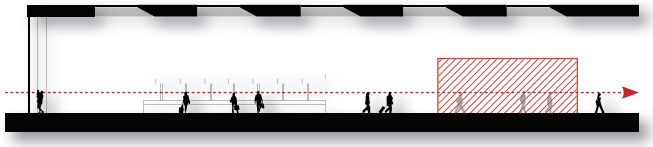


[5.4] *A diagram showing suggested prerequisite considerations for well-designed arrivals and departures halls from the perspective of the passenger, including which of those require the most attention in the design process.*

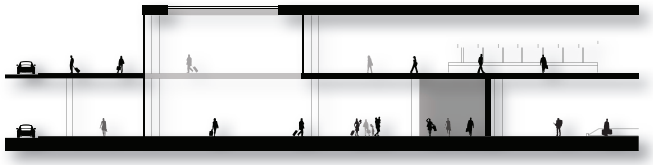
The Generic Approach

Curbside

Check-in

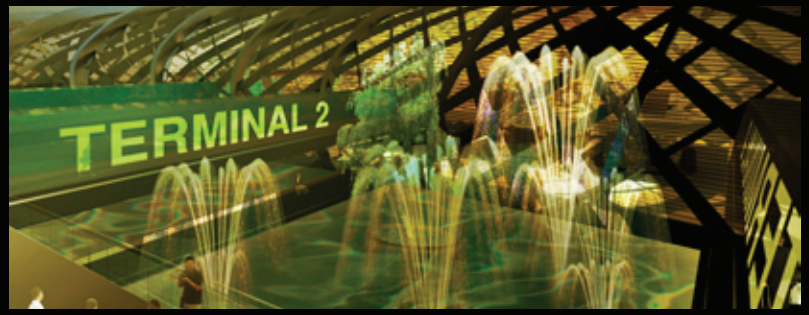


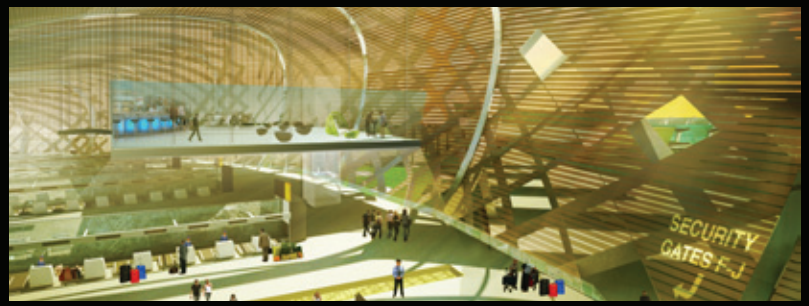
Bag Claim + Arrivals



Security/Customs

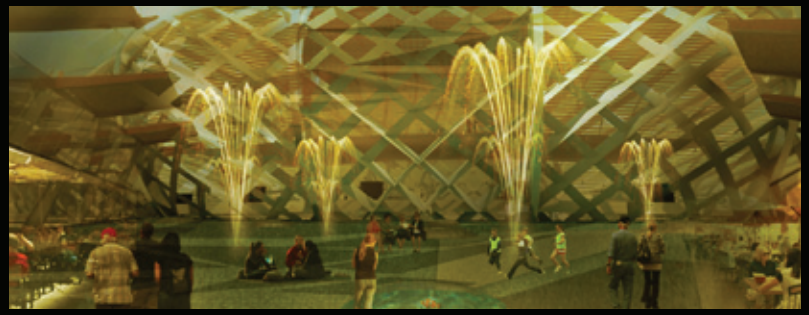
The Realization

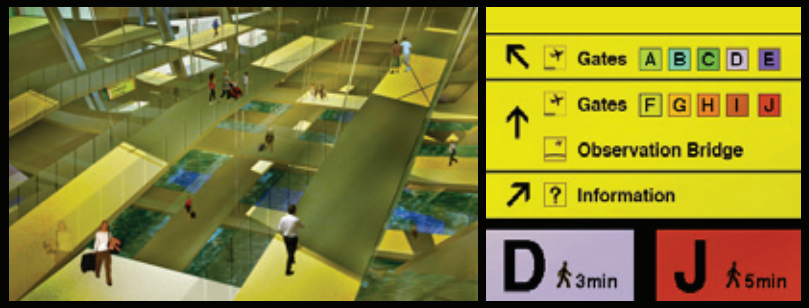


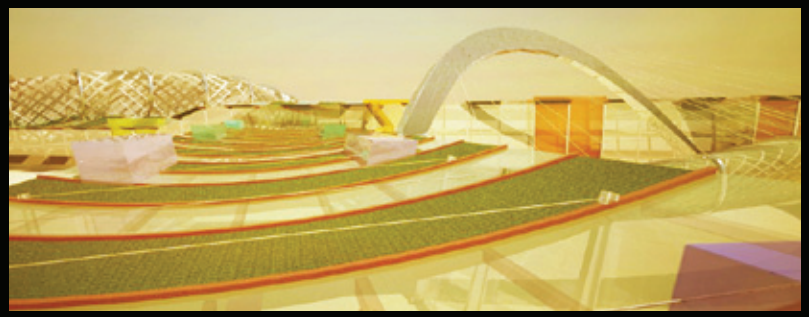


[5.5] *The curbside at the New T2 creates a generous setback in order to emphasize the sense of approach.*
[5.6] *The check-in hall is spacious, emphasizes a forward-flow, and lets in direct and diffuse natural light.*
[5.7] *The bag claim area has a high-ceiling, is visually intriguing, and leads into transparent waiting areas.*
[5.8] *The customs checkpoint, like the security checkpoint above it, is left visually and physically open.*

The Realization

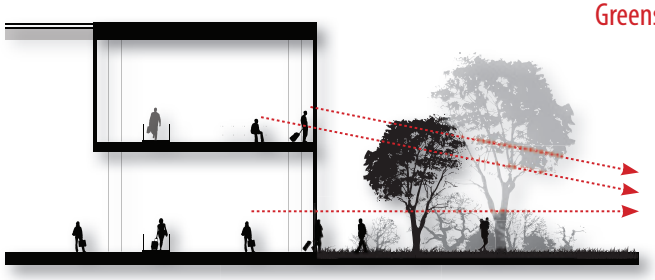




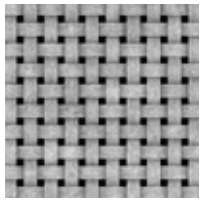


The Generic Approach

Greenspace

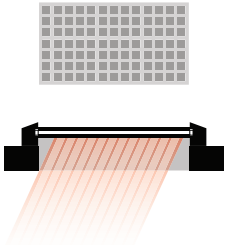


Signage + Circulation

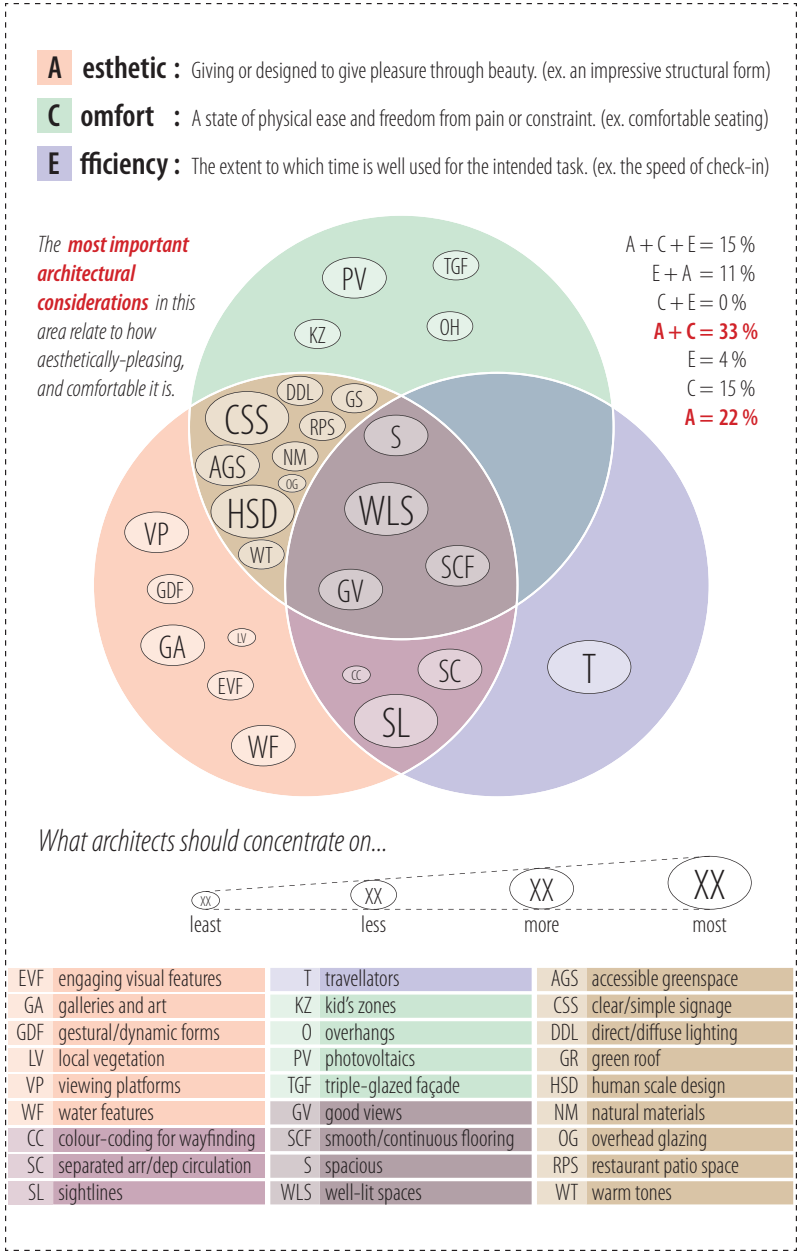


Observation Area

Sustainability



[5.9] *Greenspace is visible prior to the security checkpoint and both visible and accessible beyond it.*
[5.10] *Especially in more complex circulation nodes, designing for clear and simple signage is crucial.*
[5.11] *The New T2 frees up the perimeter, and designates an entire pedestrian bridge for plane-watching.*
[5.12] *Green roof strips cool the interior, reduce stormwater runoff, and improve exterior air quality and aesthetic.*



[5.13] *A diagram showing suggested prerequisite considerations for well-designed intermediary spaces from the perspective of the passenger, including which of those require the most attention in the design process.*

Intermediary Spaces

The design of the spaces before, after, and in between parts of the terminal containing major functions can be as important as the design of those parts themselves. These are the moments that link the various strands of the passenger experience together and contribute to the creation of a continuous and holistic environment. Passengers must have access to things to do and see throughout their terminal experience in order to avoid becoming bored, depressed, apathetic, or all three and more.

The inclusion of greenspace can be visually appealing, physically engaging, and psychologically calming for all passengers. The creation of an outdoor area, shielded from the elements and noise pollution, fully accessible to the average passenger should be a goal of every modern day airport designer. Besides greenspace, it is important to include spaces that, despite being more loosely programmed, can engage the passenger visually and intellectually. In my design, this manifested in the form of an observation bridge (visually aligned to the runway), an enormous aquarium on the lower level, and a unique architectural solution for the intersection point of the international and domestic wings.

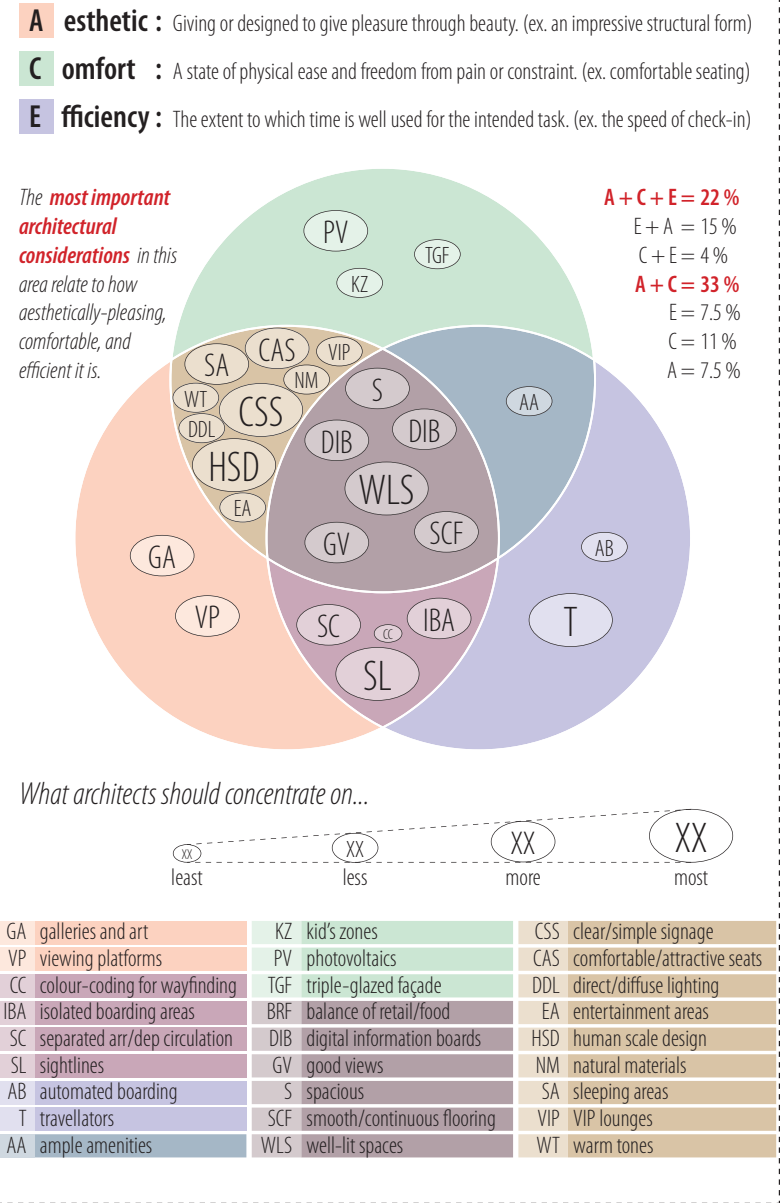
It is also important to design for sustainability in order to reduce energy demands and offset negative environmental impacts in the long term. In most major cities, annual airport capacity numbers are increasing at a steady rate and will continue to do so for the foreseeable future. As such, green strategies for collecting energy and powering people-mover systems should become norms at all airports. In designs in which the use of glass is abundant, architects should strongly consider employing thin-film photovoltaics as a means of collecting solar energy and also reducing internal heat gains. An extensive use of glass is acceptable so long as it is properly insulated, shaded, and actively works to collect energy.

Gates Concourses

The movement towards a gate, like the initial approach to the terminal, should be almost ritualistic in nature, with the passenger's excitement rising to a crescendo upon reaching it. To design in any other way will lead to disappointment and disillusionment on the part of the passenger and reduce his or her terminal experience to the, all too often, negative circumstances faced prior to and during the security screening process. Beyond fulfilling the most basic mandates on a functional level, the architecture of an airport must serve to inspire passengers through how well and holistically it manifests the symbolism of flight.

This means that views must never be interrupted and always be magnificent. The materials on the floor, wall, and ceiling have to work together to create a warm and appealing atmosphere throughout in order to counter any hint of a sterile or institutional vibe that may creep in -- an airport is not and must never resemble a hospital, prison, or an office building. The creation of unobstructed spaces with high ceilings, light, warmth, comfort, and ambiance must be sought-after goals for architects.

A plethora of retail and restaurants must be readily accessible, and yet not forced upon those who wish to avoid the more commercial aspects of the airport. Additionally, architects should seek to incorporate art and culture into the terminal makeup in order to establish a sense of place and add intellectual intrigue. Lounges, kid's zones, and sleeping areas must become prerequisites for all modern-day terminal designs; each passenger is different and has different needs, all of which have to be met. Circulation should be kept fluid and separate for those departing and arriving. And lastly, the boarding process itself must incorporate latest technologies to ensure efficiency and simplicity and avoid any unnecessary cluttering of things and people.

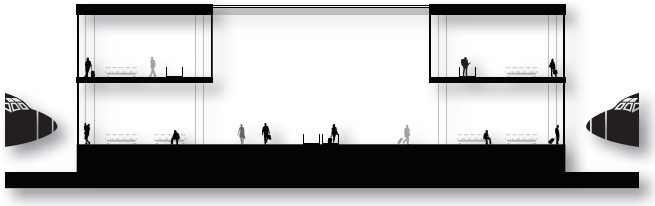


[5.14] *A diagram showing suggested prerequisite considerations for well-designed gates concourses from the perspective of the passenger, including which of those require the most attention in the design process.*

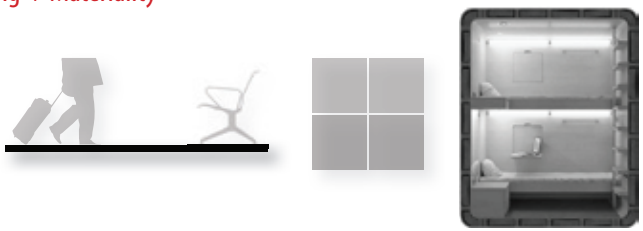
The Generic Approach

Seating + Comfort

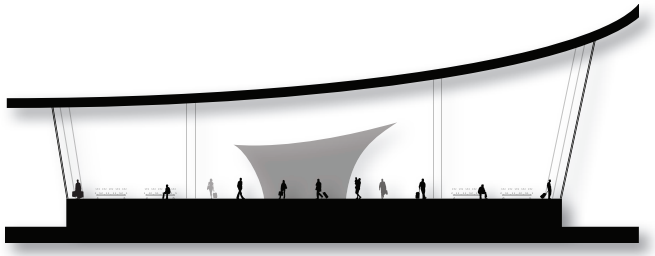
Gates



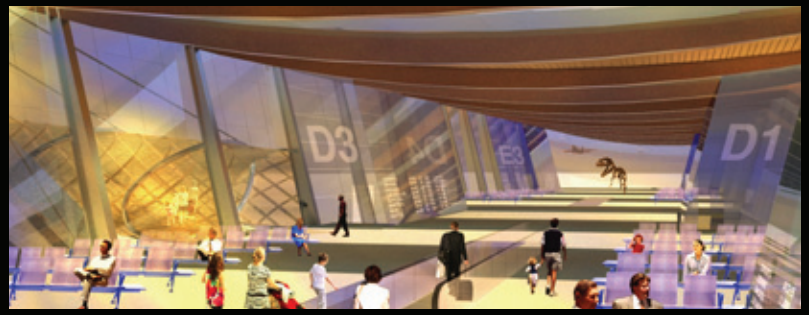
Sleeping + Materiality



Art



The Realization



[5.15] *Seats in the gates concourse are designed to have retractable armrests and ample cushioning.*
[5.16] *Departing and arriving passengers circulate to and from their planes on separate levels to avoid congestion.*
[5.17] *A smooth terrazzo floor finish is used throughout the gates concourses. Sleeping areas are also available.*
[5.18] *The skeletal frame of the sculptures mimic the repetitive structure of the gates concourse.*

Notes

1 “Leonardo's Vitruvian Man,” The Alchemical Egg, accessed June 24, 2012, http://thealchemicalegg.com/VitruviusN.html.

2 “Vitruvian Man,” SymbolDictionary.net: A Visual Glossary, accessed June 24, 2012, http://symboldictionary.net/?p=2485.

3 *Oxford Dictionaries,* s.v. "holism," accessed July 9, 2012, http://oxforddictionaries.com/definition/english/holism.

4 *Wiktionary,* s.v. "holo-," accessed July 9, 2012, http://en.wiktionary.org/wiki/holo-.

5 Micheline Maynard, “Prefer to Sit by the Window, Aisle or ATM?,” *The New York Times,* June 27, 2008, accessed June 24, 2012, http://thelede.blogs.nytimes.com/2008/06/27/prefer-to-sit-by-the-window-aisle-or-atm/.

We have always known two kinds of geography.

Nature drew the oceans, continents, mountains, rivers and plains. Men etched in cities and national boundaries.

For our well-being, we have tried to harmonize natural and man-made geography.

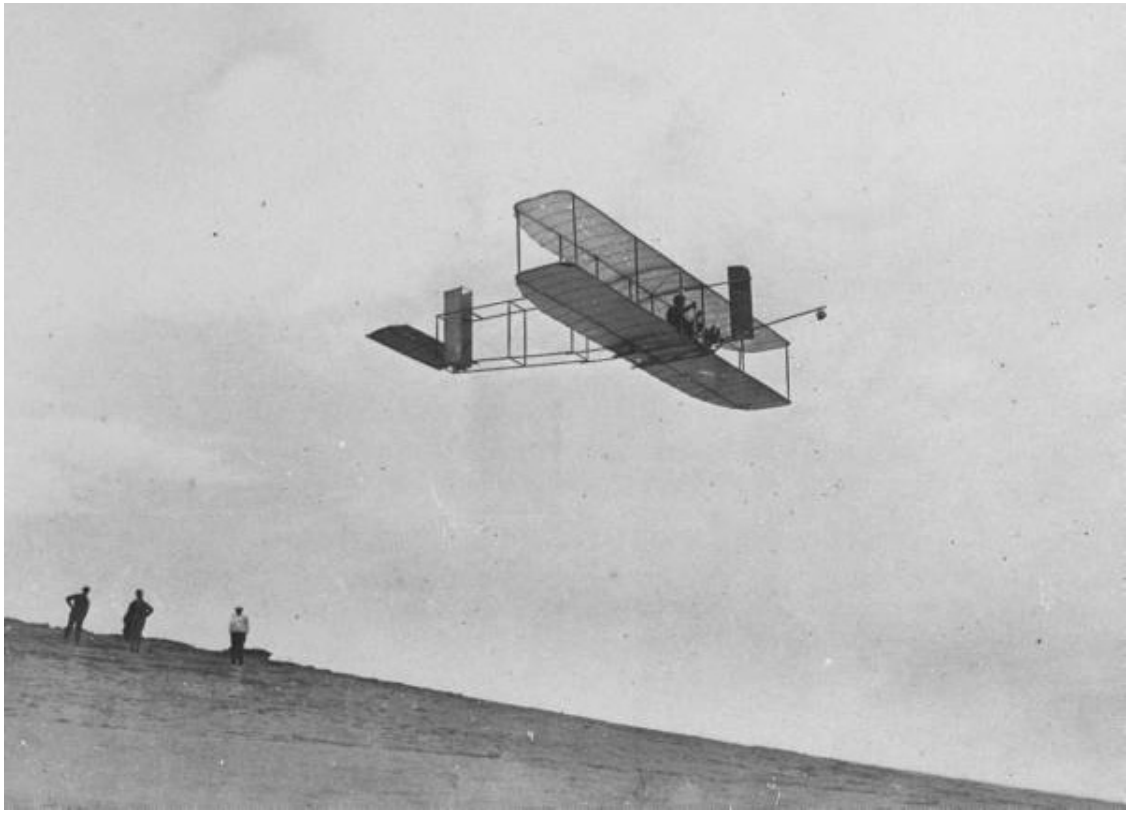
The modern airplane creates a new geographical dimension.

A navigable ocean of air blankets the whole surface of the globe.

There are no distant places any longer: the world is small and the world is one.[5]

~ Wendell Willkie

Airways to Peace



[6.1] *The Wright Flyer shortly after take-off at Kitty Hawk in 1903.*

Epilogue

One of my committee members recently asked me, "Is there anything still positive left about the airport experience?" I found this to be quite a telling question and I struggled somewhat in answering it. Upon reflection, I would have to say that while there certainly still are pleasant moments to be had at the airport, these moments have become increasingly few and far between. However, if there was nothing left to salvage of the magic that once epitomized airport travel, then there really wouldn't be much of a problem to solve, would there?

The remnants of what once was are still there, driving those with influence to try and rekindle that atmosphere of eagerness, hope, and ambition that at one point in time pervaded the terminal experience. The airports being constructed today, while impressive structurally, and to a good degree architecturally, often rely far too much on style rather than substance to impress passengers and visitors. Bigger does not necessarily mean better, as the old adage goes. In fact, the bigger an airport is, the less the passenger is able to relate to it on a human level and the more he or she feels like just another one of the millions that travel through it every year. A passenger should not feel as if the airport is catering to millions; a passenger should feel as if every moment has been designed specifically to suit him or her.

Of course, nostalgia should not be the one and only motivator for progress. New technologies and methods of air travel will one day transform the experience to such a degree that it would likely no longer be recognizable to us in the here and now. Until then, as this thesis suggests, we must slowly begin to adapt the airport typology to meet the needs of today's generation and be prepared to meet the needs of next. Terminal design, especially in North America, has been stagnant for decades. If anything, harsh economic realities and security threats should serve as catalysts for meaningful and lasting progress to occur in airport architecture.

Epilogue (cont.)

While this thesis focuses primarily on what the airport of the *near* future could and should look like, the notion of a holistic passenger experience is one that must remain relevant for many years to come in order for any airport to reach its design potential. The purpose and essence of the airport, despite the advent of new technologies and travel methods, will likely remained unchanged until air travel itself becomes entirely obsolete.

With this in mind, architects mustn't forego designing for the needs of today and concentrate only on pursuing dreams of tomorrow. Progress cannot occur at the snap of a finger; it will come about only as the result of a collective shift in mentality, something that will require patience and persistence to be brought to fruition. This isn't to say that airports shouldn't be designed with inherent flexibility to adapt to future needs and changes in capacity. In fact, many airports built today, my design included, do exactly that by virtue of their modular layouts and sectional shapes. But, so long as airplanes look and work roughly the same way they do now, airports will look and work roughly the same way *they* do as well. While this may be disappointing to some, it is a reality that must be accepted and addressed in the most responsible and thoughtful of ways.

200 years from now, the airport won't look or function the same way it does today -- this is obvious. It may even become antiquated in the face of new air and space travel methods and typologies. What won't change is the fact that the passenger will expect to have an efficient, pleasant, and rewarding experience at the airport. If this wouldn't be too much to ask of architects 200 years from now, it shouldn't be too much to ask of them today.

[a1.1] *A map of flight paths around the world.*

Appendix

[a1.2] *Set 1 of the panels submitted for the '2011: Airport of the Future' competition, sponsored by Fentress Architects.*

[a1.3] *Set 2 of the panels submitted for the '2011: Airport of the Future' competition, sponsored by Fentress Architects.*

To Whom It May Concern,

My name is Andrea Nagy and I am a graduate student at the University of Waterloo, School of Architecture. I would like to ask for your permission to survey passengers through a questionnaire or interview in your airport as a means of validating my thesis research, which deals with the successes of terminal design, as well as where opportunity for improvement exists, as perceived by the passenger.

The brief questionnaire or interview, which would take no longer than 5 minutes, will be simple and straightforward and is designed to acquire the most genuine responses in the form of thoughts, feelings, and experiences that relate to terminal design.

Examples of questionnaire and interview questions include:

Questionnaire Questions

1. If there were an area that could use more natural light, where would it be?
2. Does the design of the terminal help to alleviate the stress of your airport experience?
3. Does the design of the terminal respond to your needs as a passenger?

Interview Questions

1. Do you think architects can influence the way people view airports?
2. Does the architecture of this airport excite or inspire you in any way? If no, do you wish that it would?
3. Do you think your experience of airports has changed over time? If yes, has it changed for the better or for the worse?

For the results of the study to be meaningful, I hope to conduct up to 6 questionnaires and interviews (3 each). Passengers would be approached primarily in gate waiting areas and café/bar seating areas to take advantage of their inherently more relaxed setting. I can assure you that if any passenger were to deny my request for participation, I would immediately respect his or her wishes and move along. The goal is not to harass passengers by any means, but to simply receive insight on the topic of airport design from the people who experience it first-hand. As a student of architecture, these opinions will make for an invaluable contribution not only to my thesis research but also ultimately to my design proposal.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Any and all information acquired from interviews and surveys will be anonymously represented in my body of work. Contact information will be provided to participating passengers, as well as the airport general manager(s), upon request if they wish to monitor the progress of my thesis at any point in time.

Thank you very much for your time and consideration. I look forward to hearing your response. Should you have any questions, please do not hesitate to contact myself, Eric Haldenby (Director of the School of Architecture), or my thesis supervisor Terri Meyer Boake (Associate Professor).

Sincerely,

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Graduate Student

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[a1.4] *Survey and questionnaire information letter as required by the Office of Research Ethics.*

Modern Airport Terminal Design
A Comparative Case Study

Questionnaire (32 Questions; 5 minutes)

1. **What is your age range?**
   ☐ 18-24 ☐ 25-34 ☐ 35-44 ☐ 45-59 ☐ 60 and over
2. **What is your sex?** ☐ Male ☐ Female
3. **What is your occupation?** _____
4. **Are you a frequent flyer?** ☐ Yes ☐ No
5. **With whom are you travelling?**
   ☐ Alone ☐ Family (no children) ☐ Family (with children) ☐ Partner
   ☐ Friend(s) ☐ Co-worker(s) ☐ Other (please specify) _____
6. **Do you generally require special assistance at airports?** ☐ Yes ☐ No
   If yes, please specify. _____
7. **Are you a departing or transferring passenger?** ☐ Departing ☐ Transferring
   If you are transferring, did you have to recheck your baggage? ☐ Yes ☐ No
8. **How easy is it to navigate the terminal?**
   ☐ Not Easy ☐ Fairly Easy ☐ Easy ☐ Very Easy
9. **How clear are the signs?**
   ☐ Unclear ☐ Fairly unclear ☐ Fairly clear ☐ Clear ☐ Very clear
10. **Overall, is there enough natural light in the terminal?** ☐ Yes ☐ No
11. **If there were an area that could use more natural light, where would it be?**
    ☐ Check-in ☐ Waiting Areas ☐ Dining Areas ☐ Transfer Corridors
    ☐ Lounges ☐ Baggage Claim ☐ None ☐ Other (please specify) _____
12. **How would you rate the overall indoor air quality?**
    ☐ Poor ☐ Adequate ☐ Good
13. **Are the seats in the waiting areas comfortable?** ☐ Yes ☐ No
    If no, please specify why not. _____
14. **Are there enough outlets for your electrical devices?** ☐ Yes ☐ No

[a1.5] *Page 1 of the questionnaire, with a specific focus on the architectural properties of spaces, was distributed to a select number of passengers. Collected responses influenced the author's approach to the final design proposal.*

15. Are the electrical outlets conveniently located? ☐ Yes ☐ No

16. How easy is it to find the bathrooms?

☐ Not easy ☐ Fairly easy ☐ Easy ☐ Very easy

17. Are the bathrooms conveniently located? ☐ Yes ☐ No

If no, please specify where more bathrooms should be located. _____

18. Are there areas of the terminal that are too crowded? ☐ Yes ☐ No

If yes, please specify which areas are too crowded.

☐ Drop-off ☐ Check-in ☐ Commercial Areas ☐ Dining areas ☐ Customs

☐ Lounges ☐ Bathrooms ☐ Waiting Areas ☐ Baggage claim ☐ Corridors

☐ Other areas (please specify) _____

19. If you could change one thing about the design of the terminal, what would it be?

Please specify. _____

20. As either a departing or transferring passenger, how easy was it to navigate to your gate?

☐ Not easy ☐ Fairly easy ☐ Easy ☐ Very easy

If not or only fairly easy, what was the reason behind this? Check all that apply.

☐ Too many level changes ☐ Confusing signs ☐ Winding routes ☐ Crowds

☐ Customs/security queues ☐ Crowded areas ☐ Long travel distances

☐ Other (please specify) _____

21. How do you find the length of time it takes to arrive at your gate from the check-in/arriving gate?

☐ Very long ☐ Long ☐ Adequate ☐ Short

22. How well does the design of the terminal anticipate your needs?

☐ Not Well ☐ Fairly Well ☐ Well ☐ Very Well

23. Are the materials and finishes used inside the terminal appropriate? ☐ Yes ☐ No

If no, please suggest what alternative materials and finishes could have been used.

_____

24. Do you find the ceiling height in the baggage claim area to be adequate? ☐ Yes ☐ No

If no, please specify why not. _____

25. Does the design of the terminal help to alleviate the stress of your airport experience?

☐ Yes ☐ No ☐ Somewhat

[a1.6] Page 2 of the questionnaire.

If yes, what aspect of the design helps most in alleviating your stress? Please specify.

_____

If no or somewhat, what could be designed differently to help, or help more, in alleviating your stress? Please specify. _____

26. Is the artificial lighting throughout the terminal adequate? ☐ Yes ☐ No

If no, please indicate which areas would require **HIGHER** or **LOWER** levels of lighting by writing **H** or **L** in the corresponding spaces provided.

__ Drop-off __ Check-in __ Commercial Areas __ Dining areas __ Customs

__ Lounges __ Bathrooms __ Waiting Areas __ Baggage claim __ Corridors

__ Other areas (please specify) _____

27. Are there enough family-friendly facilities at this airport? ☐ Yes ☐ No ☐ n/a

28. Is there enough access to food (ex. restaurants, café's) BEFORE security? ☐ Yes ☐ No

Is there enough access to food **AFTER** security? ☐ Yes ☐ No

Is the variety of the food satisfactory to you? ☐ Yes ☐ No

Does the food meet your dietary needs? ☐ Yes ☐ No ☐ n/a

If applicable, please specify what those are. _____

29. How would you rate the quality of the frequent flyer lounges?

☐ Poor ☐ Fair ☐ Good ☐ Excellent ☐ n/a

If poor or fair, how could the quality be improved? Please specify.

_____

30. On a scale of 1 to 10 (where 1 = terrible and 10 = excellent), how would you rate your terminal experience thus far? Please circle a number below.

terrible **1 2 3 4 5 6 7 8 9 10** excellent

31. What would you say contributed most to the quality of your experience?

Please specify. _____

32. Which of the following criteria should there be MORE or LESS of? Please indicate by writing M or L in the corresponding spaces provided.

__ Greenery __ Bars/Café's __ Shops __ Signs __ Artwork

__ Lounges __ Restaurants __ Colour __ Services __ Seating

__ Windows/Views __ Moving Walkways __ Escalators/Elevators

__ Other (please specify) _____

[a1.7] Page 3 of the questionnaire.

Modern Airport Terminal Design

A Comparative Case Study

Interview (11 Questions; 5-10 minutes)

1. What do you like and dislike about airports? This airport?

2. How do airports make you feel and why do they make you feel that way? This airport?

3. What, if anything, does the design of an airport have to do with how you view and feel about it? This airport?

4. Do you think architects can influence the way people view airports?

5. What are the most important things architects should think about when designing airports?

6. Does the architecture of this airport excite or inspire you in any way? If no, do you wish that it would?

7. Do you think your experience of airports has changed over time? If yes, has it changed for the better or for the worse?

8. Do you find that your experience of airport terminals changes significantly at nighttime? If yes, why? This airport?

9. What do you like and dislike about this particular airport?

10. If you were an architect, how would you design this terminal differently?

11. As you walked through this terminal, how, if at all, did you experience the architecture?

[a1.8] *The survey, with a specific focus on the architectural properties of spaces, was distributed to a select number of passengers. Collected responses influenced the author's approach to the final design proposal.*

Code	Ter	Architect	Open. Date	Cost (billions)	Terminal Area (sq m)	Annu. Capacity (millions)	Dist. to City Centre (km)*
YYZ	T1	SOM; Safdie; Adamson[1]	2007[2]	1.800 CAD[3]	339,000[2]	21[2]	27
IAD		Eero Saarinen; Expansion by SOM[4]	1962/1996[4]	0.108 USD[4] (original)	102,000 (46,000+56,000)[4]	24[4]	42
JFK	T2	White & Mariani[5]	1962[6]	N/A	19,000†	N/A	19
JFK	T4	SOM[7]	2001[7]	1.400 USD[8]	139,000[7]	10-12[9]	19
MAD	T1	Luis Gutiérrez Soto[10]	1931[10]	N/A	90,000†	N/A	9
MAD	T2	Luis Gutiérrez Soto[10]	1954[10]	N/A	55,000†	N/A	9
MAD	T4	Rogers Stirk Harbour + Partners[11]	2006[11]	1.070 EUR[11]	785,000[11]	35[11]	9
CDG	T2E	Paul Andreu[12]	2003[12]	0.750 EUR[13]	220,000[12]	11[12]	25
CDG	T2F	Paul Andreu[14]	1998[14]	0.335 EUR[15]	130,000[14]	13[14]	25
LHR	T4	Scott, Brownrigg and Turner[16]	1986[17]	N/A	106,000[17]	10[17]	22
LHR	T5	Rogers Stirk Harbour + Partners[18]	2008[18]	£4.3[12]	465,000[18]	36[18]	22
STN		Foster + Partners[19]; Pascall/Watson[20]	1991[19]/2008[20]	£0.450 (£0.400+£0.050)[14]	56,000 (50,000[19]+6,000[20])	18[21]	48
AMS		Expansion by Benthem Crouwel[22]	1993[22]	N/A	600,000[22]	60-65[22]	9
CGN	T2	Murphy/Jahn[23]	2000[23]	0.600 EUR[24]	69,000[23]	6[24]	16
MUC	T1	Busse, Blees, Büch, Kampmann[25]	1992[25]	N/A	198,000[26]	20[26]	29
MUC	T2	Koch + Partner[27]	2003[27]	0.800 EUR[27]	271,000[26]	20-25[26]	29
DOH		N/A	1959[28]	N/A	70,000†	12[29]	N/A
PVG	T1	Paul Andreu[30]	1999[30]	0.510 USD[30]	220,000[30]	20[30]	30
PVG	T2	ECADI[31]	2007[31]	N/A	480,000[31]	40[31]	30
PEK	T3	Foster + Partners[32]	2008[32]	2.280 USD[33]	1,300,000[32]	50[32]	32
ICN	M	Fentress Bradburn Architects[34]	2001[34]	1.100 USD[35]	496,000[34]	44[34]	70
KIX	M	Renzo Piano[36]	1994[36]	N/A	303,000[36]	17[37]	50
YVR	IT	Expansion by Stantec[38]	2007[38]	1.400 CAD[38]	135,000[39]	17[39]	12
PDX		Expansion by Zimmer Gunsul Frasca[40]	1960s[41]/2000[40]	N/A	125,000[42]	14[43]	15[44]
DEN		Fentress Bradburn Architects[45]	1995[45]	4.800 USD[46]	511,000[45]	52[45]	37[47]
ORD	T1	Helmut Jahn[48]	1987[48]	0.500 USD[49]	110,000[48]	67 (total)[50]	27
ORD	T2	C. F. Murphy and Associates[48]	1959[51]	N/A	39,000†	67 (total)[50]	27
ORD	T3	C. F. Murphy and Associates[48]	1959[51]	N/A	70,000†	67 (total)[50]	27

[a1.9] *An airport data matrix showing statistical data on airports visited on author's trip. *Unless otherwise specified, data points have been sourced from: http://www.ifly.com/. †Indicates area estimates from: http://www.daftlogic.com/.*

Terminal	Form	Satellite	Concept	Organization	Floors	Wayfinding	Signage
YYZ T1	Multiple Piers	N/A	Crescent-shaped plan; arched shell structure; emphasis on transparency, natural light, and ease of orientation	Radial grid spacing varying between 8-10 metres	L-1: Ground Transport L0: Arrivals, Bag Claim L1: Gates L2: Departures, Check-in	Natural light and views to establish rhythm and orient passengers	Yellow (and sometimes green) on black with white on black for arrows; English and French text; Standard icons
IAD	Multiple Island Piers	2 Island Piers	Gestural concrete forms; no waiting areas; mobile lounges; simplicity of layout and circulation	Large open span created by self-supporting concrete structure; Typical grid-based gates	L-2: AeroTrain L-1: Security L0: Arrivals, Bag Claim L1: Gates L2: Departures, Check-in	No unique wayfinding measures	White on dark grey with black on yellow for arrows and black on white for icons; English text; Standard icons
JFK T2	Linear	N/A	Standard 2-level linear plan; Program centralized	Standard window wall and column system, typical of 1960's airport construction	L-1: Arrivals, Bag Claim L0: Departures, Check-in L2: Gates	Small, rectangular footprint makes for uninterrupted sight lines from one end to the other	Black on yellowish orange with black on white for arrows, Yellow on black for services; English text; Standard icons
JFK T4	Multiple Piers	N/A	Arced, gestural roof over check-in; 2-level, low clng gates concourse	Curved roof form is self-supporting over check-in hall; Grid-based, with columns, elsewhere	L-1: Arrivals, Bag Claim L0: Departures, Check-in L2: Gates	Check-in hall spills into retail area, which leads to two distinct security checkpoints; Natural forward-flow	Black on yellow with black on white for arrows, Yellow on black for services; English text; Standard icons
MAD T1	Linear	N/A	Standard modernist design; Facetted nature of enclosure makes expansion difficult	Standard grid and column construction	L0: Arrivals, Bag Claim L1: Departures, Check-in, Gates L2: Lounges	Circulation is strictly segregated, leading to a logical wayfinding process	White and yellow on black, white on colours for gates; English and Spanish text; Non-standard icons
MAD T2	Linear	N/A	Standard modernist design; Facetted nature of enclosure makes expansion difficult	Standard grid and column construction	L-1/L-2: Ground Transport L0: Arrivals, Bag Claim L1: Gates & Gates at Pier L2: Departures, Check-in	No unique wayfinding measures	White and yellow on black, white on blue for gates; English and Spanish text; Non-standard icons
MAD T4	Linear + Single Satellite	1 Satellite	Wave roof supported on structural trees; Horizontal aesthetic; Legible, modular design	Modular repetition on 18 x 9 metre grid	L0: Arrivals, Bag Claim L1: Gates L2: Departures, Check-in	Linear scheme; Light canyons denote various stages of transit	White and yellow on black; Spanish and English text; Non-Standard icons

[a1.10] *An airport architecture matrix outlining the spatial qualities of the airports visited on the author's round-the-world trip.*

Terminal	Gate Seating	Structure	Daylighting	Artificial Lighting	Ceiling/Roof
YYZ T1	Blue, lightly padded with armrests at every seat	Exposed structural steel 'wishbone-shaped' assemblies supported roof loads and thrusts	Roof depth kept to min. to allow for maximum daylighting; radial skylights at every 4th arch	Pot lights and spotlights on departures level; pot lights and upturned ambient lighting in baggage claim	Vaulted and skylit; concrete buttresses anchor wing-like roof panels; metal panel and drywall finishes
IAD	Black with metal trim, lightly padded with armrests at every seat; Plush chairs in baggage claim area	Massive, reinforced concrete piers slanted outwards to resist and support roof structure	Swoop of curved roof allows for deeper penetration of natural light; clerestories in concourses	Upturned lighting at check-in; fluorescent panel lighting in concourses and baggage claim	Catenary-shaped, concrete roof tiles on lightweight suspension bridge cables
JFK T2	Blue, padded with armrests at every seat; variety of colours, styles	Looks like old-fashioned poured conc. structure; structural columns on grid in most terminal areas	Lack of natural light in waiting areas; skylights allow for daylighting check-in areas	Pot lights in most areas; some fluorescent panel lighting framed in conc. waffle slabs, possibly on underground levels	Worldport - 'flying saucer', concrete, metal-clad roof supported by prestressed steel posts and cables Rest - standard conc. roof
JFK T4	Black, lightly padded with armrests at every seat	Modular, braced-frame structure; structural independence between new and old bldgs.	Bands of roof glazing flood interior with natural light; low clngs and lack of skylights make for poor penetration at gates	Unique upturned lighting trees in retail area; pot lights and upturned lighting in retail and gates; fluorescent lighting in b.c.	Exposed structural steel and metal panelling system
MAD T1	Red, hard with occasional armrests; variety of colours, styles	Square structural columns on a grid in most areas; assume reinforced conc.	No natural light!	Fluorescent lighting and pot lights in most areas; suspended round lamps and potlights in bag claim	Structure not visible; low, T-bar ceiling
MAD T2	White, blue, lightly padded with occasional armrests	Massive perimeter, steel-clad columns support roof system; integrated into façade	Any and all daylighting from exterior façade; no skylights; seemingly poor depth of penetration	Pot lights and upturned lighting in check-in; pot lights in waiting areas	Structure not visible; tall, painted T-bar ceiling
MAD T4	Grey, hard with armrests at every seat	Post-tensioned concrete beams support roof; Structural steel roof system	Light canyons for maximum daylighting and views; External shading to reduce solar glare	Bespoke light fittings or 'woks'; Upturned at skylights to provide ambient lighting	Insulated roof clad in laminated strips of Chinese bamboo

[a1.11] *See caption on page 298.*

Terminal	Façade	Waiting Areas	Check-in	Floor Finishes	Climate Control
YYZ T1	Fully-glazed curtainwall system attached to underside of roof; white mullion motif	Spacious; clear differentiation between gate area and circulation; very pleasant; art fully integrated	Extremely spacious departures hall; vaulted roof soars over; plenty of natural light; completely open and flexible	Beige terrazzo flooring; dark-grey carpeted waiting areas	Hydronic elements in curtainwall system; air towers; semi-stratification; many areas use overhead VAV
IAD	Fully-glazed angled window-wall system attached to perimeter conc. columns; black mullion motif	Oppressive gate areas in concourses with low clngs and lack of natural light; clear differentiation between gate and circ.	Grand with imposing, elegant roof; seems a bit narrow for its purpose; lack of seating and general flow	Greyish terrazzo flooring; variety of colours and patters of carpeting in waiting areas; often fully carpeting in concourses	No info; passengers complain that ventilation is poor; air towers?
JFK T2	Low window-wall ratio; metallic mullion motif; structural exterior concrete walls	Seems extremely cramped and crowded; blurring of gate area and circ. space	No info, but certain it's awful	Not sure; looks to be a polished material in retail areas and some type of carpeting in waiting areas	No info; passengers complain that ventilation is poor; probably VAV
JFK T4	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif	Good interior lighting makes low clng bearable; good differentiation bw gates and circ.; fairly good penet. of natural light	Some similarities to YYZ; roof somewhat oppressive; very spacious, flexible	Beige ceramic tile flooring (multiple pattern combo); no carpeting in waiting areas	No info; looks like VAV and air towers
MAD T1	Fully-glazed curtainwall system attached to underside of roof; black mullion motif	Lack of natural light and seating; seems cramped; no differentiation bt gate area and circ.; monotone	Low clng; anti-climatic entrance; poor passenger organization; low clngs and overall depressing	Looks to be light and dark coloured marble flooring (possibly travertine); no carpet in waiting areas	No info, but probably VAV
MAD T2	Fully-glazed double-façade, curtainwall system; grey mullion motif	Spacious; poor seating organization - possibly lacking; well lit; seems a bit counterintuitive	Appears pleasant despite lack of daylighting; large obstructive columns; nice wall art above check-ins	Trapezoidal beige marble tiles in check-in; square bluish marble tiles in waiting areas; no carpet	No info, but probably VAV
MAD T4	Fully-glazed curtainwall system supported by tensioned trusses; horiz. fins; grey mullion motif	Some areas seem unnecessarily cramped and poor in differentiating bw gate area and circ.	Manual and automatic; Large open spaces; Flexible queue	Variety of coloured stone flooring throughout terminal; some wood at retail; no carpet at gates	Passive heating/cooling; Deep overhangs; Low energy displacement ventilation system

[a1.12] *See caption on page 298.*

Terminal	Baggage Claim	Int People Mover	Accessibility	Power Stations	Practical Services
YYZ T1	South-facing skylights for light penetration; balcony overlooks carousels	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, Designated Pickup/Drop off, TTY, Pet Relief Areas	Flyaway Power Station (between gates 244 & 272)	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Counters, Travellers Aid, Business Facilities in Sheraton, Luggage Storage, Showers
IAD	Below grade; low T-bar clng with lighting panels; dark, lacking in contrast	Elevators, Escalators	Fully Accessible; Wheelchair Access, Visual Paging, TTY, Braille in Elevators, Pet Relief Areas	Charging Stations at Gates	Porter Service, Lost & Found, Currency Exchange, ATM's, Travellers Aid, Student Ambassadors, Business Services
JFK T2	No info, but for sure ugly	Elevators, Escalators	Fully Accessible; TTY, Mobility Assistance, Pet Relief Areas, Planemates (Mobile Lounges)	Power Outlets	Lost & Found, Currency Exchange, Information Counters, Travellers Aid, Showers
JFK T4	Below grade; exposed clng & clng panels with fluor. lighting; bright and spacious	Elevators, Travellators, Escalators	Fully Accessible; TTY, Mobility Assistance, Pet Relief Areas, Planemates (Mobile Lounges)	No power outlets!	Lost & Found, Currency Exchange, Information Counters, Travellers Aid
MAD T1	Below grade; steel T-bar clng with susp. light fixtures; nice colours	Elevators, Travellators, Escalators	Fully Accessible; Assistance at Meeting Points; Mobile Software for Hearing Impaired; Mobility Assistance	Internet Access Points	Lost & Found, Currency Exchange, Virtual Hostesses, Skycaps (Staff), Pharmacy
MAD T2	No info, but suspect it's ugly	Elevators, Travellators, Escalators	Fully Accessible; Assistance at Meeting Points; Mobile Software for Hearing Impaired; Mobility Assistance	Internet Access Points	Lost & Found, Currency Exchange, Virtual Hostesses, Skycaps (Staff), Pharmacy
MAD T4	Double-height, naturally lit; very spacious, great contrast; flat carr.	Glass Elevators, Angled/Horizontal Travellators, Escalators	Fully Accessible; Assistance at Meeting Points; Mobile Software for Hearing Impaired; Mobility Assistance	Internet Access Points	Lost & Found, Currency Exchange, Virtual Hostesses, Skycaps (Staff), Pharmacy, Business Centre

[a1.13] *See caption on page 298.*

Terminal	Medical Services	Security Requirements	Premium Lounges	Religious Centres	Ground	People Mover
YYZ T1	Medical Centre	CATSA; Footwear Removal (Only if Travelling to US), Metal Detector, Carry-on Screening, Liquids Restriction	3; International, Domestic, Transborder; $30 for 2 hours, $35 for 3 hours	Aviation Interfaith Ministry	Taxis, Buses, Shuttles, Downtown Express Bus, Car Rentals	LINK Train
IAD	Emergency Services	TSA; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns for Alarms, Random Scanning	10; Air France, All Nippon Airways, American Airlines, British Airways, Northwest, United Airlines, Virgin Atlantic, USO (Military Only)	Interfaith Chapel	Taxis & Limos, Shuttle Buses, Metrorail & Metrobus, Car Rentals, Public Transport, Service to Air/Space Museum	AeroTrain
JFK T2	Airport Medical Offices	TSA; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns for Alarms, Random Scanning	4; Delta Sky Club x3, Delta Crown; $40 for 1-Day Pass; $$	None	AirTrain (Connection to Light Rail & Subway), Taxis, Buses, Trains, Vans, Car Rentals	AirTrain JFK
JFK T4	Airport Medical Offices	TSA; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns for Alarms, Random Scanning	7; Air India Maharaja, El Al King David, Emirates, KLM Oasis, The Lounge, Virgin Clubhouse, Swiss	Interfaith Chapel	AirTrain (Connection to Light Rail & Subway), Taxis, Buses, Trains, Vans, Car Rentals	AirTrain JFK
MAD T1	Medical Assistance Point in Corridor to T2, Pharmacy on L1	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	1; Cibeles (Non-Schengen)	Catholic Chapel	Taxis, Buses, Subway (to Train), Car Rentals	Airport People Mover (Shuttle Bus)
MAD T2	Medical Assistance Point in Corridor to T1, Pharmacy on L2	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	2; Tauromaquia (Schengen), Spanair	Catholic Chapel	Taxis, Buses, Subway (to Train), Car Rentals	Airport People Mover (Shuttle Bus)
MAD T4	Medical Assistance Point	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	5; Amnios at T4S, La Revoltosa, Iberia (Dali at T4, Goya at T4S, Velasquez at T4S)	Catholic Chapel	Taxis, Buses, Subway (to Train), Car Rentals	Airport People Mover (Shuttle Bus)

[a1.14] *See caption on page 298.*

Terminal	Artwork	Observ. Area	Green Spaces	Children's Area	WiFi	Unique Facilities
YYZ T1	Mao's 'Looking Up' (100 4x4 photos between gates 175 & 176), Permanent Collection, Changing Exhibition Spaces, Dinosaurs	No formal observation area	Interior - None; Exterior - Project Green (Green Office Park - In Progress)	Play Areas, Baby Changing Facilities	Yes, Free	None
IAD	Gateway Gallery (Rotating Art); Public Art, Live Performances	No formal observation area	None	No Play Area, Baby Changing Facilities	Yes, Free	None
JFK T2	None	No formal observation area	None	None	Yes, $4.95/hr	None, World Port
JFK T4	Pieces and Installations by Selected Artists	No formal observation area; small area for plane spotting on L4	None	None	Yes, $4.95/hr	None
MAD T1	AENA Contemporary Art Collection; Murals, Paintings, Sculptures	No formal observation area	None	None	Yes at Access Points, $$	None
MAD T2	AENA Contemporary Art Collection; Murals, Paintings, Sculptures	No formal observation area	None	Playground, Nursery	Yes at Access Points, $$	None
MAD T4	AENA Contemporary Art Collection; Murals, Paintings, Sculptures	No formal observation area	None	Children's Lounge, Nursery	Yes; 7.5 Euros/hr	None

[a1.15] *See caption on page 298.*

Terminal	Form	Satellite	Concept	Organization	Floors	Wayfinding	Signage
CDG T2E	Linear + Single Satellite	1 Satellite	Concrete "body", glazed gates concourses; No overarching gestural features	Forces travel down curved roof form - no columns req'd; Alternating solid and glazed bays	L0: Arrivals, Bag Claim L1: Gates L2: Departures, Check-in	Sight lines are maintained from one end of concourse to other; Floor plan is simple and intuitive	White on black; French and English text; Standard icons
CDG T2F	Multiple Piers	N/A	Solar control emphasized, hence the use of punched openings in concrete structure pre-collapse; Emphasis on maintaining views to exterior	Megastructure, massive in height, supported by infrequent columns; Grid not apparent	L-1: Retail L0: Arrivals, Bag Claim L2: Departures, Check-in	Confusion and congestion results in check-in from sideways as opposed to forward-flow	White and yellow on black; French and English text; Standard icons
LHR T4	Linear	N/A	Standard 2-level linear plan; Factory-like baggage claim area	Standard grid and column construction	L0: Arrivals, Bag Claim L1: Check-in, Security L2: Departures, Gates	Model signage from Mijksenaar; Otherwise no unique wayfinding measures	Black on yellow, white on black for icons; English text; Standard icons
LHR T5	Linear Terminal + Single Satellite	1 Satellite	Wave roof supported on structural trees; Horizontal aesthetic; Legible, modular design	Minimum number of columns req'd, allowing for max future flexibility	L0: Arrivals, Bag Claim L1: Departures, Gates & Gates at Pier L2: Check-in, Security	Linear scheme; Light canyons denote various stages of transit	Black on yellow, white on black for icons; English text; Standard icons
STN	Multiple Island Piers	3 Island Piers	Modularity and simplicity without gesture; Expansion is made much easier given the structural modularity and freestanding elements in plan	Column repetition on a 6'x6' grid; Structural trees support modular roof units	L0: Check-in, Security, Arrivals, Bag Claim L2: Departures, Gates at Piers	No natural forward-flow is established; security clearance points are difficult to see and get to	Black on yellow, white on black for icons; English text; Standard icons
AMS	Multiple Piers	N/A	Aerotropolis precursor; Airport as more than just airport (in this case: shopping mall, casino, hotel, etc.)	Multiple organizational systems ranging from new to traditional	L0: Arrivals, Bag Claim, Schiphol Plaza L2: Departures, Check-in	Good signage leads to easy wayfinding, despite a wealth of programming	Black on yellow, black on white for arrows, yellow on black for icons; English and Dutch text, Non-standard
CGN T2	Linear	N/A	Akin to Stansted, no gestural references are made; A modular plan and roof system characterize the terminal	Structural trees on 99'x99' module	L-1: Trains L0: Arrivals, Bag Claim L2: Departures, Check-in	Multi-level structure leads to necessary level changes and adds confusion	White on dark blue, yellow on dark orange for icons; Large pictograms on surfaces

[a1.16] *See caption on page 298.*

Terminal	Gate Seating	Structure	Daylighting	Artificial Lighting	Ceiling/Roof
CDG T2E	Red/orange, lightly padded with armrests at every seat	Single-span, meaning no column supports at all; curved steel structure meets ground at perimeter	Squares openings in plywood cladding allows for daylight penetration throughout terminal	Suspended lights in place of square openings	AESS truss frame system, fully-glazed; birch plywood slats with ash veneer on underside
CDG T2F	Dark red, very lightly padded with atypical armrests at every seat; comfortable recliners	Single-span, meaning no column supports at all; angled steel structure meets ground at perimeter	Fully glazed providing maximum natural light opportunities; possibly heat sink and glare issue	Strategically-placed spotlights shine below	Glass roof and steel space frame structure; basically a fully-glazed hip roof; exterior louvers and coated glazing
LHR T4	Dark/light green, padded with occasional armrests; Wooden, hard with occasional armrests	No intermediary support system visible	No natural light!	Pot lights in suspended metal panels	Exposed braced-frame structure with suspended metal panels for HVAC and lighting
LHR T5	Multi-coloured, hard with armrests at every seat; occasional plush chairs and couches	In-situ concrete for the bulk, structural steel trees at edges	Bands of roof glazing flood interior with natural light	Pot lights dispersed throughout terminal	Dynamically curved AESS single-span roof = column-free interior space; prefab cassettes consisting of modular parts
STN	Turquoise, hard with occasional armrests in main bldg.; Multi-coloured, padded with occasional armrests in satellites	Modular roof panel system supported by numerous structural, multi-purpose trees or 'pods'	Roof allows diffused daylight in and acts as a reflector for uplighters at night; concept seems somewhat unsuccessful	Minimal lighting from roof system in main terminal; other areas employ potlights and upturned ambient light. techniques	Floating roof, steel, diagrid structure with steel infill panels and glazed openings to allow for diffuse light to enter
AMS	Armrests at every seat; Comfort Seats (reclining leather seats with foot rests)	White-painted, angled HSS columns support slightly wavy roof structure	High ceilings at check-in draw in a good degree of natural light	Spotlights at structural columns; fluorescent strip lighting in most other areas	Steel frame of superstructure integrates with new, lightweight, metal-slat roof system
CGN T2	Hard seats without armrests at check-in; Comfortable seats with armrests	22 steel trees support roof system	Highly transparent glass membrane allows for optimal daylighting	Floor lighting, suspended ceiling lights	Glass and steel roof space frame structure; jagged, folding roof

[a1.17] *See caption on page 298.*

Terminal	Façade	Waiting Areas	Check-in	Floor Finishes	Climate Control
CDG T2E	Fully-glazed, double-façade system; glazing supported by arched structural steel members; interior cladding hung	Seems extremely successful with clear differentiation of spaces; nice colours, contrast, and lighting; ample seating	Very strange; almost no natural light! Looks to be very spacious but somewhat dark and creepy; nice clng details	Bright red carpeting covering the full floor area of the departures concourse	No info but likely uses air towers and displacement ventilation
CDG T2F	Fully-glazed, angled; supported by angled structural system and tensioned trusses; white mullion motif	Less spacious than T2E; less separation bw spaces; overall similar motif, layout, and organizational strategy	Possibly part of T2E check-in; interesting transition between styles; more welcoming than the T2E section - daylighting	Multi-coloured carpeting covering a large extent of the departures concourse; light-colour ceramic or stone tile in retail areas	No info but likely uses air towers and displacement ventilation
LHR T4	Fully-glazed curtainwall system attached to underside of roof; black mullion motif	Not enough natural light - feels like an underground space; poor seating organization/circulation	Very industrial look with exposed structure; seems narrow and cramped; lack of circulation space	White/grey polished marble (?) throughout terminal; no carpet in waiting areas	No info, but looks like VAV
LHR T5	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif; thick mullions - double check	Large and spacious; interesting seating arrangement; polkadot clng; has potential to become cramped	Extremely spacious departures hall; reminiscent of YYZ; plenty of natural light; flexible; dynamic space	Greybreccia flooring in most of the terminal areas; some hardwood in retail areas; no carpet	Displacement air conditioning system and canopy shading to reduce solar gain
STN	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif	Fairly low clngs in each concourse; spaces seem somewhat bland and cramped; unappealing interiors	Manual and automatic; large open space though seems cramped at times; flexible queue; servicing both domestic/int'l flights	Terrazzo in main terminal and some concourses; HORRIBLE, ugly green carpet in most concourse waiting areas	All HVAC contained in roof support pods
AMS	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif	Lack of seating in some areas and somewhat cramped; interesting creation of little nooks	Very open and spacious, though somewhat rigid in its organization; not fond of the clng/floor finishes	Combination of square and rectangular beige-colour ceramic tile flooring throughout	Presence-detection system that controls vent; otherwise VAV and possibly air towers
CGN T2	Fully-glazed curtainwall system supported by tension cables; black mullion motif	Neatly organized and laid out; perhaps somewhat narrow in terms of circ. space	Grand, spacious; completely modular check-in units; great visual depth	Large great stone tiles throughout terminal; no carpet in waiting areas	Claimed to be innovative but no info; likely involves use of air towers

[a1.18] *See caption on page 298.*

Terminal	Baggage Claim	Int People Mover	Accessibility	Power Stations	Practical Services
CDG T2E	Below grade; double-height w undulating wooden clng; slim columns and pot lights	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Visual Floor Indicators, Pet Relief	Multimedia Terminals	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Desks
CDG T2F	Below grade; double-height, exposed clng; indirect lighting; dark, brutalist	Elevators, Angled/Horizontal Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Visual Floor Indicators, Pet Relief	Multimedia Terminals	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Desks, Luggage Storage
LHR T4	No info	Elevators, Travellators (?), Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Low-Level Flight Info, Signs with Optimal Contrast	Power Poles, Internet Terminals	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Desks, Help Points, Business Services in Lounges
LHR T5	Below grade; double-height with reflective pokadot ceiling & pot lights; flat carrousels	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Low-Level Flight Info, Signs with Optimal Contrast	Power Poles, Internet Terminals	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Desks, Help Points, Business Services in Lounges
STN	At grade; double-height, naturally lit; similar to rest of terminal const.; spacious, bright	Elevators, Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Low-Level Flight Info, Signs with Optimal Contrast	Internet Kiosks	Lost & Found, Currency Exchange, ATM's, Information Desks, Help Points, Business Services in Lounges
AMS	Below grade; low panel clng with fluor. lighting; instit. tile flooring	Elevators, Angled/Horizontal Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY, Induction Loops, Axxicom Airport Caddy	KPN Internet Centres	Lost & Found, Currency Exchange, ATM's, Information Desks, Business Points, Luggage Storage, Showers
CGN T2	No info but should be nice	Glass Elevators, Angled Travellators, Escalators	Fully Accessible; Wheelchair Access, Personal Assistance	None	Lost & Found, Currency Exchange, ATM's, Information Booths, Dry Cleaning, Luggage Storage

[a1.19] *See caption on page 298.*

Terminal	Medical Services	Security Requirements	Premium Lounges	Religious Centres	Ground	People Mover
CDG T2E	None, but can easily connect to T2E	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	No clear info	None	Taxis, Buses, Trains, Shuttles, Car Rentals	CDGVAL (Shuttle Train)
CDG T2F	Health Centre, Pharmacy	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	No clear info	Multi-Faith Prayer Area (Arrivals Level)	Taxis, Buses, Trains, Shuttles, Car Rentals	CDGVAL (Shuttle Train)
LHR T4	Heathrow Health Centre (Between T1 & T2), Pharmacy	DfT; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	3; Servisair, British Airways, The Holideck	St. George's Interfaith Chapel (near T1 & T3), Prayer Rooms	Taxis, Buses, Trains, Subway, Shuttles, Car Rentals, Biking	Shuttle Bus & Train Service
LHR T5	Heathrow Health Centre (Between T1 & T2), Pharmacy	DfT; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	6; British Airways (6)	St. George's Interfaith Chapel (near T1 & T3), Prayer Rooms	Taxis, Buses, Trains, Subway, Shuttles, Car Rentals, Biking	APM (Automated People Mover - Shuttle Train)
STN	None	DfT; Footwear Removal (Mandatory), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	3; No.1 Stansted (2), Servisair Executive	Airport Chapel (Interfaith Prayer Room)	Taxis, Buses, Trains, Shuttles, Car Rentals	ATS (Airport Transit System - Shuttle Train)
AMS	Travel Clinic, First Aid Centre, Pharmacy	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	5; NS Hispeed, Airline Lounges (4)	Silence Centre (Interfaith Chapel)	Taxis, Buses, Trains, Shuttles, Car Rentals	N/A
CGN T2	Medical & Dental Suite (in T1), Pharmacy	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	1; Airport Business	None	Taxis, Buses, Trains, Airport Shuttles, Rental Cars	N/A

[a1.20] *See caption on page 298.*

Terminal	Artwork	Observ. Area	Green Spaces	Children's Area	WiFi	Unique Facilities
CDG T2E	Exhibits by Local Artists	No formal observation area	None	Play Area, Playstation Play Areas, Baby Changing	Yes, Free for 15min and then 4.50 Euros/hr	Yotel
CDG T2F	Exhibits by Local Artists	No formal observation area	None	Gulli Spaces (2E), Playstation Play Areas, Baby Changing	Yes, Free for 15min and then 4.50 Euros/hr	Yotel
LHR T4	None	No formal observation area; Costa Café, 4Deck Lounge	None	Play Area, Little Miss Sunshine Appearance, Baby Changing	Yes, 5.95 Pounds/hr	Yotel
LHR T5	Expo Gallery (British Artists)	No formal observation area; Gordon Ramsay Plane Food; wagamama	Public piazza with trees	Play Area, Little Miss Sunshine Appearance, Baby Changing	Yes, 5.95 Pounds/hr	None
STN	Local Artists	No formal observation area; Pret a Manger offers good views	None	Family Rooms, Arcade Games, Baby Changing	Yes, 5.00 Pounds/hr	None
AMS	Rijksmuseum, Airport Library, CODA Meeting Point	Panorama Terrace	None	Kids Forest, Baby Care, Lounge, Baby Changing	Yes, Free for 1hr but SLOW, then $$	Yotel, Schiphol Plaza, Holland Casino, Talk Through Glass Wall
CGN T2	Giant Pictograms	Visitors Terrace (T1) with Restaurant	None	Toy Airplane, Baby Changing	Yes, $$	Gambling room

[a1.21] *See caption on page 298.*

Terminal	Form	Satellite	Concept	Organization	Floors	Wayfinding	Signage
MUC T1	Linear	N/A	Standard modernist design; No gestural references	Standard column, wall, and window wall construction	L3: Check-in, Retail L4: Arrivals, Bag Claim, Check-in, Departures L5: Transfers	Natural light and views to establish rhythm and orient passengers	White on blue; German and English text; Standard icons
MUC T2	Linear	N/A	Transparency, adequate lighting for reading indications, optimum climatic and acoustic conditions specified	Space-frame roof structure with occasional columns	L0: Arrivals, Bag Claim L1: Departures, Check-in L3: Departures	Natural light and views to establish rhythm and orient passengers	White on black, white on brown for lounges; German and English text; Standard icons
DOH DT	Remote Aircraft	N/A	Standard modernist design; No gestural references	Dense column grid	L0: Check-in, Ground Transportation L2: Departures	Multiple level changes create confusion; No unique wayfinding measures	White on black; Arabic, English text; Standard Icons
PVG T1	Linear	N/A	Angled roof form mimics plane take-off; Tenion members, highlighted by backlighting, suggest a starry night sky	Angled-facades support a slanted roof form; No interior columns	L1: Arrivals, Bag Claim L2: Transfers L3: Departures, Check-in	Linear concourse, with frequent signage, makes for easy navigation	White on blue; Chinese, English text; Standard icons
PVG T2	Linear	N/A	Iconic wavy roof structure intended give airport icon status in city; Dynamic forms relate to sense of flight	Wide circular columns support roof structure on a large grid	L1: Arrivals, Bag Claim L2: Transfers L3: Departures, Check-in	Linear concourse, with frequent signage, makes for easy navigation	White on blue; Chinese, English text; Standard icons
PEK T3	Multiple Linear Units	N/A	Dragon in flight; aerodynamic roof (scales) with traditional Chinese colours red and yellow	Sporadic columns to support massive roof structure; one large, open space	L2: Arrivals, Bag Claim L3: Gates L4: Departures, Check-in	Large spaces make wayfinding an issue; Poor signage leads to confusion	White on blue, white on black; Chinese, English text; Standard icons
ICN	Multiple Piers + Single Satellite	1 Satellite	Arcade-like framework; Victorian references; Main hall similar to YYZ T1	Standard grid and column construction; Arcade-like space along central circulation spine	L0: Bag Claim, Ground Transportation L2: Int'l Arrivals L3: Departures, Check-in L4: Lounges	Arcade-like space uses structural rhythm and light to orient passengers to gates	White on blue; Korean, Japanese, Chinese, and English text; Non-standard standard icons

[a1.22] *See caption on page 298.*

Terminal	Gate Seating	Structure	Daylighting	Artificial Lighting	Ceiling/Roof
MUC T1	Wood benches and leather couches without armrests; Hard seats and metal benches; black, lightly padded - no armrests	Standard column-grid system; slightly obstructive	Not enough natural light in check-in; lack of skylights; better daylighting in concourse area via clerestories	Potlights, upturned lighting, and occasional fluorescent lighting fixtures	Structure not visible; likely standard steel framing system; unusual T-bar clng; not entirely unpleasant
MUC T2	Wood benches and leather couches without armrests; Hard seats and metal benches	Series of external tubular posts supporting six large trusses throughout a tubular framework	Multitude of skylights; sophisticated mechanism of screens and textile shades filters natural light	Pot lights and spotlights attached to ceiling structure; pot lights in baggage claim	Secondary beams support glazing and metal panels of curved roof
DOH DT	Multi-coloured, padded with armrests at every seat; comfortable seats in the 'quiet area'	Round columns set out on a fairly dense structural grid; assuming reinforced	Poor penetration of daylight because of low ceilings; no skylights	Fluorescent lighting panels and potlights in most areas; upturned lighting in lounges	Structure not visible; T-bar ceiling with poured conc. Elements
PVG T1	Grey, padded without armrests; occasionally small tables in between	Tension cables splaying from conc. columns attached to the roof; single-span system	Openings around roof support members allow light through; natural light seems to penet. deeply	Roof support members illumin. at base to look like 'shower of comets''; otherwise spotlights	Lightweight steel roof with hundreds of vertical roof support members; exterior glazing
PVG T2	Light brown, lightly padded without armrests; occasionally small tables in between	Structural trees on shifting grid; wider points = square grid, narrower points = one row in centre	Deep light penetration; translucent clng openings allow in diffuse light; well lit	Spotlights and upturned lighting; possible illumination from behind translucent openings	Curving, dynamic roof with translucent openings; bamboo strip cladding akin to MAD T4
PEK T3	Multi-coloured, padded with occasional armrests; occasionally small tables in between	Massive space-frame structure supported by occasional columns on non-standard grid	Ample daylighting from floor-to-clng glazing and skylights; brightly lit	Pot lights inserted into spaces between clng louvers; gives space an ambient wash of light	Skylights facing south-east; exposed structure; widely spaced, white-painted metal louvers
ICN	Brown, padded without armrests; occasionally small tables in between	Massive, curved space-frame structure spanning width of airport; no structural columns except at perimeter; white motif	Ample daylighting from floor-to-clng glazing; brightly lit spaces	Combination of pot lights and fluorescent lighting throughout the terminal	Stainless steel roof to resist corrosion from salty sea water; exposed structure, occasional skylights

[a1.23] *See caption on page 298.*

Terminal	Façade	Waiting Areas	Check-in	Floor Finishes	Climate Control
MUC T1	Fully-glazed curtainwall system attached to underside of roof; white mullion motif	Lack of seating; good access to shops and restaurants; clean and neat; ample daylighting	Fairly spacious though some areas have low clng; good organization of space; fairly clear sightlines	Black and white checkerboard tiling; no carpet in waiting areas	No info, but probably VAV
MUC T2	Fully-glazed, double-façade system; black mullion motif	Clean, crisp lines, almost monolithic in its sleekness; clear differentiation bw spaces; has slight institutional look	Massive hall with very clear sightlines; very tall clng; ample room to circulate; perhaps a lack of seating	Multi-coloured/patterned epoxy terrazzo flooring throughout; no carpet in waiting areas	Ventilated double-glazed façade; otherwise no info; possible use of VAV and air towers
DOH DT	Fully-glazed curtainwall system attached to underside of roof; white mullion motif	Very odd non-linear space planning; multitude of seating in centre, circ. at perimeter; impractical?	Not much info; looks to be fairly well thought out given the bldg. restrict's; somewhat sterile space	Multi-coloured/patterned epoxy terrazzo flooring throughout; no carpet in waiting areas	No info; passengers complain that ventilation is poor; probably VAV
PVG T1	Fully-glazed, angled; supported by angled structural system; black mullion motif	Some areas seem a bit cramped but overall fairly spacious; clear differentiation bw spaces	Spacious; fixed check-in unites; ample circulation space; seems somewhat dark at night-time	No carpeting; looks like terrazzo in most places; some kind of seamless flooring in some areas	No info but likely uses air towers and displacement ventilation
PVG T2	Fully-glazed, angled; supported by angled structural system; black mullion motif	Beautiful waiting areas w ample seating and clear views to ext.; grand and spacious; info screens	Fairly spacious; similar to CGN w completely modular check-in units; could become congested	Terrazzo or polished marble at check-in and retail areas; carpeting everywhere else	No info but likely uses air towers and displacement ventilation
PEK T3	Fully-glazed curtainwall system supported by red, yellow, tensioned trusses; black mullion motif	Tall ceilings; intricate steel window framework; unhindered views of tarmac; clean, spacious	Manual and automatic; large open spaces; flexible queue; servicing both domestic/int'l flights	Polished terrazzo throughout the terminal; no carpet in waiting areas	Underground ductwork to allow for lightweight roofing system
ICN	Fully-glazed, angled; supported by angled structural system; white mullion motif	Tall ceilings; intricate steel window framework; unhindered views of tarmac; clean, spacious; plenty of greenery	Manual and automatic; large open spaces; flexible queue; spacious departures hall	Hardwood flooring in waiting areas; geoquartz tiling in most other areas; no carpet!	Underground ductwork to allow for lightweight roofing system

[a1.24] *See caption on page 298.*

Terminal	Baggage Claim	Int People Mover	Accessibility	Power Stations	Practical Services
MUC T1	No info	Glass Elevators, Travellators, Glass Escalators	Fully Accessible; Wheelchair Access, Information in Braille, Tactile Floor Guidance System, TTY	Internet Points	Lost & Found, Currency Exchange, ATM's, Information Desks, Luggage Storage, Showers
MUC T2	Below grade; double-height T-bar clng w indirect lighting; bright, spacious; flat carr.	Glass Elevators, Travellators, Glass Escalators	Fully Accessible; Wheelchair Access, Information in Braille, Tactile Floor Guidance System, Visual Identifiers	Internet Points	Lost & Found, Currency Exchange, ATM's, Information Desks, Luggage Storage, Showers
DOH DT	Not much info; double-height; looks dark and unappealing	Elevators, Escalators	Passenger Escorts, Comfortable Chairs	Internet Kiosk	Lost & Found, Currency Exchange, ATM's, Information Counters, Smoking Rooms
PVG T1	No info, but should be cool	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY	None	Lost & Found, Currency Exchange, ATM's, Information Desks, Luggage Storage
PVG T2	No info, but should be cool	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, TTY	None	Lost & Found, Currency Exchange, ATM's, Information Desks, Luggage Storage
PEK T3	Above grade; Tall clngs w beautiful diagrid structure; Pristine and spacious	Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, Passenger Escorts	Charging Stations	Porter Service, Lost & Found, Currency Exchange, ATM's, Information Desks, Dressing Rooms, Business Centre
ICN	Below grade; double-height, open to above with some natural light; reflective surfaces	Glass Elevators, Angled/Horizontal Travellators, Escalators	Fully Accessible; Wheelchair Access, Passenger Escorts	3 Internet Lounges, IT Experience Centre	Lost & Found, Currency Exchange, Laundry Service, Luggage Storage

[a1.25] *See caption on page 298.*

Terminal	Medical Services	Security Requirements	Premium Lounges	Religious Centres	Ground	People Mover
MUC T1	Airport Clinic M	GAA; Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	4; Salon Air France, British Airways Galleries, Emirates, Atlantik, Europe	Interfaith Chapel	Taxis, Buses, Trains, Airport Shuttles, Rental Cars	N/A
MUC T2	3 Pharmacies (1 in Airport Centre)	GAA; Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns and AIT	3; Lufthansa Senator Café, Lufthansa Business (EU & Non-EU)	Meditation and Prayer Room	Taxis, Buses, Trains, Airport Shuttles, Rental Cars	N/A
DOH DT	Hamad Medical Clinic	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns	3; Gold, Silver, Oryx, Premium Terminal (Separate)	Mosques for Men & Women	Taxis, Buses, Shuttles, Car Rentals	Shuttle Bus
PVG T1	Chargers at Gates	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns	2; Plaza Premium (2)	None	Taxis, Buses, Trains, Maglev, Airport Shuttles, Rental Cars	Shuttle Bus
PVG T2	Chargers at Gates	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns	2; Plaza Premium (2)	None	Taxis, Buses, Trains, Maglev, Airport Shuttles, Rental Cars	Shuttle Bus
PEK T3	3 'Taxi' Centres	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns	3; Air China (2), Business Traveller's	None	Taxis, Buses, Trains, Shuttles, Car Rentals	APM (Automated People Mover - Shuttle Train)
ICN	Inha, University Hospital, 5 Pharmacies	Footwear Removal (Upon Request), Metal Detector, Carry-on Screening, Liquids Restriction, Patdowns or AIT	2; BC CARD, Hyundai Card Air, 5 Smoking Rooms	None	Taxis, Buses, Trains, Shuttles, Car Rentals	Starline (Shuttle Train)

[a1.26] *See caption on page 298.*

Terminal	Artwork	Observ. Area	Green Spaces	Children's Area	WiFi	Unique Facilities
MUC T1	Sonnier's experiential 'Lightway', Lechner's	None	None	Playground at MAC, Baby Changing	Yes, 5.00 Euros/hr	Merkur Spielothek (Casino), MAC
MUC T2	Local Artists	Visitors Terrace (L7) with Restaurant	Visitors Hill, Visitors Park	Kinderterminals, Children's Shows, Playground at Visitors Park, 5 Play Corners, Baby Changing	Yes, 5.00 Euros/hr	Skywalk (Glass Tunnel), Mini Golf (Visitors Park), Cinema, MAC
DOH DT	None	None	None	Playground, Baby Changing	Yes, Free	Premium Terminal
PVG T1	No info	None	None	Baby Changing	Yes, Free	None
PVG T2	No info	None	None	Baby Changing	Yes, Free	None
PEK T3	Staff Art Trouppe Performances (Singing, Dancing, Magic Tricks); replica of traditional Chinese temple	None	Suzhou Garden and Royal Garden with fish; ample greenery everywhere	3 Activity Zones, Nursing Rooms	Yes, Free at T3	Mini Golf (Visitors Park)
ICN	Design Gallery at AIRSTAR Terrace, Korean Culture Museum, Traditional Craft Gallery, Cultural Performances	AIRSTAR Terrace (Observation Area, Café, Design Gallery, etc.)	Star Garden (Green Walkways), Many gardens in the passenger terminal	Babycare Lounges, Playground, Nursing Rooms, Playroom	Yes, Free	Golf Course, Casino, 24hr restaurants and café's

[a1.27] *See caption on page 298.*

Terminal	Form	Satellite	Concept	Organization	Floors	Wayfinding	Signage
KIX	Linear	N/A	Structure mimics dirigible shed; Light and space are emphasized; Main hall employs a curved roof form for more efficient air circ.	Dirigible-like section uses a self-supporting steel diagrid const.; Linear grid configuration	L1F: Int'l Arrive., Bag Claim L2F: Dom Depart/Arrive. Check-in L3F- Retail L4F- Int'l Depart, Check-in	Transparency of design in both plan and section provides users with clear direction	White on dark grey with yellow arrows; Japanese, English, Korean and Chinese text; Non-standard icons
YVR IT	Multiple Piers	N/A	No unique driving concept other than creating an efficient network of operations via the pier-finger layout	Tile or terrazzo for exits, Low-resistance carpeting for gates, Other (ex. Laminate) for retail	L2: Arrivals, Bag Claim L3: Departures, Check-in L4: Canada Line Station	Three types of flooring used to create a texturized guide (helpful for visually-impaired)	Yellow, white on black; English, French and Chinese text; Large, standard icons
PDX	Multiple Piers	N/A	Standard pier-finger design; No revolutionary concept; Expansion introduced gestural forms at the front façade of the airport	Standard grid and column construction; clerestory windows add vertical depth	L0: Arrivals, Bag Claim L1: Departures, Check-in	No unique wayfinding measures	White on turquoise; English text; Standard icons
DEN	Multiple Island Piers	3 Island Piers	Double curvature of structure = flight and bird's wings; use of fabric stretched over structural frame = airplane fuselages	Structural steel trees placed at 60' intervals	L-1: Passenger Pick-up L0: Arrivals, Bag Claim L1: Departures, Check-in L2: Mezzanine (Piers only)	Standalone, fixed-to-floor signage used as markers throughout	White on black; White on grey at gates; English text; Standard icons
ORD T1	Linear + Single Satellite	1 Satellite	Borrows from Victorian train shed typology; Repetitive curved AESS structure; Alternating glazing with panelling for roof system	Grid-based, with wide-flange columns and beams	L-1: Pedestrian Tunnel L0: Arrivals, Bag Claim L1: Departures, Check-in L2: Mezzanine	Repetitive AESS structure creates a visual rhythm (floor tiling also emphasizes this)	White on blue; English text; Standard icons
ORD T2	Multiple Attached Piers	N/A	1960's high clng, linear check-in hall; Floor-to-clng window wall systems; Punched openings in concourse; Modernist design	Standard const. with support columns located on a grid	L-1: Pedestrian Tunnel L0: Arrivals, Bag Claim L1: Departures, Check-in	No unique wayfinding measures	White on dark blue; English text; Standard icons
ORD T3	Multiple Attached Piers	N/A	Arcade-like framework; Victorian references	Standard const. with support columns located on a grid; Rotunda separates gates concourses	L-1: Pedestrian Tunnel L0: Arrivals, Bag Claim L1: Departures, Check-in	No unique wayfinding measures	White on blue; English text; Standard icons

[a1.28] *See caption on page 298.*

Terminal	Gate Seating	Structure	Daylighting	Artificial Lighting	Ceiling/Roof
KIX	Multi-coloured, padded without armrests; sleeping rooms; consensus that there is a general lack of seating	900 structural steel, 'adjustable' columns support roof structure; multitude of steel bracing anchors 'wing' to ground	Fully daylit structure; glazed roof at terminal entrance; canyon daylight via skylights	Soft, indirect lighting used throughout terminal; light is projected onto curved ceiling and reflected to created soft shadows	Exposed structural steel creates elegant curved, toroidal geometry; perforated metal tiling
YVR IT	Green, padded with occasional armrests; terrible colour	Sophisticated structural trees support roof beams; organized on a standard column-grid system	Multitude of skylights; ample daylight filtering in around hung clng panels in most areas; some areas unusually dark	Potlights, upturned lighting; fluorescent lighting panels in some waiting areas	Semi-exposed structural steel roofing system; suspended clng panels that house climate control systems
PDX	Black with metal trim, lightly padded with occasional armrests	Twin circular columns laid out on grid system; assume reinforced conc.	Ample daylighting in most terminal areas from skylights and floor-to-clng glass; lack of daylighting in some concourse spaces	Pot lights and spotlights throughout terminal; indirect lighting in baggage claim; neon lighting in some areas	Structural steel truss roof system with occasional suspended panelling for louvers and pot lights
DEN	Black with metal trim, lightly padded with armrests at every seat	Structural steel trees support gently curved steel roof members; secondary curved steel tubes support fabric wings	Translucent fabric creates bright, diffusely lit area	Roof tensile structure acts as a reflector at night-time for uplighting, creating a soft, uniform glow	Lightweight, tensile fabric structure of Teflon-coated fibreglass stretched over white-painted steel truss structure
ORD T1	Turquoise, lightly padded with occasional armrests	Triple, quadruple HSS column sections; AESS used throughout structure	Continuous roof skylight system; fritted glass used to provide maximum daylighting and cut down on solar gain	Upturned, indirect lighting throughout terminal	Exposed structural steel and partially-glazed roof panel system
ORD T2	Black, padded without armrests; sleeping cots	Structural columns, clad and painted grey, at perimeter; rest obscured	Low clngs and lack of skylights make for very little daylighting - especially true for concourses	Fluorescent lighting and pot lights in most areas	Structure not visible; perforated ceiling panel system
ORD T3	Dark grey, padded with armrests at every seat	Exposed structural steel framework	Low clngs and lack of skylights make for very little daylighting	Fluorescent, curved lighting panels in most areas; tubes in baggage claim	Glazed panel system with fritting

[a1.29] *See caption on page 298.*

Terminal	Façade	Waiting Areas	Check-in	Floor Finishes	Climate Control
KIX	Fully-glazed, curved, curtainwall system supported by tensioned trusses; white mullion motif	Beautifully planned with ample circ. space; very large; simple yet articulate; people mover system at edge; sleek	Again reminiscent of YYZ with swooping roof; modular check-in units; flexible space; clng appears a bit low	Marble flooring throughout the terminal; no carpet in waiting areas	Open air duct system using jet nozzles to direct air along ceiling; Macro-scale climate control and micro-scale air con
YVR IT	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif - double check	Very long rows of seating in some areas; otherwise fairly pleasant albeit typical arrangements; disturbing use of green	Fairly large; somewhat cramped in domestic departures; good degree of natural light; poor flooring in some areas	Horrible green carpet in baggage claim; old-fashioned tiling in most other areas; carpeted waiting areas	No info but likely VAV; oddly, no sign of air towers, including in check-in area
PDX	Angled glass wall system supported by structural steel members; many areas with a low window-wall area; white mullions	Concourses fairly generic; seating in centre as well as at sides; some boxed in waiting areas; poor material choice	Fairy spacious, yet inflexible space; disturbed by the use of ugly carpet EVERYWHERE; some poor space planning	Horrible green carpet in baggage claim	No info but likely VAV; oddly, no sign of air towers, including in check-in area
DEN	Fully-glazed curtainwall system supported by tensioned trusses; white mullion motif	Central seating area not well thought-out; interesting use of atrium-like spaces/balconies; continuous carpet	Similar to IAD in it's configuration; lack of natural light; perhaps too cramped; inflexible space	Marble in check-in and parts of baggage claim; otherwise patterned carpet everywhere else	Central opening for natural ventilation and exhaust fumes in front canopy; no info elsewhere but likely uses air towers
ORD T1	Solid - need more info; appears as if there is almost no perimeter glazing	Difficult to tell; motif similar to departures hall; looks like limited seating; mall-like, Victorian-inspired corridors	Large and spacious, though somewhat old-fashioned with checkerboard tiling; clear sightlines; novel approach	White and grey floor tiles in check-in; generic floor tiles everywhere else; ugly brown carpet in waiting areas	No info but likely VAV and some sort of air towers
ORD T2	Fully-glazed, fritted, curtainwall system attached to underside of roof; black mullion motif	Not very apparent; relegated to the side to make room for hall this is possibly too large; similar to T3	Ugly as hell; similar to T3; completely rigid space and can very possibly could become cramped during peak hours	White and grey floor tiles mostly everywhere; terrible beige, linoleum-like tiles in transfer corridor; no visible carpeting	No info, but probably VAV
ORD T3	Fully-glazed, fritted, glass wall system supported by HSS curvilinear members; white mullion motif	Relegated to one side and faces obstructions; direct light from above may be uncomfortable; clear differentiation bw spaces	High clng; somewhat dark and narrow space; retail directly opposite check-in - make cause congestion	White and grey floor tiles mostly everywhere; some carpet in waiting areas	No info, but probably VAV

[a1.30] *See caption on page 298.*

Terminal	Baggage Claim	Int People Mover	Accessibility	Power Stations	Practical Services
KIX	At grade; double-height, exposed ductwork; glass features; reflective surfaces	Glass Elevators, Travellators, Escalators	Fully Accessible; Wheelchair Access, Braille blocks lead visually impaired to info counters for assistance	Coin-Operated Mobile Chargers, Internet Terminals (100yen/10min)	Lost & Found, Currency Exchange, ATM's, Porter Service, Baggage Storage, Coin Lockers, International Telephone Counters, Information Desks, Showers, Business Centre
YVR IT	Below grade; low T-bar clng with suspended lighting; Seems cramped and unappealing	Elevators, Travellators, Escalators	Fully Accessible; Pet Relief Areas; Accessible Parking; Wheelchair Access; TTY	Power Outlets	Porter Service, Lost & Found, Currency Exchange, ATM's, Customer Care Counters, Green Coat Volunteers
PDX	Below grade; low multi-material clng w suspended indirect lighting; very institutional	Elevators, Travellators, Escalators	ADA Compliant; Pet Relief Areas; Areas of Rescue Assistance; Accessible Parking; Wheelchair Access; TTY; Visual Paging Monitors	4 Power Stations	Lost & Found; Currency Exchange, ATM's, Information Booths, Traveller's Assistance
DEN	Above grade; low T-bar and cross beam clng; too busy w material & colour; old-fashioned look	Elevators, Travellators, Escalators	ADA Compliant; Pet Relief Areas; Unisex Bathrooms; Accessible Parking; Wheelchair Access; TTY; Visual Paging Monitors; Escort Passengers to Gate	6 Power Stations (2 in Each Concourse)	Lost & Found; 4 Smoking Lounges, Currency Exchange, ATM's, Information Booths, Traveller's Assistance, Hospitality Ambassadors
ORD T1	No info	Elevators, Escalators	ADA Compliant; Pet Relief Areas; Braille in Elevators; Accessible Parking; Wheelchair Access	6 Power Stations (4-8 Seats)	Lost & Found; Currency Exchange; ATM's; Traveller's Aid; Volunteer Ambassadors; Virtual Concierge Kiosks (at Baggage Claim)
ORD T2	No info, but suspect it's ugly	Elevators, Travellators, Escalators	ADA Compliant; Pet Relief Areas; Braille in Elevators; Accessible Parking; Wheelchair Access	1 Power Stations (4-8 Seats)	Lost & Found; Currency Exchange; ATM's; Traveller's Aid; Volunteer Ambassadors; Virtual Concierge Kiosks (at Baggage Claim)
ORD T3	Below grad; low, perforated metal panel clng w fluor. lighting; Very grey; flat carrousels	Elevators, Escalators	ADA Compliant; Pet Relief Areas; Braille in Elevators; Accessible Parking; Wheelchair Access	4 Power Stations (4-8 Seats)	Lost & Found; Currency Exchange; ATM's; Traveller's Aid; Volunteer Ambassadors; Virtual Concierge Kiosks (at Baggage Claim)

[a1.31] *See caption on page 298.*

Terminal	Medical Services	Security Requirements	Premium Lounges	Religious Centres	Ground	People Mover
KIX	Doctor's Clinic, Dental Clinic, 27 AED's (Automated External Defibrillators)	Metal Detector, Carry-on Screening, Liquids Restriction, Footwear removal only upon request	11; Korean Air, JAL Family Service, signet, Sakura (2), KIX Airside, Asuka, Club ANA (2), Lounge Pacific, Royal Orchid	Prayer Room - L4 North	Taxis, Buses, Monorail, Airport Shuttles, Ferries, Rental Cars	Wing Shuttle Train
YVR IT	Pharmacy, Medical Clinic, Dental Clinic, Rehab and Wellness	CATSA; Footwear Removal (Only if Travelling to US), No Metals, Carry-on Screening, Liquids Restriction	1; Plaza Premium	Interdenominational Chaplaincy (Arrivals L2)	Taxis, Buses, Trains, Shuttles, Downtown Shuttle, Car Rentals, Biking	N/A
PDX	None	TSA; Footwear Removal (Mandatory), No Metals, Carry-on Screening, Liquids Restriction, Automatic Patdowns for MT Alarms; AIT	3; Delta Sky Club; United Red Carpet; Alaska Airlines Board Room	None	Taxis, Buses, TriMet Max Light Rail, Airport Shuttles, Biking, Rental Cars	N/A
DEN	Denver Health Medical Center	TSA; Footwear Removal (Mandatory), No Metals, Carry-on Screening, Liquids Restriction, Automatic Patdowns for MT Alarms; AIT	4; American Admirals Club, United Red Carpet (2); $30-50 Day Pass; British Airways; USO (Military Only)	Interfaith Chapel & Islamic Prayer Hall (Open 24hrs/day)	Taxis, Buses, Airport Shuttles, Mountain Carriers, Charter Buses, Rental Cars	AGTS (Automated Guideway Transit System - Shuttle Train)
ORD T1	None	TSA; Footwear Removal (Mandatory), No Metals, Carry-on Screening, Liquids Restriction, Automatic Patdowns for MT Alarms; AIT	3; United Red Carpet (3); $40-50 Day Pass	None	Taxis, Buses, Trains (CTA), Airport Shuttles, Biking, Rental Cars	ATS (Airport Transit System - Shuttle Train)
ORD T2	UIC Medical Center	TSA; Footwear Removal (Mandatory), No Metals, Carry-on Screening, Liquids Restriction, Automatic Patdowns for MT Alarms; AIT	3; Delta Sky Club, United Red Carpet; $40-50 Day Pass; USO (Military Only)	Interfaith Chapel (Open 24hrs/day)	Taxis, Buses, Trains (CTA), Airport Shuttles, Biking, Rental Cars	ATS (Airport Transit System - Shuttle Train)
ORD T3	None	TSA; Footwear Removal (Mandatory), No Metals, Carry-on Screening, Liquids Restriction, Automatic Patdowns for MT Alarms; AIT	2; American Admirals Club (2); $40-50 Day Pass	None	Taxis, Buses, Trains (CTA), Airport Shuttles, Biking, Rental Cars	ATS (Airport Transit System - Shuttle Train)

[a1.32] *See caption on page 298.*

Terminal	Artwork	Observ. Area	Green Spaces	Children's Area	WiFi	Unique Facilities
KIX	None	Sky View Observation Hall (Take shuttle bus)	Greenery-filled canyon space	Kid's Room, 3 Playing Areas, 5 Nurseries	Yes at Access Points, Free	Pet Hotel, Personal Lounge, Sleeping Rooms
YVR IT	Native art in the form of sculpture throughout the terminals	Public Observation Area; Telescopes and Info Panels, Interactive Kiosks	Green Wall at Canada Line YVR-Airport Station; green roof	Kids Works (Shop), Baby Changing	Yes, Free	None, Vancouver Aquarium
PDX	None	None	None	2 Children's Play Areas; Areas for Nursing Mothers	Yes at Access Points, Free	None
DEN	Public Art; Art Exhibitions	None	Ample greenery in the Jeppesen terminal	Internet and PC Game Cafes, Airport Scavenger Hunt, Children's Play Area	Yes, Free	None
ORD T1	Pedestrian Light Tunnel	None	None	None	Yes, approx. $8.00/day	None
ORD T2	None	None	None	Children's Museum; "Kids on the Fly" Exhibit - Interactive Displays	Yes, approx. $8.00/day	None
ORD T3	Large Globe	None	None	None	Yes, approx. $8.00/day	None

[a1.33] *See caption on page 298.*

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