Landside Synthesis

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Abstract

The rapid development of commercial aviation produced the contemporary airport in its wake: a synthesis of culture, consumerism and infrastructure. While airports have remained for the most part in peripheral locations, they have developed to a scale and complexity comparable with that of the city/town centre. Isolated, internalized, edge cites. The Queenstown International Airport is the fourth busiest in New Zealand, with passenger traffic figures set to double in the next 25 years; the Wakatipu Basin in which it resides is currently the 2nd fastest growing population in New Zealand. A subsequent design hypothesis is established in line with the projected growth of both environments, questioning if an urban centre and an airport, two physically antithetical environments, can be synthesized if planned synonymously. A critique of the conventional terminal program is the primary initiator of a new form of development, along with design strategies for injecting the airport terminal into an urban environment. The physical design output of this thesis takes the form of an urban masterplan, contextualizing the town centre in relation to the existing built regions of the Wakatipu Basin, forming a framework to outwork the design of a new international airport at an architectural scale, investigating the implications of the program opened to a pedestrian environment.

Contents

Acknowledgement

Abstract

Contents

1.

Introduction

4.0

Urban

4.1

Process Intention

4.2

Content Gather

4.3

Strategy Establishment

5.0

Design Case Study

6.0

Design Exegesis

7.0

Conclusion

8.0

References

2.0

Airport:

2.1

Historical Context

2.2

Conceptual Definition

2.3

Program Analysis

2.4

Strategy Establishment

3.0

Context

3.1

Wakatipu Basin

3.2

Feasability Study

3.3

Existing Centres

3.4

Existing Urban Structure

3.5

Proposals + Site Selection

Introduction

Fig 1.

The modern airport assumes an indispensable role in the global transit network. The development of aviation in the last 100 years has seen the architectural type administering a perpetual state of ‘catching up’ with the aggressive pace of developing aircraft and commercial aviation. From its inception, aviation has required specific spatial and functional requirements of the airport, demanding an annexed relationship to the urban core of an established city. While airports have remained for the most part in peripheral locations, they have developed to a scale and complexity comparable to that of the city/town centre. Isolated, internalized, “edge cites”.

The thesis subsequently identifies an opportunity to test the antithesis of this premise, questioning if the airport can be integrated into a central urban environment, through the establishment of an airport terminal within an urban framework. Actual conditions for the testing of this hypothesis are realized within the Wakatipu Basin region of Central Otago. The latest Subnational Population Projections from Statistic New Zealand expect that [behind Auckland] the population of the Queenstown-Lakes District will experience the fastest growth between 2011 and 2031 [StatisticsNZ]. In a similar timeframe, the passenger traffic through Queenstown’s International Airport is expected to double [Airbiz] by 2037. In alignment with the hypothesis, these conditions set up a contextual framework for the outworking of a design case study. The physical output of the research is an urban masterplan for a town centre on Frankton Flats, specifically informed by the programmatic integration of an international airport terminal.

Fig 2.

The outcome is investigated through two scales: the *urban*; how the terminal and town centre fits within the broader urban framework, and the *architectural*; the implications of an airport terminal/urban fabric interface.

Research Structure:

[2.0] The inception of the research comprises the following investigations into the airport as an urban entity: [2.1] The historical context of urban airport integration, identifying and formalizing design principles from historic proposals of the hypothesis. These design principles provide a consistent design framework for the research to align with. [2.2] A review of the conceptual role of the airport, inclusive of the airport terminal as an urban environment. This review provides a conceptual language, outworked in the design case study as ‘design interventions.’ [2.3] The program analysis of 7 airport case studies, determining programmatic trends in airport terminals of comparable size to the design case study. [2.4] A critique of the typical airport program, informing a revised version of the programmatic procession, implemented in the design case study as a terminal design strategy.

[3.0] The research then provides a contextual analysis of the Wakatipu Basin, cascading from an overview of the region through to a specific urban structure analysis of the site, culminating in the selection of site based upon the contextual framework.

[4.0] The initiation of the design process comprises a ‘context-less’ rapid design phase, in order to establish urban design strategies to be implemented in the design case study. This process identifies 10 New Zealand town centres of comparable size to the design case study, gathering urban data to initiate a geometric form-finding process. The design strategies extracted from this process initiate the design case study.

[5.0] The design case study chapter shows initial concept /developement sketches, integrating the two design strategies, then proceeds to document the resultant design scheme. Documentation is structured through specific design ‘interventions,’ based upon the preceding body of background research. The *urban* scale is documented first, addressing the broader context; how the scheme fits within the existing urban framework, followed by the *architectural* scale; documenting the design of an airport terminal and its relative interface with the urban environment.

[6.0] A design exegesis administers a discussion of the implications of the design case study, within the framework of the established design principles. Opportunities for further research are also identified.

Methodology

The research methodology is represented as a flow diagram to the right. The overarching method was research led design; with the research component comprising a historical, conceptual and programmatic investigation of the type, in order to critique it through the injection of the type within a new environment. The background research materialized in the design case study as overarching design principles, specific design strategies as the inception design process, and design interventions; a series of relevant applications of functional requirements and a conceptual language. The thesis follows this structure, with chapter sections corresponding to the following headings.

2

Airport

Airport Defined

The dissemination of commercial aviation brought with it the establishment of the airport: both an infrastructural and architectural type, administering the system for transition from land to air to land. Fundamentally, the airport is a stopover point to serve the aircraft, conducting the processes of passenger interchange and exchange of goods. At this basic level, the airport is an infrastructural component within its city of service.

Beyond its primary infrastructural role, the airport has a level of civic and cultural presence in a city. The airport is a physical threshold to and from a region; the final frontier of a region and the gateway to a new region. In Mark Gottdiener's book 'Life in the Air', a commentary of the social realities of air travel, he defines the existential state of the airport as 'transition space'. More than merely a systemic and physical transition from air to land, the airport represents the changing of environments, "facilitating the shrinking of the globe and transcending both space and time." [Gottdiener 11] As aviation permits rapid transit with virtually infinite destinations; [fig 4] the conceptual role of the airport within a particular city is one of providing a sense of *identity* as well as first and last impressions.

Fig 4: Mapping every flight path

Chapter Intention

The hypothesis argues for the airport being an integral component within an urban environment. This chapter forms a context for which the design case study will operate within, providing historical context, a series of conceptual reviews and a program analysis - investigated through a series of case studies. The overarching intention of each section is to provide applicable design principles, interventions and strategies, tested through the design case study.

2.1 Historical Context

Through its popularizing and formative years, aviation provided seemingly limitless potential for the future of a modernizing society. Intensive investigation and thinking was devoted to determine methods for grafting a fast developing form of transport to existing central city fabric. However, aviation requires a fundamental commodity to sustain its infrastructure; space.

Introduction of the automobile was largely accounted for with existing roading networks. Rail could either be grafted to these roading networks, placed under or above ground without major intrusion of space. Aviation required a singular expanse that the density of a developed city could not offer. The result was a series of radical solutions in an attempt to graft the airport to the centre of major world cities.

The following series of images is a taxonomy of unbuilt airports proposed through the 20th century, expressing a vast range of attempts across the major cities of the globe to append the airport to the existing inner city fabric.

The ensuing chapter section comprises a critique of more serious proposals from the past, identifying key strengths and weaknesses of the design hypothesis. From this critique, a set of design principles are extracted, providing fundamental guidelines to inform the design case study.

1903 | Ohio
Wright Brothers first powered flight

Fig 6. 1908
Moses King's "Dream of New York City" New York

1919 | London
Fig 7. London News: "On the Impulse to Fly Commercially"

Fig 8. 1926
Lloyd Wright's "Los Angeles Skyscraper" Los Angeles

1927 | The Ocean
Fig 9. Edward Robert Armstrong's "Seadrome"

1929 | New York City
Hamilton Wright: "Penn Rail Station Airport"

Fig 10. 1929
H. Alvater's "New York Airport" New York

1929 | Los Angeles
Fig 11. Amazing Stories: "The Moon Doom"

1934 | London
Popular Science Monthly: "Thames River Airport"

Fig 12. 1938
French Engineer [Anon]: Rotating Runway Any City

1945 | London
Fig 13. Lewis & Lindy's "Liverpool Street Station"

Fig 14. - Plan Voisin

Fig 15. - Plan Voisin in Context

Central Paris, France
1925

Plan Voisin

Aviation went through major developments in Le Corbusier's formative years as an architect [1910-1920], influencing the development of his urban philosophies. *Ville Contemporaine* [1922] was one of his first utopian plans; proposing a progressive city form. His proposal would sustain a population of 3 million residents at high density, realising his totalitarian formulas for modern living at an urban scale. He made radical propositions for the inclusion of aviation within the urban fabric, positioning an airport "literally at the centre of everyday life" [Bruegmann 197] within his precise and streamlined vision for the city.

'Plan Voisin' ['Voisin' is the name of his sponsor, an aircraft manufacturer] was the adaptation of this plan to the centre of Paris. His vision assimilated residents in tower blocks, based upon a gridded transit network. Located at the centre of the city was a transportation depot/hub for the train, bus and aircraft, comprising motorways and train lines within an expansive structure, topped with an airfield.

In principle, concentrating transportation at the social centre of a developing city made sense, ensuring absolute connectivity and accessibility, locally and globally. However, fundamental issues of practicality arose. Approaching aircraft would have to navigate between tall residential towers; and a centrally located airfield within a concentrically arranged city block structure disallowed expansion. Corbusier critiqued his own formal arrangement: "Any city concentrically designed city makes regular, organic development impossible: a biological defect." 'Ville Radieuse' was his answer, allowing infinite expansion. The airport in this version however, was marginalized from inner-city fabric. [Pearman 80-81].

Fig 16. - Kings Cross Airport

London, England
1931

Kings Cross

Charles W. Glover saw a similar vision to Le Corbusier; creating a transportation hub by locating the airfield upon other major terminals of transportation. His 1931 proposal located a runway 'wheel' above the existing Kings Cross Rail Station, comprising four 800m runways arranged radially, allowing multi-directional take-off and landing. The terminal at ground level would handle all curbside, airline and security processes, with elevators carrying travellers to the airstrip level. Elevating the runway meant the terminal could be fully integrated into the existing city fabric, ensuring minimal disruption of existing infrastructure.

Unlike Corbusier's Plan Voisin, London City didn't yet have skyscrapers, so aircraft approach was clear. However, like Plan Voisin, the structure was finite and runways couldn't be extended to account for the needs fast-developing aircraft that called for increasingly longer runways. Safety was also a major issue, as overshooting the runway meant aircraft would plummet to the city below. Although the proposal was never realised, the notion of appending an airport terminal reveals the thinking of the era; the airport was the future of transportation and expressed the most potential for the city, and therefore should be placed at the centre of civic life.

Fig 17. - Kings Cross Airport in Context

Fig 18. - Manhattan Airport

Fig 19. - Manhattan Airport in Context

Midtown Airport

The zenith of all proposals was the \$6 billion “Dream Airport” in New York City, [1946] the vision of real-estate tycoon William Zeckendorf. The project took over 144 city blocks [990-acres] in Midtown Manhattan with an elevated airfield, supported by a “series of buildings ten stories [60m] high” [Anon. 76]. Within the platform structure was a transportation hub, containing all forms of modern transport; air travel, rail, bus, auto-mobile and, with an entire edge bordering the Hudson River, a major shipping port, making New York City “the biggest clearing house of all traffic in the world” [Anon. 78]. The structure would contain multi-level highways and carparks, as well as offices and entertainment establishments, interconnected by horizontal escalators as sidewalks. Reminiscent of the transport hub in Le Corbusier’s *Ville Contemporaine*, the intention was to localize all forms of transport within one mega site; however Zeckendorf’s version was a site-specific adaption to Midtown Manhattan.

Although the project was predominantly a precedent for infrastructural pragmatism, one of its other main drivers was the transit time from the city to the nearest airport, La Guardia. In the project’s showcase article in *Life Magazine*, a simple diagram expresses the issue of transit time from the city to the airport; on a trip to Philadelphia from NYC, taking the train was still the fastest method of transport. As a result, planners believed that the rate at which aviation was developing “made their idea a necessity.”

Fig 19. - Speers Berlin Plan with Tempelhof Airport

Berlin, Germany
1936-2008

Fig 19. - Tempelhof Airport in Context

Tempelhof Airport

The Tempelhof Airport in Berlin Germany was perhaps the most feasible example of the airport being an integral part of inner-city fabric. The airfield comprised a 2km (approx.) diameter of clear space, within the fabric of Berlin City. The first built terminal [built 1926-29] was sited in isolation within the field, and although the terminal building itself was a considered one of the most logical and successful airports of the era, air traffic growth in the 1930's was too fast for the size of the terminal.

The second iteration [built 1936] located the terminal to the edge of the airfield space, allowing the building to have a "true urban presence that befitted a terminal so very close to the city centre" [Pearman 64], heightening it's presence and importance within the city. The terminal building was of a grand scale, synonymic with the rise of the Nazi regime; one of the few sublime-scale capital projects that was actually built. Albert Speer gave a clear consideration to the significance of the airport in his axial plan for Hitler's capital [fig18], integrating the terminal into the east-west axis, providing an urban connection to the busiest airport of the era.

The Tempelhof Airport was the last real example of an airport that was realized in close proximity to a major city centre, able to be conceived due to the existing provision of space. Although still within its capacity, it was closed down in 2008, without being expanded upon since its opening.

Fig 20. - Aerotropolis Representation

THE OUTERMOST RINGS

Extend nearly 20 miles into the countryside from the runways.

GIANT CLUSTERS OF APARTMENT TOWERS

House residents working the assembly lines and cargo hubs in the inner rings

BUNGALOWS

House expatriates imported by the various multinationals expected to set up shop around the airport (golf courses, shopping malls, movie theatres, and schools that seem airlifted straight from southern California keep the expats happy)

THE MID RINGS

Manicured campuses for those multinationals

OFFICES

The back offices and regional headquarters of the Toyotas and Nokias persuaded to relocate.

ENTERTAINMENT

Hotels, shopping malls, convention centres - anything and everything to sustain the workers laboring in the shadow of the airport.

THE INNERMOST RINGS

Abutting the runway fences, free-trade zones, factories, warehouses, and logistics hubs designed for the FedEx/UPS/DHL

AIRPORT

SIX-LANE HIGHWAYS

Link the inner and outer rings, with semitrailers barreling down dedicated aerolanes while residents stroll along boulevards lining canals

Fig 21. - Aerotropolis Book Cover

Anywhere 2011 | Aerotropolis

The economist John Kasarda makes the case in his manifesto “Aerotropolis: The Way We’ll Live Next” [fig21] for the airport being the literal centre of all operations within new future cities. His vision is grounded in the prospect of an increasingly ubiquitous global economy and the rapidity of globalization, likening the international network of airports as a “physical internet” phenomenon. At the outset of his manifesto Kasarda professes a well-known assertion made by Le Corbusier; “A city made for speed is made for success.” His resultant proposal is a utopian plan for a city, built upon the economic opportunities of trade and transition that an airport offers [fig 20].

Conceptually, Kasarda goes as far as to assert that the aerotropolis “offers an antidote” to Rem Koolhaas’s notion of the “Generic City” [Koolhaas 1248-1257]; ‘imposing a hierarchy of needs on cities so that they openly and honestly express their true purpose: creating work for their inhabitants and competitiveness for their nation’ [Kasarda 19]. This may be so, however for the most part, the proposal seems to align with the ‘generic’ notion. Koolhaas contends that the generic city is “nothing but a reflection of present need and present ability”, “without history,” liberated from the “captivity of center” and the “strait jacket of identity” [Koolhaas 1249-1250]. The aerotropolis proposal is essentially a radial plan around the focal airport [shown in fig 20 and outlined in the diagram of concentric zones to the left]. In theory, his vision is a fast-paced urban engine for global business, a hub of production and international HQ, sustaining and housing a permanent ‘local’ industry work force population (who also serve the transient expatriate population). Functionally, Kasarda’s oversight of Le Corbusier’s critique of his own similar urban proposal [Plan Voisin] reveals the finiteness of the aerotropolis system; “any concentrically designed city makes regular, organic development impossible: a biological defect” [Pearman 81]. With the airport and a transient population being the predominant identifiers, aerotropolis seems to embody the generic, devoid of coherent identity, existing for the business model and maximum profit, not for its inhabitants.

Discussion

Expansion

Le Corbusier's Plan Voisin and Kasarda's aerotropolis highlight a major weaknesses in their formal integration of the airport within the city centre; *concentricity*.

Corbusier's labelling of a concentrically designed city a "biological defect," refers to the radial planning disallowing *organic growth* from a heavily prescriptive underlying urban structure. Not only does this limit the expansion of the central city fabric, but more importantly, the expansion of the central airport is limited. Ville Radieuse [fig 22] was Corbusier's developed answer, comprising an underlying organic structure that in theory was "infinitely expandable" [Pearman 81], with the airport and transport hub marginalized, not hindering future expansion of either infrastructure.

Fig 22. - Ville Radieuse

Proximity

Plan Voisin also highlights a further pragmatic issue of a central-city airport; its *proximity* to built form. The runway placement amidst his residential skyscrapers were a dangerous obstacle for aircraft landing/take-off trajectories upon approach. This was a major downfall observed in the 1920's, long before jumbo commercial aircraft, so the nature of the city/airport layout would have been exponentially more dangerous through the development of aviation.

A built incarnation of an airport in close proximity to surrounding urban fabric is Hong Kong's Kai Tak Airport. Approaching aircraft [fig 23] were required to fly over and through the built up city fabric. The dangerous approach, noise, and the airport infrastructure limiting city expansion ultimately resulted in the airport's closure and re-location in 1998.

Fig 23. - Kai Tak Approach

Expansion

Albeit a ridiculous premise in the 21st century, the rooftop airstrip [King's Cross Airport and the futurist taxonomy] was a seriously considered option in the early 20th century in order to append the airport to existing central city fabric. However the major downfall was two-fold; their runways were finite, *preventing expansion*, and the potential danger for aircraft overshooting and plummeting to the streets below was too great.

The convenience of this premise is still realised in servicing VTOL (vertical take-off and landing) aircraft [fig 24] atop central city sky scrapers. However, the technical and spatial needs of the modern commercial fixed-wing aircraft far surpass engineering capabilities for the outworking of a rooftop runway.

Fig 24. - VTOL - Building Platform

Civic Dominance

Although Zeckendorf's New York Dream City again appears to be a ludicrous proposal, conceptually the project revealed the drastic lengths planners were prepared to take in order to facilitate the airport within the city. However the proposal served to be an economic strain (\$6 billion in 1945, respectively) as well as a physical strain on the existing city (its size is comparable to NYC's Central Park).

Endurance

Despite the Manhattan Airport proposal being a civic strain on New York City, the success of a massively over-compensated form is perhaps shown through Tempelhof Airport's endurance. Like Zeckendorf, the German planners of the era saw the rise of aviation and acted accordingly, over-compensating [in alignment with Nazi Regime grandeur] and constructing a building that far exceeded the capacity needs of its era. Not only did the building not ever reach its capacity [although partly due to the establishment of other airports], the open-ended plan allowed for expansion if it was ever required. Its closure was founded in Berlin's intention to focus all air traffic operations at one site; the better-prepared Berlin-Schönefeld International Airport.

These two principles are inherently similar, in that *scale* is the design strategy used to deal with rapid passenger traffic growth. For the purpose of the design case study, the ability for the airport to *expand* will be favoured over designing a finite, overcompensated airport. For this reason, these two principles will not be furthered.

Connected/Accessible

Although conceptually Kasarda's Aerotropolis scheme predominantly exists for its own economy and the international businessperson, as opposed to the civilian, its layout reveals an important design implication; connectivity and accessibility. In his manifesto he asserts "the three rules of real estate have changed from location, location, location to accessibility, accessibility, accessibility" [Kasarda 11]. This transcends into the physical infrastructure of the utopian plan, comprising a focus upon arterial highways, culminating at the airport. This focus on transport connection highlights an implication beyond this specific example; the airport is part of a wider transit network upon terra firma. Its connectedness and accessibility to the broader transport infrastructure network is critical for the airport to operate successfully.

Fig 25. - Aerotropolis graphic

Design Principles

Although the historical examples have been far surpassed by the development of the modern airport, their intention to be integrated into their respective urban environments reveal implications for the urban integration of the airport terminal. The ensuing identified implications are considered ‘design principles,’ extracted from the analysis of historical examples. As specific design standards, these principles work in *unison* to provide an essential framework, acknowledging the design issues from the past examples, in order to resolve them through the design case study. These principles will be applied through all subsequent investigations.

Expansion

The historical examples show that an urban environment can negate the expansion of the integrated airport terminal. As the growth rate of passenger traffic is unpredictable, an unprepared urban airport without a framework for expansion could exhaust its passenger capacity, creating issues for both the urban and airport terminal environments. Although the previous discussions on expansion refers to the ability for the airport *as a whole* to expand [inclusive of airport infrastructure - runway etc.], the principle is specifically applicable across all scales included in the design case study; directly to the terminal building itself, as well as the urban environment. As the design case study is a specific investigation into the interface between the airport terminal and urban fabric, the ability for the terminal to *expand* despite being part of a wider immediate built context is a key consideration for the sustainability of the design outcome.

Proximity

As the hypothesis argues for an interface between the airport terminal and the urban environment, *proximity* as a design principle has a two-fold intention, across two scales.

Architectural Scale: In order to initiate the hypothesis’ argument, the airport terminal must be directly integrated into an urban setting;

Urban Scale: The historical examples show that an airport’s close proximity to an urban setting presents two major issues that must be acknowledged:

- i. Safety;
dependant on the relative location of the airport/urban fabric to aircraft flight-tracks/airport infrastructure, the possibility of mechanical failure or pilot error presents the potential for aircraft to crash into the airport/urban fabric.
- ii. Noise;
the roaring jets of modern aircraft could impact negatively on an urban/residential environment, so the implications of noise needs to be considered in the relative location of the airport/urban fabric to aircraft flight-tracks/airport infrastructure

The programmatic planning of the design case study will require the symbiosis and of these two intentions to satisfy the design principle, however as noise is specific to the site context, it will be investigated through a design *intervention*.

Connectivity/ Accessibility

As stated in the discussion, the *connectivity and accessibility* of the airport within a wider transport network is a key determinant for the successful operation of the airport. In order for airport to be a functional transit interchange, this design principle requires that the overall urban structure maintains a high level of integration with existing infrastructure [external context] as well as the implementation of a high level of internal connectivity. This is to ensure that the transit operations of the urban environment do not impact negatively upon the typical operations of the airport and vice versa.

[Conceptual Definition]

2.2 Place Icon

Increasingly, the airport embodies a micro-culture of a particular city or region. Rem Koolhaas defines this in his essay ‘the Generic City’ as a “concentrate of both the hyper-local and hyper-global” [Koolhaas 1251]. Specifically referring to ‘performance and iconography,’ his conceptual definition can translate to a travellers’ perception of the architectonic make-up of the airport.

The tensile roof encasing the Jeppesen Terminal at Denver’s International Airport exemplifies hyper-locality, as a clear iconographic reference to the bordering Rocky Mountain range, as well as a literal representation of the ‘tepee,’ a Native American structure. The undulating roof form is an overt contextualization of the building through an allusion to a geographical and cultural icon of the immediate region. From Denver International Airport, an intensive local representation of Central United States, a matter of hours separates a traveller from Terminal 3 at Beijing Capital International Airport. The roof of Terminal 3 suggests a bulging, dragon-like form, a Chinese cultural motif, suffused in red, the Chinese national colour of good luck.

The airport in this context can be a powerful symbol of a place, establishing a conclusive coherency to travel upon arrival and departure. Through abstraction of cultural iconography, spatial arrangement and evocative structural gestures within the overall enveloping form, the airport can provide a cultural summary of its respective region.

Fig 26: Denver International Airport roof against the Rocky Mountain range

Fig27: Beijing International Airport main entrance

Global Culture

Amidst an intensive local experience, as a result of “global marketing,” the traveller also experiences a “global culture of franchised stores, rental cars, commodities and services” [Gottdiener 59] within the airport. The interior environment of the Jeppesen Terminal is heavily focussed upon the internal program, with limited views outside [the Denver Airport interior specifically is known to be difficult for ‘plane spotting’ [Gottdiener 79]] and although highly equipped and multifunctional, the experience is comparable to that of a shopping mall – an expression of the ‘hyper-global’. [Gottdiener 79] Under the vaulting red ceiling of the Beijing Terminal, satellite retail establishments fill the floor, disassociated with the local expressionism above. The ubiquitous presence of recognizable brands and services ensure that despite transitioning through new environments and immersion into new culture, the familiarity of “everyday life” is still present.

The existential status of the airport then, is one of duality. John Kasarda uses the metaphor the “physical internet” to describe the way in which the global network of airports connects *goods* and *people*. However this definition transcends merely the ability to rapidly connect people and things, but the airport terminal itself; a phenomenological container of people, representing at any one time a multiplicity of culture, skill and life experience, as well as a built environment flagrant with brands from anywhere. The airport ‘type’, as Deyan Sudjic expresses, is “a hybrid kind of space, one for which there are next to no conceptual frameworks, just the pragmatic expedencies of keeping traffic moving” [Sudjic 169].

Fig 28: Denver International Airport: McDonald's – a global franchise

Fig 29: Beijing International Airport: Burger King: another global franchise

Avian Expression

The introduction of the jet engine to commercial aviation in the 1960's is seen as a metaphor for the time, birthing the 'Jet Age'. The jet engine meant faster speeds, higher altitudes and longer distances, resulting in higher capacity aircraft [the most revolutionary being the 'jumbo jet' - Boeing 747]. The supply of the jet engine produced intensive demand as air travel became affordable to the masses, not merely the world elite. As a result of this pervasive social change, airlines profited and competition escalated. As the airport was the conduit for the public use of the airline's services, the process of the Jet Age produced some of the most evocative airport architecture of the 20th century.

Pre-1960's airports were emblematic of the 'form-follows-function' mantra, exemplifying a *refined and composed machine aesthetic*, closely related to the precision of aviation. The Jet Age incited an expressionist movement in airport design that resonates in the airport architecture of the 21st century. It was an era of wealth and competition between airlines, as aviation's popularization instigated exponential commercial growth. Eero Saarinen's TWA Terminal at New York's JFK International [fig.30] is perhaps the clearest expression of budget-less airline extravagance and the excitement of the Jet Age, setting a standard for the generation. Saarinen defined the dramatic form as "pure abstraction, simply intended to express the idea of flight" [Stoller 1]. Although the commission from TWA wasn't as a direct result of the Jet Age (the project was initiated in 1954; the first Jet aircraft came into commercial use in 1958) its presence in the canon of airport development is a generally accepted symbol for the Jet Age turning point.

Fig 30: *The poised eagle: TWA Terminal Building, JFK Airport, NYC . Circa. 1960*

Fig 31: *Theme Building at Los Angeles International Airport; designer, Paul Williams, pictured. Circa. 1960's*

Fig 32: *Buffalo Niagara International Airport Buffalo, NY, USA by KPF*

Fig 33: *Bilbao International Airport, Bilbao, Spain by Santiago Calatrava*

'Theme Building' at Los Angeles' International Airport is essentially a sculptural folly in terms of its programmatic worth to the airport. The building operated as a restaurant and observation deck until its recent closure, as a result of visitor numbers dwindling. However, the building has taken on a higher purpose in its 50 year life, representative of not only the Jet Age, but an *enduring symbol* of entrance to Los Angeles International Airport and the Greater Los Angeles Area [the 2nd most dense region in the United States].

Buffalo Niagara International Airport and Bilbao Airport are two further examples of a formal avian metaphor. Although both built in the late 20th-early 21st century, there is a clear perpetuation from the 1960's TWA Terminal. Both terminals have glazed, triangulated corners oriented towards the sky. Externally, the aesthetic effect is reminiscent of the TWA terminal; poised for flight, celebrating the transition from land to air. These dramatic forms transform internally, washing the interior in natural light, providing vast, uninterrupted views outside, connecting the traveller with the next step in an intended journey; the sky.

The romance of the Jet Age and its celebration of flight fostered a movement of expressionism through airport architecture, evident since its inception in the 1960's. In association with the airport as a symbol of global and regional culture, the contemporary airport takes on a third conceptual role; capturing the spirit of travel and flight through thrilling formal gestures. Although for the most part, this form of expressionism does not initially embody a *place*, as a gateway, the power of a thrilling architectural experience engenders the airport becoming a place icon.

Urbanity Within

The relative isolation of the airport from the city centre in combination with the level of amenity needed to service a multi-purposed and captive passenger population, generates a quasi-urban condition comparable to an actual city centre. The ever-present and ever-updating airport schedule engenders a constant flow of social activity: arriving and departing, waiting and transferring, greeting and fare-welling; a multiplex of inherently transient social situations and interactions, occurring within rigid processing system.

Gottdiener identifies several key allegorical references to the airport *as* an urban environment:

“Like a city:

- [the airport]’s concourses are its grand boulevards [23]
- [the airport] is a busy metropolis containing thousands of people at any given time [23]
- [the airport] merely houses temporary drama (people live, love, die, babies are born, children are abused or abandoned, high drama reunites loved ones and bears witness to final departures), and only it’s physicality endures [23]
- [the airport]’s scale of operations has its very own economy [23]
- [the airport] processes people and commodities for profit [25]
- [the airport] has become a general-purpose public space that enables all kinds of behaviours [26]
- [the airport] houses theft, murder, and the sex trade; interweaving their occurrence with the more mundane activities of ordinary routines and daily life [26]”

His metaphorical explanation expresses that the airport “merely houses” temporary activity. As the population of the airport is transient, the nature of dwelling travellers can be explored through its two main directions of flow; departing and arriving.

Departing Direction

In the departing direction, dwell-time within the airport is dictated by the check-in schedule of the airline company, resulting in activity and space required for the traveller to inhabit. The key design-motive here is the economy of a captive market; travellers required to stay longer than they would intend, as a result of airline processes. Space between the check-in desk and airline gate is therefore devoted to occupying the ‘held’ traveller.

The existential disposition of a traveller is at this point is transformed from civilian to potential consumer. Based from a network of pedestrian passages and access routes, the post-check-in terminal environment comprises pockets and processions of intensive retail and food establishments, as well as spatial provisions for *waiting*. Retail within the airport is heavily reliant on the *waiting* traveller, existing upon the boredom and non-time the traveller adheres to. This retail environment can be attributed to the shopping mall typology [Gottdiener 15], establishing an internal economy; the predominant source of airport revenue.

Aside from the concentrated retail space, internal conditions are provided for the waiting traveller. A vast allowance of space is supplied, predominantly in the form of seating; either prescribed [food

establishments] or un-prescribed [for the most part near departure gates in the form of departure lounges pre- and post-security checks or executive lounges], occupying the waiting population.

Arriving Direction

Upon arrival, at the point of deplaning, the traveller is released from the airline schedule, into the autonomy of the destination. Aside from international inbound security checks [immigration and border control processes] and baggage claim, the arriving population is wholly transient, for the most part merely *passing through* the terminal. Subsequent means of travel are then sought, often intrusively presented, upon exit of the terminal. Retail upon the arriving direction also exists, however the traveller is not required to dwell, so interaction with arrival retail is intentional.

Other Inhabitants

Beyond these activities of the traveller, the airport engages a major *work-force*. All airport operations as well as the multiplicity of services sustains a significant base of workers, dwelling consistently, utilizing the airport as not only their occupation, but [as necessary] a source of sustenance, as for the most part, the relative isolation of the airport means it’s services are the most convenient.

The *visitor* also makes up a small part of the airport population; people who come to collect or farewell the traveller. As flight schedules change [delays/cancellations], the visitor may be required to *wait*, so the market expands to consumers whose intention isn’t to embark on an aircraft.

From within these mandatory processes and social behaviours, the airport assumes the role of a social platform. The demographic of society that passes through the terminals and concourses of the airport has no prescription. Therefore, definitive attribution between social activity within the city environment and within the walls of the airport terminal can be made upon the behaviour of their inhabitants. The major differences being a difference in psyche, [i.e. the traveller is under the authority of the airport, whereas the city pedestrian is a civilian]; and the length of stay [airport inhabitation is temporal; the city “possesses residents, that is, people who stay within the space for an extended period of time” [Gottdiener 27]]. By definition, the airport terminal is not an ‘urban’ space, however internal activity; the multi-purposed ‘flows’ and social situations within the airport terminal results in the establishment of it’s own “urban culture” [Gottdiener 21].

In conjunction with internal social condtions, the hybrid of existing building types contained within the terminal furthers the urban condition, much like the shopping mall. As Gottediener states, “the airport’s concourses are its grand boulevards” [Gottdiener 23]. Lined with retail and food outlets, as well as the services and operations the airport offers, the terminal assumes a multi-faceted quasi-form of a street frontage. The internal environment is one of varying edge treatments, penetrations and barriers, all with varying levels of interaction, occupying an ever-changing and updating population.

Scale Definition

The airport exists in a range of scales, dependent on its intended function and location. The role of the airport can be broken down into three distinct terminal types, each with a different role within the wider airport network. These three are the 'hub', the 'international', and the 'regional'. Definitions for these three 'types' are stated to the left, as well as how they operate as an overall network. As shown, the Queenstown Airport is an 'international' type, containing international and domestic processes.

This determines the definition of the programmatic scope for the ensuing case study analysis and subsequent design case study, eliminating program allowances for the inclusion of transfer flights, as per the design of a 'hub' airport, and including the domestic functions of a 'regional' airport.

Hub

Auckland International Airport [AKL] Fig 34

The hub airport handles all forms of commercial air traffic - both international and domestic for the city in which it resides, as well as serving as the gateway to a continent, nation, an island or a state, transferring passengers to flights to intended destinations. The global network of airports in essence is a filtration system dependant on airlines and catchment areas. The longest haul flights enter a continent or country via the largest hub airports, subsequently breaking down and filtering passenger traffic to intended destinations. For this reason, hub airports have significantly inflated passenger traffic, with programmatic conditions handling considerable cross-flows of arriving, departing and transferring passengers.

International

Queenstown International Airport [ZQN] Fig 35

The international airport handles the departures and arrivals of both international and domestic passenger traffic. International traffic is direct, from a catchment proximity that doesn't require transferral through a hub airport. This airport operates explicitly as a direct destination, with passenger traffic intending arrival to the particular town, city or region the airport services.

Regional

Invercargill Airport [INV] Fig 36

The regional airport is the last node in the global airport network, serving domestic passenger traffic. This airport contains the simplest of airport operations, the smallest of which being merely a check-in point and baggage transferral service before boarding or baggage claim upon arrival. As the regional airport is the final link in the global network, it is the most common type, resulting in absolute global connectivity.

2.3 Program Analysis

The airport program essentially has two programmatic types. The required program; a processional system of processing and handling passengers, and the discretionary program; existing for the occupation and service of passengers [retail, eating establishments, transport].

The procession through the required program [fig 37] depends on the direction of travel, [departing/arriving] and the travel type [domestic/international]. The typical terminal layout materializes in two main concourses, the landside and airside.

The landside concourse contains all public activity before the traveller is bound [after check-in] to the schedule of the airline, or is the final transition space upon arrival through the terminal. As a result, this space contains all forms of airport activity and all people groups, as discussed in 'Urbanity Within' on pages 29-30.

The airside concourse comprises all activity after check-in and security processes are completed, so all airside space contains passengers only.

The following diagram formalizes the airport 'required program' into a 'procession diagram', showing the process of passing through the airport terminal.

Fig 37: Procession Diagram

Case Study Selection Criteria:

The following 7 airports were selected in comparable scale and operation to the Queenstown International Airport, in order to contextualize the program investigation within the scale that the design case study will operate in. The selection criteria is as follows:

<i>Scale:</i>	As per the 'international' definition on page 42
<i>Design Capacity:</i>	Approximately 1-2 million passengers per annum [with the exception of Learmonth Airport]
<i>Location:</i>	All from different countries
<i>Configuration:</i>	Single level operations [with the exception of Carrasco and Gibraltar Airports]

The ensuing analysis categorizes the various stages of the base procession diagram [fig 37] into spatial categories. The intention of this process is to investigate the level that each plan differs from the base diagram, through two diagrammatic representations of the terminal building. The colored categories are applied to a simple layout of each terminal plan, to determine the treatment of the spatial layout within each terminal. An isometric diagram of the landside-airside-landside transition is also shown, in order to establish a basic spatial understanding through the terminal, as well as interactions with private areas.

3 exterior reference images are also provided at 3 perspective scales; interior, curbside and overall. These assist the discussion on each, determining how the overall form/conceptual expression has an interaction with programmatic operations.

The ability for expansion is also briefly noted and discussed.

Southampton Airport [SOU] Southampton, England

The Manser Practice

Passenger Movements: 1,722,471

Distance to Southampton Centre: 6.5 km

The programmatic processions within Southampton International Airport are straightforward, based upon the logical arrangement of spaces on landside/airside, as shown in the base procession diagram [fig 41]. Contained under an aerofoil roof plane, all terminal processes occur within elongated halls on either side of a central spine, containing private areas. Security processes take place within two penetrations through this central spine, permitting the transition either way from landside - airside - landside. The roof gesture is indicative of the interior plan, following the split-level nature of the terminal; the central spine comprises a multi-level private zone as the peak of the roof, falling each side to the single level public zones.

The relative orientation of the airport to the runway is perpendicular, so expansion of the terminal is severely limited as any further built form would encroach upon the access road and transitional apron at either end.

Fig 38

Fig 39

Fig 40

Fig 41: Southampton Plan

- Private Areas
- Check-in/Bag Drop
- Public Concourse
- Security Checks
- Departure Lounge
- Departure Gates
- Arrival Gates
- Baggage Claim
- Curb
- Apron

Fig 42: Southampton Procession

RAAF Learmonth [LEA] Exmouth, Australia

Jones Coulter Young

Passenger Movements: 90,861

Distance to Exmouth Centre: 38 km

RAAF Learmonth is an international airport significantly isolated [30km] from the town it supports, Exmouth [as its main operations are Royal Australian Air Force]. The terminal is an example of a small-scale international airport, containing all immigration/customs processes. Learmonth's overall layout is similar to Southampton, with airside/landside processes split by a central spine containing private areas, and serving as the security gateway from landside-airside-landside. However as climate allows [north-west region of the West Australian state], once arriving passengers have passed through required security processes, they emerge directly from the building to the curbside, under a veranda. Departing passengers check-in within the adjacent concourse, then emerge through the central spine, filtering to either international or domestic lounges.

Although the terminal has no need to expand, it's basic form allows linear expansion, as the basic program arrangement is unrestricted at either end.

Fig 46: Learmonth Plan

Fig 47: Learmonth Procession

Lille Airport [LIL] Lesquin, France

Atelier Sloan with Laloux-Lebecq

Passenger Movements (2012): 1,397,637

Distance to Lille Centre: 7 km

The overall plan of Lille International Airport' terminal is formally/conceptually driven, with the overall envelope and resultant plan embodying an angular avian form [terminal end is low with verandas and roof surfaces jutting out as 'wings;' a private office section at the other end thrusts into the sky embodying the tail wing of a plane]. The programmatic procession is straightforward, separating arriving and departing directions whilst localizing domestic and international processes, much like the base procession diagram. However, the public concourse penetrates between departing and arriving areas, allowing public access to view airside operations. This provides an overall clarity and coherency to the understanding of terminal layout, as from the first entrance to the public concourse, the traveller is immediately exposed to their next destination, the plane. The gate system at the airside edge is a universal system, handling passengers travelling both directions [arriving/departing].

As the overall form of Lille's terminal is conceptually driven, expansion is somewhat restricted, however, space either end is open, allowing further linear extrusion.

Aalborg Airport

[AAL] Aalborg, Denmark

Schmidt Hammer Lassen Architects
Passenger Movements (2013): 1,422,289
Distance to Aalborg Centre: 6.5 km

The rectilinear terminal of Aalborg International Airport again essentially outworks the base procession diagram. Landside comprises a long public concourse, with departing and arriving processes arranged logically along the airside edge, penetrating through to the opposite airside. The roof is the main conceptual driver, reminiscent of Saarinen's Dulles Airport in Washington, USA. A singular aerofoil roof surface is a reference to the internal program, with the airside end elevated high, oriented towards the sky, allowing significant vistas of the sky and aircraft movements. The mid-section of the roof compresses over the most internalized part of the program, security, and the landside entrance edge lifted again.

The rectilinear plan is a highly efficient terminal form, as either end is open for expansion. The interior environment of Aalborg also for the most part consists of light partitions to divide up different zone/lounges within the overall plan, so essentially the basic terminal is a singular hall. This is a further planning success in terms of expansion potential, as new programmatic layouts would require low effort.

- Private Areas
- Check-in/Bag Drop
- Public Concourse
- Security Checks
- Departure Lounge
- Departure Gates
- Arrival Gates
- Baggage Claim
- Curb
- Apron

Graz Airport

[GRZ] Graz, Austria

Florian Riegler and Roger Riewe
Passenger Movements: 881,740
Distance to Graz Centre: 9 km

Graz International Airport is a further outworking of the rectilinear trend. The plan diagrams to the right are the pre-expansion form of the terminal, as it was expanded upon in 2007. This initial building however is a clear application of the base procession, splitting arriving and departing zones, joined by the elongated landside concourse. Both these zones oppose each in their layout, as the departure zone has a clear view from public concourse to apron, whereas the arrival zone is fully internalized, embedded within the plan.

Conceptually, the initial Graz terminal was heavily prescriptive and clinical, based upon the basic function of the program. However the extension to the north provided not only further spatial allowances at ground level, but a second floor lounge and observation deck. The roof surface is a 'cloud' structure, appearing to float above the ground floor, an allusion to the sky, and a formal gesture antithetical to the orthogonal nature of the terminal below.

Carrasco Airport

[MVD] Montevideo, Ugurguay

Rafael Viñoly Architects
Passenger Movements: 1,913,734
Distance to Montevideo Centre: 20 km

Carrasco International Airport is Uruguay’s largest airport, handling the greatest number of passenger movements. The terminal’s capacity is 4 million per annum, over-compensating current traffic by 100% as the current passenger movements are around 2 million. The terminal building is a multi-level structure, comprising all operations under a singular roof surface. The terminal completely separates the arrival and departure directions over the two levels. This allows the international and domestic processes to be further separated within each direction, on each level. The procession of space is reasonably direct through the [mostly] symmetrical plan, dictated by the supportive private areas.

The dramatic monolithic roof and terminal beneath is inherently finite [although extensive over-compensation is a successful design method to mitigate need for expansion i.e. Tempelhof], preventing organic extensions to the base form. As a conceptual entity, this structure is a representation of a design intent favoring concept over design allowances.

Gibraltar Airport

[GIB] Gibraltar, British Overseas Territory

Bblur Architecture and 3DReid
Passenger Movements (2013): 383,876
Distance to Gibraltar Centre: 2 km

Gibraltar International Airport entails an unconventional use of the base procession, as the terminal has a unique role in its region; it has the ability to handle traffic from two countries - the British Overseas Territory of Gibraltar and Spain. Instead of an inherently linear procession from landside to airside, the concourse and gates are on perpendicular edges, allowing landside entrance access from the north as well as the west, from both countries, converging through the centre of the terminal building. This occurs over two levels, with departing security processes and gate lounge on level 1 and arrivals through the ground floor. Each edge of the plan is in use, with the south edge containing the 4 gates, and east edge the back of house processes [baggage handling]. Like Carrasco, the terminal has massively over-compensated capacity figures, with a passenger traffic capacity of 1.5 million per annum. This warrants a gestural and somewhat finite envelope and planning arrangements, as allowances for expansion aren't immediately required.

Fig 70: Gibraltar Plan

Fig 71: Gibraltar Procession

2.4 Design Strategy

Landside Operations + Schematic Terminal Form

The airport is the terminal for aviation; a form of transport that resides within a wider network of transport operations. As a result, a fundamental design consideration is the facilitation of other modes of transport and their operations at the curbside of the terminal [fig 72].

Physically, this includes the following functions:

- an expanse of *parking space* for public use, short-term and long term,
- vehicular access* to the terminal edge for picking up/dropping off passengers
- temporary parking for all forms of transport at the terminal edge [Private vehicles, taxi rank, bus]

The ensuing design investigation critiques the airport terminal in a simplified block form based upon the fundamental internal processes. This design process critiques the basic spatial layout of a selection of the case study airports and the typical international airport layout [based from the procession diagram]. This is a context-less process, developing a new spatial layout, providing a terminal design strategy for application to the design case study.

Fig 72: Carrasco Airport - showing parking provisions

Fig 73: Southampton

Fig 74: Graz

Fig 75: Aalborg

- Landside
- Arrivals
- Departures

Fig 76: Conventional Terminal

Aalborg, Southampton and Graz all have similar configurations of spaces, comprising an elongated landside concourse, and separate arriving/departing processes on the airside. This means that all curbside operations occur upon the singular exterior edge of the landside concourse. As identified in the program diagram, the curbside facilitates *vehicular transport*, public and private. As the design case study locates the terminal within an urban environment, the landside edge will have a close proximity with a pedestrian environment. The ensuing chapter section critiques this simplified version of the spatial arrangement, developing a formal design strategy that acknowledges to introduce a pedestrian interface, whilst maintaining conventional landside processes. The critique is informed by two key opportunities identified from the case study analysis of Learmonth and Lille terminals.

Entrance Exposure

Strategy Development

The Learmonth terminal [fig 77] eliminates the need for passengers to pass through the landside concourse. As the terminal is so small in physical size and its passenger numbers are minimal in comparison to the other case studies, its overall programmatic functions are more direct. Departure processes follow the conventional process, however upon arriving, the passenger disembarks the aircraft, passes through the arrivals terminal and emerges directly onto the curbside edge.

In the context of an urban environment, this programmatic arrangement reveals a design strategy to initiate a pedestrian-focused interface at the landside edge. A series of developmental iterations [fig 78-81] from the initial case study observation form a new spatial arrangement that acknowledges the landside vehicular process, and considers the addition of a pedestrian-focused terminal edge. This basic spatial arrangement challenges the previously identified conventional terminal layout, orienting a section of the landside concourse perpendicular to the arrival and departure processes. Separating vehicular and the proposed pedestrian landside processes allows the conventional vehicle pick-up/drop-off process to take place as normal, then provides the means for a pedestrian-only landside environment. The pedestrian edge then sets a condition to integrate landside operations into a pedestrian-focused urban scheme.

Landside
Arrivals
Departures

Fig 77: Learmonth

Landside
Arrivals
Departures
Landside Process:
Vehicular
Pedestrian

Fig 78

Fig 79

Fig 80

Fig 81

Revised Terminal

Program Development

In aligning the revised terminal layout with the procession diagram, it was identified [fig 80] that revealing the pedestrian edge to arrival processes only, failed to take into consideration the intensive inbound international security checks. As the Learmonth terminal is small in comparison to the design case study, international arrival processes would take up minimal room. Upscaling these processes to the design case study terminal size would negate the assumed 'directive' arrival process.

Notwithstanding, upon further observation of the procession diagram, it was identified that the domestic processes require minimal interaction with the landside concourse. This presents an opportunity to consolidate international and domestic processes separately, [fig 81] as opposed to the conventional centralizing of the arrival/departure processes in the same zone. As only the inbound/outbound international directions require intensive security checks, transferring the international processes to the previously identified 'departures' zone centralizes all *international* airside processes within one zone. This allows all *domestic* processes to centralize within the previously identified arrivals zone.

Landside
Domestic
International

Fig 82

[Context-less]

Airside Exposure

Strategy Development

The layout of the Lille terminal splits the airside departing/arriving airside processes by penetrating an extrusion between the two designated zones, exposing an edge of the landside concourse to the airside edge. Application of this strategy to the developing terminal layout [fig 83] instigates a simpler iteration of the formal arrangement. Instead of a dog-leg form [fig 82], the landside concourse is re-configured as a rectilinear form. This instills a distinct categorization of the 3 zones, whilst maintaining the established vehicular/pedestrian landside separation.

Fig 83

Fig 84: Departing Form

Fig 85: Arriving Form

Design Strategy

Strategy Establishment

The '3-zone' arrangement effectively forms the international and domestic zones isolated 'terminals,' much like larger 'hub' airports would, however they are 'plugged' into the mutual landside concourse. In this form, the landside concourse operates as a connecting arm, accumulating all forms of traffic [from both vehicle/pedestrian sides] for processing, then dependant on the direction of travel [departing/arriving] the traveller is filtered to their respective destination [domestic/international, pick-up].

This revised version of the base procession diagram will be used in the design case study as a *design strategy* for integrating the terminal program into an urban environment. The specific requirements of the design case study terminal will be applied to the basic form, determining the effectiveness of the revised arrangement.

3

Context Analysis

Fig 92

Chapter Intention

This chapter analyses the proposed regional context, the Wakatipu Basin, in order to give credible evidence to support the establishment of a new town next to existing airport infrastructure, as well as identifying specific urban program requirements for the selected site.

The ensuing context analysis seeks to achieve the following:

- investigate the surrounding regional structure of the Wakatipu Basin, identifying surrounding geography, existing centres and their roles;
- initiate a population growth feasibility study inclusive of the resident and visitor populations as well as the airport passenger numbers, based upon actual statistics to establish where the projected growth will occur, validating the possibility of a new town next to existing airport infrastructure;
- analyse the existing urban structure and infrastructure of the context surrounding the site and identify the existing proposed plans for urban development surrounding the site;
- present and compare three site proposals based upon the context analysis and subsequently select the best proposal [based upon previously identified design principles] to form the design case study within.

3.1 Wakatipu Basin

Fig 94

Wakatipu Basin is a 290sq/km area of relatively flat terrain [in comparison to surrounding topography] in Central Otago, located southeast of the Southern Alps mountain range.

The geographic composition of basin is formed by *Coronet Peak* to the north, the *Crown Range* to the east, the *Remarkables* mountain range to the south and the *Ben Lomond* mountain range and *Lake Wakatipu* to the west. Contained within this geographic frame is the highest developed urban area within Central Otago, comprising Queenstown and its subsidiary urban centres.

Lake Wakatipu adjoins the southwest of the basin via two inlets: the minor; *Queenstown Bay* and the major; *Frankton Arm*. Queenstown's centre and ancillary built fabric are built around the coastline of these inlets. The *Kawarau River* begins at the east of the Frankton Arm, draining Lake Wakatipu and running east through the Kawarau Gorge. The *Shotover River* branches off the Kawarau River and runs north. *Lake Hayes* and Lake Johnson are two bodies of water also within the basin.

Fig 95

Wakatipu Basin comprises 2 major commercial centres; *Queenstown* and *Frankton*. Although each centre essentially has the service capacity to support it's respective surrounding residential population, both have distinctly different social and economic roles. *Queenstown* is the centre of the region's tourism industry, with an intensive cultural identity, whereas *Frankton* comprises supportive retail fabric. A further breakdown of these two centres ensues on the following pages. 'Outlying' suburbs appropriate in isolated clusters, or as singular rural dwellings in the remaining flat areas within the Basin. Aside from the township of *Arrowtown*, this area comprises solely residential [and some accomodation] fabric, with both *Queenstown* and *Frankton* sharing the commercial servicing of residents.

3.2 Existing Centres

Queenstown is the urban core of the Wakatipu Basin region. It consists of high density, low-rise, fine-grain built fabric. The centre is the region's hub for its prosperous tourism industry, containing commercial retail and hospitality, as well as being a social and cultural mecca within New Zealand. Urban fabric is diverse; rich in the heritage of its establishment at the height of the 1860's Otago Gold Rush, with iconography and thematic influences in contemporary development. The result is a cohesive, identifiable town centre.

The Queenstown settlement has expanded to a size that is exhausting its surrounding geographic restraints; steep topography and Lake Wakatipu. [fig 91] Although hillside residential developments can continue to be built upon the urban fringe, the commercial Queenstown town centre is fast consuming remaining central space. Subsequent expansion is decentralised, filling fringe areas and negating cohesive expansion. The District Plan of the region prohibits building heights more than 12m, meaning centralized commercial development is finite in all directions.

Fig 97

Fig 98

Contextual Proximities

Queenstown Centre

Fig 99

Frankton Flats is a subsidiary centre, located at the geographic centre of the Wakatipu Basin. It comprises two main urban centres; Frankton/Terrace Junction and Remarkables Park Shopping Centre, distanced approximately 1.7km apart. Frankton/Terrace Junction is a gateway settlement en-route to Queenstown, residing beside a major intersection, where the arterial State Highway 6 meets the access road to Queenstown. This area of development is directed toward a transient, vehicular-based market, consisting of strip-mall built fabric; retail, fast-food, offices and a petrol station.

Fig 100

- Urban Fringe
- Commercial Centre
- Open Space

Fig 101

- Built Area [within]

Remarkables Park Shopping Centre is a retail centre, also heavily vehicular-based, mainly consisting of NZ franchise stores bordering a single level carpark. The pedestrian is considered, with wide-footpaths and effective wayfinding through the centre. The carpark is congested through peak seasons, with supplementary carparking provisions residing upon surrounding unprepared green space. Built fabric is a mixture of fine grain and big-box, again, mostly strip-mall type. Aesthetic cohesiveness is gained through an overall language of material, form and color palette.

Contextual Proximities

Frankton Centre

Fig 102

The purpose of an initial feasibility study is to give credible evidence and applicable context to one of the starting points of the thesis; *the Stats NZ sub-national projection*. The outcome will determine the growth of the Wakatipu Basin in terms of population quantity and where resident growth is expected to go. This is a key step in the analysis of the site at ascale; applying actual tested data. To do so, StatsNZ’s projected growth rates from the past 7 years estimates are averaged, and applied to the current *Wakatipu Basin* population, to approximate a general overall estimate for the next 25 years of growth.

The ‘Growth Projection’ report prepared by ‘Rationale Ltd.’ for the Queenstown territorial authority is the latest iteration in population growth data available for the QLD area. The report provides a population projection for the next 25 years [from 2011-2031], investigating existing population growth rate data; developing an approximate population estimate for this time period. Clusters of existing dwellings are then identified, and estimates for the existing dwelling capacity and resultant residual dwelling capacity of defined residential settlements in the Queenstown-Lakes District are determined. This will be used as a tool to identify the *physical dispersal* of the projected resident population. To establish resident catchment areas, the Wakatipu Basin has been split into 4 clustered regions, and the residual capacity study is applied to approximate the estimated residual dwellings in each. The ‘usual resident per dwelling’ coefficient (2) is then used to determine an approximate resident population for each region. This process gives a more focused overview for where development is predicted to occur within Wakatipu Basin. *Results show* that the Frankton Flats region [the Queenstown International Airport site] is projected to accommodate the largest percentage of resident population growth. This provides a major impetus for the siting of the design case study.

Queenstown Central and its urban fringe settlements reside within landlocked geography. The residual dwelling capacity is 26% - mostly consisting of medium to high density residential near the centre of Queenstown, with lower density housing on the periphery. The *north-east region* contains a mixture of residential settlements, ranging from low density ‘sub-divisions’ [consisting of a range of housing types, from spec homes to high quality, exclusive settlements] to rural residential and open space/farmland. The identified settlements and open space make up 16% of the residual dwelling capacity. *Kelvin Heights and Jacks Point* are both low density residential settlements, comprising 21% of the total residual capacity. The remaining 37% of the residual dwelling capacity is the least dispersed, focussed solely within the *Frankton Flats* area, containing just over a third of the entire residual dwelling capacity.

At the time of writing, the current total [domestic+international] number of passengers through the Queenstown International Airport is approximately 1,215,400 in the last year. Although the existing airport is currently within it’s capacity, the Queenstown teritorial authority have produced a masterplan for the expansion of the airport, detailing the size of the various terminal program elements as of 2008 and the spatial needs for it’s ensuing expansion to handle the growth of passenger numbers.

Element	Domestic	International
Check-in	1000m²	
Security	90m²	170m²
Outwards Immigration	-	130m²
Departure Lounges	1095m²	
Airline Lounges	275m²	-
Retail	1050m²	
Primary Check	-	330m²
Baggage Claim	310m²	620m²
Baggage Examination	-	300m²
Arrivals Hall	-	280m²

Domestic	International
2000m²	
440m²	
-	225m²
1670m²	
400m²	-
1800m²	
-	660m²
620m²	620m²
-	400m²
-	600m²

A ‘Growth Projections’ report for the Queenstown International Airport prepared by ‘Airbiz’ for the Queenstown territorial authority projects that by 2037, approximately 2,348,150 passengers will pass through the terminal. The masterplan produced by the territorial authority details the airport terminals required programmatic spatial needs for the year 2023. These figures will be used as an assumed ‘specific requirements’ for the planning of the terminal, as the requirements for the 2037 growth projections are unknown. The design case study investigates the inclusion of the ability for expansion, the terminal could hypothetically be expanded to account for the specific passenger growth projections to 2037 and beyond.

3.3 Existing Urban Structure

[Existing Major Public Amenity]

Frankton

Frankton Industrial Estate exists on the periphery of Frankton Flats, centralizing all industrial activity and depots, inclusive of the Queenstown Refuse and Recycling Station. Built fabric is predominately strip-mall type, containing trade/servicing warehouses, and offices.

Frankton + Terrace Junction is perhaps the busiest intersection in the region, comprising a developing strip-mall retail base and major petrol station, concentrating vehicle volume around an already heavily stressed roundabout.

Queenstown Events Centre and Davies Park is the designated green space and recreation facility within Frankton Flats. It contains a commercial swimming pool, natural 360° amphitheatre, fitness circuit, gym, gold green, indoor/outdoor courts and a significant amount of undefined green space.

Remarkables Primary School is the only primary school in the Frankton area, centrally located, serving a large catchment area. It resides on a collector road, off the major arterial route through Frankton.

Kawarau Falls Station is a mixed use accommodation development in varying stages of completion. Comprising visitor and resident accommodation, it is a tourism stimulant in close proximity to Frankton, engaging a large visitor/resident market.

Lakes District Hospital is a low-rise, large format building, on a site with room for expansion. It services majority of the Lakes District area and is in close proximity to the airport; pertinent for emergency aircraft services.

Remarkables Park shopping centre is essentially a large-scale cul-de-sac, at the end of a collector road, primarily accessed via car or public transport.

Fig 104

Fig 105

Fig 106

Fig 107

Fig 108

Fig 109

Fig 110

Fig 111

[Proposed Centre Developments]

Frankton Flats

Shotover Park shopping centre is a retail development proposed for northern Frankton Flats. An version of the early plan is shown, consisting of predominantly big-box retail, inclusive of hardware supply/ DIY/trade stores. Bordering the industrial park, the placement of this development is pertinent, as an extension of similar activity (industrial, trade).

Urban form is low density, comprising large-format buildings surrounded predominantly by single-level carparking.

Five Mile retail centre is another proposal for the northern side of the airport runway. The area will contain big box, bulk outlets, as well as smaller scale retail.

Shotover Park and Five Mile are being developed by different companies; although each 'centre' is targeted toward different markets, commonalities (supermarkets, department stores) naturally breed competition. Lack of coherency between the two, in conjunction with an overall focus on the car dicourages any discernable urban heirarchy. The result is an overall urban 'field' - consistant urban fabric, without heirarchy of form and planning.

Remarkables Park expansion is proposed to fill residual space south of the airport runway. A mixture of uses is planned (shown on map), inclusive of retail, high density residential, a high school, convention centre and 'resort village'. Development occurs over an elongated area, upon an 'organic' proposed road structure. Although connected into a new minor arterial road, the proposed road structure is light for such a large area, with minimal access routes, resulting in large block sizes.

Fig 112

Fig 113

Fig 114

Fig 115

[Wakatipu Basin]

Roading Context

Queenstown

Arterial
State Highway 6A

Frankton

Queenstown Airport

Remarkables Park

Arterial
State Highway 6

Arterial
State Highway 6

Crown Range Road

[Existing Road Structures]

Frankton

Frankton Flats has a hierarchical road structure, handling the complexities of road user demands. This structure is categorized through an existing set of road types, each with a different intended role. Although these definitions don't exclusively operate as the sole use of a given road, a categorical identification and analysis provides a framework for fitting new urban fabric to an existing network.

The diagrams below represent the typical form of the each category, as well as a definition of its role:

Arterial roads connect traffic from region to region and *gather* all traffic within the network. Volumes of traffic on arterial roads are therefore the highest, as are vehicle speeds and the average distance travelled.

Collector roads essentially connect the arterial and the local road, operating with functions of both; *gathering* and collecting traffic as a smaller scale arterial road as well as *dispersing* traffic to specific destination and local roads.

Local roads *disperse* traffic to specific destinations, "comprising 90% of street mileage, but carrying less than 10% of total vehicle miles." [American Planning Association 226] Therefore, vehicle volumes within the local network is generally low, as is the average distances travelled, dependant on the overall local structure.

Arterial Roads through Frankton Flats handle traffic from several directions. Regionally, the arterial roads are the single vehicular access path from southern centres (Invercargill and rural farming communities on SH6) as well as centres to the north + east (Dunedin, West Coast, Christchurch, SH6, SH8). Locally, the arterial borders the north of Frankton Flats, connecting traffic from the industrial park and Events Centre. North-west of Frankton Flats is the aforementioned 'Terrace Junction,' a roundabout where three major arterial routes meet. Peak times daily and annual peak seasons pressurize this junction. The western arterial penetrates the Frankton residential settlement, collecting traffic from both sides, as well as from the south. Airport and Remarkables Shopping Centre traffic connect to the arterial at a major roundabout, along with lower priority alternative collector routes.

Collector Roads form a secondary connective structure to local roads within Frankton Flats. No underlying logic to the structure is evident, aside from directive links to key areas of amenity (Airport, retail centre, surrounding suburban centres, industrial park, events centre). The ensuing curvilinear block structures are mostly irregular. Local roads connect to the collectors at various points, predominantly through T-intersections, summing in an overall irregularity of urban form and low-connectivity street network. The addition of further commercial/residential development, especially in the Remarkables Park area, without provisions for a higher connectivity road network will induce congestion through minimal routes, further pressurizing existing major (Terrace Junction, Airport) and minor (collector to local) intersections.

Local Roads comprise the remainder of the network, primarily consisting of streets containing low density residential. The local street structure continues the irregularity of the collector roads, with no evident functional coherency or logic to the overall layout. Majority of local roads end in *cul-de-sacs*, minimizing the amount of routes able to be taken, resulting in a notably low-connectivity street network. Low connectivity within the local road network focuses traffic back upon collector roads and therefore arterial roads, creating a further addition to overall pressured arterial intersections.

[Site Selection]

3.5 Proposals

In immediate proximity to existing airport infrastructure, three 'proposals' for the site of a town centre are compared. The results of this evaluation determines the site for the design case study. Along with being located in three distinctly different physical locations, each proposal has differing levels of interaction with existing built fabric and the overall urban structure.

These proposals are established from the preceding context analysis; identifying locations of existing built/unbuilt space, amenities, and underlying urban network/infrastructure.

The subsequent site selection results from the application of the set design principles:

Expansion Potential

The purpose of this is two-fold; determining how and where urban development could occur, and existing physical parameters that hinder expansion.

Airport Proximity

This criteria is established from the design case study intention, identifying the location for the required interface between airport and urban fabric. Each proposal identifies the broad intention for this interface.

Connectivity/Accessibility

This criteria identifies the relationship of urban development to existing road structures, determining the level of overall connectivity and accessibility.

Proposal One instigates development of the existing airport site. As the proposal appropriates in close proximity to existing built fabric, the resultant design case-study would comprise an adaptive re-use of the existing airport building, and an urban intensification of the existing surrounding fabric.

Expansion Potential

The crossing runways to the north and existing low-density residential to the south provide initial built constraints to development. These parameters frame open-space quadrants to the south; interacting with existing Remarkables Park, and hospital to the west; interacting with the existing school and hospital. These growth vectors allow linear expansion in two directions, terminating at the lakefront and rivers-edge.

Airport Proximity

The geographic centre of this proposal is the existing airport. Urban intensification is within immediate proximity of the airport, with the adaptive re-use of the airport comprising an investigation into an interface between public space and airport territory. From this central point, urban fabric cascades through available unbuilt space.

Connectivity/Accessibility

The proposal area provides 3 points of access from existing major roading infrastructure. However, the location of arterial and collector routes within the proposal area severs urban development through the western and southern quadrants, potentially disintegrating cohesive linear intensification.

Proposal Two sites the airport to the south-east side of the crossing runways. This proposal is an 'alternative solution' to the current expansion plans for the Remarkables Park Retail Centre, infilling available space south-east of the runway.

Expansion Potential

The schematic plan shows the intended spatial arrangement, with indicative allowances for land uses. The plan shows the intended urban development location, around the airport terminal. Existing (absolute) constraints are the crossing runways to the north/west, existing Retail Centre to the west, and the Kawarau River to the south.

Airport Proximity

Schematically, this option implements an L-shaped 'wrapping' interaction between urban fabric and the introduction of an airport/supportive services. This provides the means for a linear interface between airport and urban fabric. The patterns of urban development draw from a single origin point, (Remarkables Park) and 'wraps' around the airport zone, initiating a linear interaction between the two programs.

Connectivity/Accessibility

Connections to the arterial roads are indirect, with access gained via the existing/proposed collector road. This collector provides the only access from either end, penetrating through the centre of intended town centre. This proposal is the least accessible from existing arterial routes.

Spatial Allowances:

- Proposed terminal
- Airside activity
- Airport expansion
- Central Urban Fabric
- Surrounding development

Possible [major] points of connection from proposal area to other areas.

Expansion direction from relative origins

Arterial Collector

Fig 125

Proposal Three sites the design case study on the north side of the runway. Again, this proposal is an 'alternative solution' to the current plan for Shotover Park and Five Mile retail developments, assuming the site is greenfield and undeveloped. The industrial park to the east, arterial route to the north, and designated green space to the west form a physical perimeter, however, these land uses prompt interaction and are therefore included as integrated uses within the wider scheme.

Expansion Potential

The airport is sited parallel with the main runway, allowing for linear expansion of the terminal and urban fabric.

Airport Proximity

The overall spatial arrangement is heirarchical, originating from the airport, defined as the town centre, with urban development emanating from the airport terminal.

Connectivity/Accessibility

The 'edge' relationship of the existing road structure to the site provides multiple nodes of possible connections into arterial roads at the four corners of the study area, as well as elongated exposure to the edge of the major arterial road to the north. A high connectivity/accessibility network is the resultant intention for the proposed site, serving to assist and ease current and induced traffic issues as a result of an increasing population.

Spatial Heirarchy:

- Proposed airport
- Airside activity
- Airport expansion allowance
- Urban Centre

Possible [major] points of connection from proposal area to other areas.

Expansion direction from relative origin

Arterial Connector

Fig 126

E v a l u a t i o n

Expansion Potential

Although each proposal shares an edge with the existing runways, the crossed configuration of the main and secondary runway informs the placement of the airport terminal and subsequent urban establishment and expansion.

Within the smallest quadrant, *Proposal One* borders two major runway edges that inform an expansion direction into a limited amount of available open space. As the existing terminal is at the centre of the runway bisection, urban intensification is heavily dictated by the runway orientation, essentially resulting in a form of concentric development.

Although less restricted, *Proposal Two* is also dictated by the two major runway edges. The proposed urban centre is an extension of existing Remarkables Park Shopping centre and residential zone. The openness of the greenfield site allows the both the airport and urban centre to take into account expansion, whilst maintaining an interface between terminal and urban fabric.

Proposal Three sites the airport along the major axis of the main runway, prompting an entirely linear urban structure and interface between the terminal and urban fabric.

Airport Proximity

Each proposal shares an edge with the border of existing airport infrastructure, satisfying the basic requirement of the proximity design principle. The design case study will address proximity, specifically exploring the interface between the terminal and urban fabric.

Accessibility/Connectivity

The three proposals all have different interactions with existing road infrastructure.

The main arterial route connecting Queenstown/Frankton with the surrounding regions severs the proposed development direction of *Proposal One*. Although the development is well connected to the existing road network, the intensification of the urban/pedestrian environment would induce higher levels of vehicular traffic along the artery, potentially inciting congestion issues on an already pressurized road.

Proposal Two is the furthest removed from the arterial route. Although there is no direct interaction with the main arterial route, it would reside on a collector route with two points of connection to the arterial.

Although *Proposal Two* has a good level of connectivity to the existing road structure, the location of *Proposal Three* offers the best potential for a high connectivity road network. The location of the greenfield site shares an entire edge with the arterial route, as well as potential exit points to other areas in 2 other locations. The addition of a high-connectivity network to the site would also provide two more alternate routes to the south of Frankton Flats. This would serve to assist pre-existing congestion issues by providing alternate routes to the Terrace Junction roundabout.

Proposal Three

- housing for the resident population of approximately 8000 people in a mixture of medium to high density housing [although the feasibility study displaces this population upon the entirety of the Frankton Flats region, the design case study assumes majority of this population will be focused upon the proposed site];
- accomodation for the growing visitor population [this will entail an assumed provision for visitor accomodation, hotels, etc; as specific visitor dispersal numbers could not be located];
- the sensible inclusion of the proposed big-box retail developments [exisiting plans proposed the need for big box retail based upon the needs of sustaining the growing population of the wider region, so should be included within the centralized development]
- an office precinct, providing a location for local business, promoting an overall live/work environment for the immediate resident population.

Fig 127

4

Sketch Design

Rapid Sketch Process

This design iteration is an ‘application’ of a pre-existing airport footprint, *within* a pre-existing block format. This process is a *context-less* application exercise at an *urban* scale. The intention of this is rapid form production, providing a series of initial sketch designs. The sketches are arbitrary, using the case study airport terminal footprints and New Zealand town block structures as a ‘kit of parts’ to inform this initial design stage.

The 10 New Zealand towns were selected based upon the population they support, comparable to the population of the design case study town. 5 were selected from each of the north and south islands of New Zealand, all comprising different underlying block structures. In order to gain an understanding of overall density within the block structure, figure ground diagrams were produced for each. They represent the *town centre* fabric, with a surrounding field depth of *one block*, for context.

The urban structural driver of this process is the exposure to an *edge*, as the airport terminal gates require a physical connection to the apron and runway. The schematic analysis of the NZ town centres [page 89-92] identifies ‘edges’ of each basic block structure; this process identifies these edges as the basis of placement next to the runway edge. 8 of the town centres [excluding; Wanaka, as its central fabric size is significantly smaller than the rest; and Queenstown,

Process Intention

as if its sketch design layout was successful it could be a mere replication upon the Frankton site] were then represented as a simple block structure of the central fabric, as well as a figure ground diagram. From this placement, the case study airport terminals [excluding Learmonth as its relative size is significantly smaller; Graz and Aalborg terminals are almost the same size so they are represented as a singular rectilinear terminal] are ‘applied’ to the block structure in various configurations and interactions with the edge. Upon the basic block structure, the process of landside to airside from urban fabric to apron edge is ‘tracked’ to show schematically how the configuration of the terminal. Although the sketch designs aren’t represented to scale, the urban centres and airport terminals are at the same scale, communicating the proportional geometry of both.

From the sketch investigations, a series of ‘new’ urban forms are generated, integrating the airport terminal into an overall [existing] block structure. Although this process ignores many functional processes the airport requires for operation, they generate an initial context to initiate development of an urban form. These urban forms will then be filtered dependant on their adherence to the defined design principles, in order to produce a series of formal design strategies to apply to the design case study.

North Island

Fig 128

Whakatane

Urban Population: 15 192

Linear
Irregular Grid
Continuous
Stand-alone

The central continuous linear street edge is the central commercial district. The overall form is heavily informed by the surrounding geography [north and south-east]. The resultant block form is irregular.

Cambridge

Urban Population: 17 703

Centralized
Irregular
Perimeter
Stand-alone

Multiple irregular, linear road axis converge forming a centralized point. Central, dense fabric is surrounded by lower density development.

Taupo

Urban Population: 23 100

Dispersed
Rectilinear Grid
Perimeter
Stand-alone

Base rectilinear grid format; active street frontages dispersed through multiple perimeter block forms. East blocks are low density, less intense. Edges are abrupt to the west and south, bordered by the main arterial route through the centre.

Levin

Population: 19 550

Linear
Irregular Grid
Continuous
Big Box

Elongated active street edge along the arterial route with varying intensities of fabric along linear edge. Back edge [east edge] of elongated fabric aligns to the rail line, providing a barrier to the public edge.

Masterton

Urban Population: 20 300

Dispersed/Linear
Irregular Grid
Continuous
Stand-alone

Linear centre street front down central street, stand-alone fabric behind, contained within a two block wide road structure, separated from lower density fabric. Artery route is offset from the central route.

South Island

Fig 129

Greymouth

Urban Population: 9 940

Dispersed/Linear
Irregular Grid
Continuous
Stand-alone

Base rectilinear grid format; linear main street with subsidiary, lower density fabric dispersed through grid (south-west of main street). Water, rail line and collector edges sever the grid pattern, informing the overall urban form.

Ashburton

Urban Population: 18 950

Dispersed
Rectilinear Grid
Perimeter
Big Box

Base rectilinear grid format dictates entire field; active perimeter on selected linear blocks, dispersed through two separate regions. Central transit axis containing artery and collector routes and rail line sever a direct connection between two block centres.

Wanaka

Population: 7 320

Linear/Centralized
Rectilinear Grid
Continuous
Stand-alone

Simple rectilinear grid format; main active street frontage is along two major perpendicular axis, with secondary active fabric behind. Water, artery and park edges contain the block form.

Oamaru

Population: 13 350

Linear
Rectilinear Grid
Continuous
Continuous

Base rectilinear format; continuous, linear, active street frontage, small amount of subsidiary fabric behind. Artery route comprises north main street, diverting at mid point. South main street continues a linear pattern on a less vehicle focused route.

Queenstown

Urban Population: 16 600

Dispersed/Centralized
Irregular Grid
Perimeter
Perimeter

Irregular grid pattern; active street frontages dispersed throughout field with small amount of surrounding lower density fabric.

Whakatane

Cambridge

Masterton

Greymouth

Ashburton

Oamaru

[Context-less]

Sketch Design

Form Identification

A further rapid selection criteria was applied in order to show the immediate potential of each sketch design. The site proposals [page 80-85] were framed around the three main design principles, expansion, proximity and accessibility. In order to align the sketch selection process with the site proposal, the same design principles are applied to the sketch designs.

Principles:

- Expansion: The ability for the airport terminal to expand, whilst retaining a level of direct physical interaction with urban fabric.
- Proximity: The level of potential interaction the terminal has with the urban environment
- Accessibility: How the block structure provides vehicle/pedestrian access to the terminal

From the application of these principles, filtration of this design iteration exposes 3 different interactions between the airport terminal and adjacent urban fabric. Although many of the sketch designs exhibited similar versions of these interactions, the 3 selections are the clearest expressions. These interactions are defined as *design strategies*, intended to be used to initiate base form of the design case study.

Fig 134

Formal Design Strategies

Offset

The Masterton block structure comprises a linear, high-connectivity rectilinear grid network. The placement of the airport within this structure is *offset* to the east, with access residing upon the main artery through the block pattern. This allows for the expansion of the airport terminal from the east edge, whilst maintaining close proximity to urban fabric, via two edges of interface.

Project

The overall Cambridge block structure comprises an irregular pattern. This configuration *projects* the terminal outside the fabric, with a spatial allowance for landside operations to the south of the terminal. As the terminal is offset outside of the urban fabric, linear expansion of the terminal from each end is allowed for. In this example, the block structure south of the terminal is open, leaving the potential for a town square, comprising three urban edges and the landside edge of the airport terminal.

Embed

The Levin configuration *embeds* the airport within the linear edge block structure. This strategy provides urban interaction with the terminal edges, however such heavy integration negates east or west expansion. In embedding the terminal in such close proximity with adjacent urban fabric though, the landside edge would become an extension of the street edge.

[Context-less]

Sketch Design

Form Development+Design Strategies

The three formal design strategies established through the form generation phase are further explored through a process of sketch development. This phase identifies the schematic implications of the strategies, followed by a sketch exploration.

A sketch design development process explored various schematic interactions with the base form of the identified design strategies, investigating terminal proximity to urban form, methods of expansion and the provision of an high connectivity street network.

The *offset* strategy was investigated as a means for the terminal to occupy the street-edge. As the form is at the edge of the block structure, airside operations can be developed to handle their required functions, without interfering with the urban edge. Whilst maintaining the street edge at the east of the terminal, *landside operations* are placed within the block pattern to the south.

The *embed* strategy was formally explored in combination with the *project* strategy. Satellite piers are projected out from the base form, administering isolated operation upon the apron. Residual space locates landside operations on either side of the central concourse, whilst maintaining a linear street-edge relationship between the landside concourse and urban fabric. The final sketch breaks up the footprint of the concourse, referencing the block structure. These transparent sections of the terminal would provide visual connections and coherency between urban fabric and airside.

Fig 135

Strategy Establishment

Offset

Offsetting terminal placement within the urban fabric allows the terminal to have two free edges on both landside/airside. This allows airside access to the gate edge of the terminal, initiating airside processes upon the apron on one edge, as well as providing a spatial allowance for expansion from the other edge. The remaining two edges of the terminal can then have a permanent interaction with the urban fabric.

Project

Projecting the terminal from the edge of the urban fabric allows expansion at either end, whilst maintaining a singular interface edge with the urban structure. As shown in the Cambridge sketch design on the previous page, a spatial allowance for landside operations would need to be maintained, otherwise the terminal would directly abut the urban edge.

Embed

Embedding the terminal within the urban fabric provides the gate edge of the terminal a physical connection with the apron and maintains an urban interface with the remaining three edges. This strategy is the most restrictive in terms of expansion as well as landside operation allowances, negating both terminal expansion and spatial allowance for landside operations.

Design Case Study

Fig 136

Chapter Intention

This chapter documents the outworking of the design case study. The implementation of established design principles, strategies and interventions provide the grounds to determine how the hypothesis claim is met, through the outworking of an in-depth design scheme. The case study operates at two scales; the urban [how the scheme as a whole fits within the existing context] and the architectural [specifically how the urban/airport terminal interface was addressed].

Strategy Implementation

Fig 138

Contextualizing Formal Strategies

The previous design investigations were explored outside of site context, aside from an interface with the runway's edge. This process formed a series of design strategies to apply upon the chosen site.

The in-context urban proposal [79-82] identified basic formal and schematic identification of the surroundings. As a starting point, the parallel arterial route and the apron edge are the two infrastructural edges, along with the perpendicular edges: the recreation grounds to the west and industrial zone to the east; both existing and functioning uses. The contained site is greenfield, with a singular established access route [Grant Road]; the starting point for the proposed retail centre. The existing edges and Grant Road frame the context for which the design case study is initiated within.

The ensuing sketch design phase begins the process of forming an urban structure, through the implementation of the identified design strategies; project, embed, offset, in combination with the revised terminal strategy.

Developed Design

Fig 139

Fig 140

[Design Documentation]

Urban Masterplan

Fig 141

[1:12000]
Fig 142

Design Intervention:

Urban Program

Zoning Breakdown
Fig 145

Fig 145

Aligned with the envisaged programmatic needs from the site selection process, this *design intervention* shows a schematic breakdown of uses, 'zoned' within the underlying grid structure.

Central Mixed-Use

1:20000

Closest to the terminal, this zone is the new-urban hub of the centre, culminating at the town square. Building types are fine-grain, mixed use; comprising ground-level retail and small business, focused on pedestrian use, contained within a 400m diameter precinct.

Integrated Big-Box

1:20000

Large-format retail borders the arterial route to the north. Aligning with the existing actual plans of Frankton Flats developers, this zone re-organizes their layout to define street edges, centralizing car-park fields. Central car parking has a sub-level allowing for a high capacity - centralizing car parking for the entire commercial zone of the town; promoting a walkable, pedestrian environment.

Accommodation/Apartments

1:20000

Upon the central collector and within proximity to the airport terminal is a series of multi-level apartment buildings or hotels. Bordering the south edge of the residential zone, these medium rise buildings also serve as a noise dissipation technique for any jet noise travelling from aircraft idling on the apron.

Office 'Park'

1:20000

Bordering the arterial is an allowance for office-blocks, within walking distance from both the residential precinct and central town fabric. This is intended to provide a live-work-play environment for residential with local businesses. Arterial edge also provides an opportunity for advertising.

Permanent Residential

1:20000

Within 400m to the edge of the central town fabric is a residential settlement. The intention for this precinct is row-housing, offering an alternative to the low-density, 'sub-division' dwelling model, as is typical in the Wakatipu Basin. Bordering the residential zone is a green belt, separating housing from the industrial zone, whilst providing amenity park space for residents.

Industrial Zone

1:20000

This block is zoned for 'industrial use.' Dependant on the needs of the airport, this could be used for aircraft support/maintenance hangars, or as an extension to the eastern industrial zone.

Design Intervention:

Urban Connectivity

[Accessibility | High Connectivity Network]

Fig 146

Urban Infrastructure

Overall Grid Network

External Integration

Possible entry points from existing infrastructure

Internal Collectors

Main connecting routes through the centre

Internal Collectors

Secondary collector network

Design Intervention:

Airport-Specific Access

[Accessibility | High Connectivity Network]

Fig 147

Vehicular Airport Access

Integrated airport access – street infrastructure

1:5000

Public Transport Routes

Direction of flow – public transport network

1:5000

Accessibility/Connectivity

The preceding map set shows the implementation of the high connectivity network. Drawing from the initial developed design sketches, the focal-point oriented grid network was side-lined in favour of a more conventional grid structure, following the site borders. The internal grid structure is hierarchical, with two major collector routes, both with separate intentions. The first is for conventional public access, aligning towards the airport terminal. This collector provides access to the big box precinct and central town fabric. The second major collector an airport-specific route, predominantly intended for airport traffic.

As seen through the “external integration” map though, these are not the only access routes for both uses. The power of such a connected urban framework is that traffic is dispersed throughout, dependant on relative uses.

An intended route for public transport is also implemented, culminating at the transit hub; the north arm of the terminal. Again, the intention here is to keep vehicular traffic predominantly on isolated routes, however the option is there to take alternate routes.

The specific planning for accessibility and connectivity of this design intervention aligns with the established design principle, intended to provide a fully functioning street network for airport-specific traffic, offsetting vehicle dominated streets from pedestrian areas. The overarching idea is to create two mutually exclusive networks, each functioning as normal.

Design Intervention:

Noise Zoning

[Residential Zone]
Fig 148

A report [Marshall Day Acoustics] produced by acoustic engineers 'Marshall Day' for the Queenstown territorial authority provided a current representation of the noise contours produced by aircraft landing and taking off at Queenstown International Airport. Whilst the scrutiny of this report for the purpose of the thesis was not exhaustive, the physical data in the form of air noise boundaries was used for the zoning of the residential settlement within the town centre. The outer contour represents the 'outer control boundary,' predicted to have less than 55dBA of aircraft noise pollution. As 45-55 dBA is the generally accepted maximum level [RMA Quality Planning Resource, The] of noise for a comfortable environment in a residential area, beyond the outer control boundary is assumed to be an acceptable zone for residential use. Further measures were implemented in order to dissipate sound before travelling to the residential zone; an industrial area - green zone and an apartment block zone.

The inner noise contour is the 'air noise boundary' with a measured noise level of 65dBA. Although this zone may change with the re-located airport terminal, the rest of the proposed urban development resides within the 65dBA to 55dBA zone. This level of sound is, again, a comfortable level of sound in an urban area. [RMA Quality Planning Resource, The]

The overall scheme identifies noise merely in the residential precinct, as the the design hypothesis is focused on the urban/architectural implications of an urban airport terminal. As a result, planning in response to noise implications is schematic.

Fig 149

Terminal Documentation

The airport terminal realises the revised terminal strategy, implementing the ‘cut’ of the landside concourse, through the centre of the domestic and international terminals. In effect, the terminals ‘plug’ into each edge of the concourse, interconnecting all activity through the central axis. The overall structure has an intentional focus on transparency, comprising a series of viewports through the main edifice, in order to simplify and reveal the underlying programmatic structure to the civilian and the traveller. The ensuing plans, elevations and perspectives express developed design strategies and interventions.

The terminal retains single-level operations, in order to fully investigate the possibilities that this terminal type produces. This also means that all activity is kept upon a singular plain, so the airport and urban interface fully integrate, without separation. The plan as seen in figure 152 maintains all public airport operations. Pages 131-132 document level 1 and the sub levels containing private and back-of-house operations.

Ground Level Plan

Terminal Plans

[1:3000]
Fig 153

Terminal Figure Ground

1:2000
Fig 154

Park Space

Green Space [notional]
Apron Barrier

1:2000
Fig 155

Active Edges

1:2000
Fig 156

External Program

- Pick-up/Drop-off
- Parking
- Future Parking Provisions
- Public Transport Hub

1:2000
Fig 157

Design Documentation

Expansion Intentions

South Elevations

Fig 159

Reference Plan @ 1:2500

South Elevation A-A [International]
@1:1500

South Elevation B-B [Domestic]
@1:1500

South Elevation C-C [Concourse]
@1:1500

North Elevations

Fig 160

Reference Plan @ 1:2500

North Elevation A-A [International]
@ 1:1500

North Elevation B-B [Domestic]
@ 1:1500

North Elevation C-C [Concourse]
@ 1:1500

North Perspective
[NTS]

East-West Elevations

Fig 161

Reference Plan @ 1:2500

West Elevation A-A [Domestic]
@1:800

East Elevation B-B [International]
@1:800

West Elevation C-C [Domestic]
@1:800

East Elevation D-D [International]
@1:800

Landside Concourse

The landside concourse is the facilitator of all passengers, via all means of transport. Internally, a series of modules house airline bag-drop facilities at ground level, with offices and private space elevated, in order to keep the ground footprint minimal. This allows for a significantly transparent overall ground plane. All baggage processes are housed at a sub-level also, further maintaining pedestrian processes at the ground level.

Internal Modules
Fig 162

Structure + Envelope
Fig 163

- Entrance Lobbies
- Unprescribed Transition Zone
- Retail Edges
- Services/Private Space
- Check-in Concourse
- Check-in Desks/Bag Drop
- Domestic Baggage Claim
- Vertical Circulation
- General Waiting/Observation Zone
- International/Domestic Terminals

[1:1500]
Fig 164

Concourse Envelope

Fig 166

The main concourse envelope is the materialization of the literature review of the conceptual role of the airport. A physical modeling process realised the basic form. Initiated from the basic rectilinear concourse plan, the roof canopy developed in acknowledgement of either edge. The 'vehicle' edge offers a large projected angular canopy, in reference to the aerofoil roof trend of the airport. The pedestrian edge aligns with the intention of the smaller scaled domestic canopy, lifting back off the internal program, serving to notion toward a 'reveal' of the inner workings of the terminal to the urban edge.

Conceptually, the steel canopy structure of the landside concourse is intended to assert a visual dominance over the lighter, timber frames of the international and domestic terminals, making a statement of permanence, as the main expression of avian form.

Fig 167

International Terminal

Fig 169

Departure Tracking

Arrival Tracking

Fig 172

Domestic Terminal

Fig 174

Departure Tracking

Arrival Tracking

Domestic Module

The domestic terminal implements a universal gate system. This is to reduce the amount of gates required, as it's function has the ability to change dependant on the arrival or departing direction of travel. This system aligns with the directive arrival/departure development of the 'revised' terminal scheme. A conceptual construction technique provides the opportunity for consistant linear expansion. The modules consist of an underlying programmatic structure, based upon the timber grid network.

A steel canopy provides the roof envelope, with a lifted orientation upon the urban edge, instilling an aesthetic notion of 'revealing' its inner program to the urban environment. The module's inherent transparency also serves to 'reveal' airside processes [upon the apron] to the urban inhabitant. The canopy comprises a directive skylight, motioning the passenger toward through the transitional corridor from landside-airside.

Fig 177

Fig 181

Fig 182

Chapter Intention

This chapter discusses the design case study, within the framework of the established design principles. The discussion will address how the design principles were met at the two scales the design operated within; the macro scale [the wider urban context and how it fits within site conditions] and the micro scale [the architectural design of the airport terminal and its interface with urban fabric]. The discussion also identifies many potential avenues for further research, as questions were raised in response to the initial hypothesis.

Amalgamation of Design Strategies

At the ‘strategy establishment’ stage of the design process, the three urban interface design strategies assumed basic geometric methods to initiate a formal structure for the design case study. Although all three were tested in a sketch design phase, the ‘project’ strategy was implemented in the design case study, as it was found to be the most successful geometric combination with the revised terminal design strategy. This allowed the new terminal spatial arrangement to be explored whilst maintaining a street edge interface.

Micro Scale: The Terminal Interface

Proximity

The implementation of the project strategy adheres to the proximity principle, directly amalgamating the two environments upon a singular street interface, allowing activities of both to also operate in mutual exclusion. The triangulated urban centre, although implements a spatial separation between environments, proves to be a positive interface, as both the domestic terminal edge and the pedestrian edge of the landside concourse aren't invasive upon the functions of the facing urban environment. The active treatment of these edges is a materialization of the conceptual exploration in the airport chapter section "Urbanity Within"[page 29-30], identifying similarities between the social activities within the airport terminal and the urban environment. The activation of these exterior edges serves to mask the intensive, internal airport-specific passenger processes, whilst allowing for the amalgamation of the more social activities upon the façade of the terminal building. The resultant pedestrian edge definition assumes a smaller scale, inverse use of the embed strategy, injecting a street-edge urban language within the terminal building.

Expansion

Use of the project strategy provided the uninhibited grounds to allow for future expansion. As the terminal program was based upon the 2023 spatial requirements, provisions for expansion were critical to the longevity of the terminal. The modular expansion system was intended to ensure the aesthetic and systemic cohesion of future expansion, in order that the terminal retains a life-long consistency. With a specific allowance for expansion, the physical 'ends' of both the international and domestic terminals in the design case study were left as open space. This isn't an issue at the international end as the space left is merely the end of the vehicle access road and open space isn't open to the public. However, as the domestic end is within a public zone, the 'open space' has an interaction with the urban interface. As a 'resolved' plan, the design case study assumes the area as 'park space'. This formal premise however, highlights an issue with a linear module system without consideration of an end point, as in theory, expansion is inherently infinite. The expansion principle intended to mitigate haphazard, incoherent airport 're-development,' in doing so, created the conditions for the opposite; absolute dictation of future form.

Connectivity/Accessibility

The revised terminal layout proved to be an effective barrier between the typical vehicle operations of the airport and the added pedestrian environment. This allowed both operations to be investigated in mutual exclusion, whilst maintaining a visual and programmatic connection; via the landside concourse. The separation transcended positively in terms of its accessibility and connectedness of the macro site, as the independent vehicle operations could be accessed directly from the arterial route, via a collector road, to the airport drop-off/pick-up/parking zone.

Macro Scale: The Urban Context

Proximity

Planning in reaction to the forces the airport served to be merely a geographic placement exercise in the design case study.

- i. Addressing the first macro proximity design principle [safety] was mitigated in the initial siting of the entire scheme, as the relative proximity of the settlement and schematic runway layout locates the scheme out of any aircraft trajectories.
- ii. Although in theory, zoning the residential precinct of the town beyond the articulated noise contours on site would mitigate the actual effects of current aircraft noise, the prospect of expansion could instigate issues of reverse sensitivity. With the expansion of an airport comes larger aircraft and extended operation hours, so although the relative proximity of the residential precinct is effective currently, this could develop negatively in later years. Preparation would be crucial in the construction of dwellings, installing acoustic penetration reduction techniques proactively, as opposed to retrospectively, as is the current case in some Frankton dwellings that reside within the noise contours.

Expansion

The design case study site to the north edge of the runway was finite at the remaining three edges [recreation grounds, arterial route, industrial zone], yet all allowed for intensive integration and interaction. However, although the design case study did not question the urban expansion of the urban environment, at a broader principle level, urban development along a runway edge would be an effect method of urban expansion in conjunction with the expansion of an airport terminal. Through the rapid sketch design phase, the NZ town centre block structures that reacted best to the injection of a terminal footprint had a ‘linear’ dominant structure, often oriented along-side State Highway 1 or a rail-line. In effect, this same principle could be applied in the urban expansion of an airport town centre, as the linearity of the airport infrastructure [runway] lends itself to this form.

Connectivity/Accessibility

The rigorous investigation into the existing infrastructure of the Frankton Flats region proved to be a crucial insight into ensuring a connected an accessible urban development. Intentionally providing means of access to both the urban environments and airport operations in mutual exclusion meant that in theory, each operation would not hinder the other. The nature of the grid network however does not assert exclusive use of the provided access route, allowing a multiplicity of dissipated routes through the entire development. A negative impact of the integration of an airport-specific route through the urban development though, could be that it severs the residential zones to the east. The intention behind the entire urban scheme was to instil a new-urbanist, pedestrian-oriented environment, in order to neutralize the transit-heavy nature of airport operations. For the settlement resident, having to cross the constant flow of an urban arterial route in order to get to the town centre could be an implication that detracts from the intention of the scheme. A further development of the scheme would be to investigate a method or a route that would not sever through the urban environment as intrusively, possibly through the marginalization of the route; whilst still maintaining an inherent connectedness and accessibility with the scheme as a whole.

Further Research Opportunities

- *Airport-Ownership/Market Research;*

The economy of decentralized airport retail is an implication that was side-lined in favour of the programmatic and architectural investigation. As airport terminal retail and the captive market is one of the main incomes for the airport owners, the close proximity to an urban retail environment could dissipate the market away from the terminal, resulting in airport profits potentially severely impacted. In terms of ownership though, if the airport and town centre were developed at the same time, on the same land, the airport company could be a large, if not a full stakeholder of land ownership. In the instance of Queenstown International Airport, the airport is owned run by the Queenstown Airport Corporation Limited [QAC], along with Auckland International Airport Limited [AIAL], who are 24.99% shareholders. If QAC were to own the selected design case study site [the site is currently privately owned], the fully urbanized land could be a major profit inducer for the local company and, in effect, would serve to even out typically high-cost airport retail. Although this is an optimistic proposition, the prospect of a public airport-owned town could be an avenue for further market research.

- *'Embed' Strategy Implementation;*

The project and offset strategies both provide a reasonably diplomatic amalgamation of geometry with the surrounding urban fabric. The “embed” strategy is invasive, asserting the program of the airport terminal upon its surroundings. The implications of injecting the terminal further into the urban environment would determine whether a full urban contextualisation would be detrimental or favourable to the operations of both environments.

- *Urban Noise Implications;*

The research intentionally side-lined the implications of noise within the urban interface, in favour of a formal, programmatic and architectural investigation of the airport terminal. Although noise was included as a design intervention in the macro planning of the town, investigation into if noise would be an issue in at the point of interface, in proximity to the urban environment. This could be a subject for further research.

- *Singularity of the Domestic Terminal;*

As the Queenstown Airport is of ‘international’ operation, the design case study ascertained the entirety of the type in its investigation [domestic + international]. Through the critique of the entire program, it was established that the domestic terminal level of operation provided an effective platform for integration into the urban environment. Aside from its security requirements, the domestic terminal fundamentally operates as any other transit interchange, [requiring a larger level of supportive operations – runway, maintenance facilities etc.] in its program. Without the consideration of the international terminal, domestic operations could function in closer integration into the urban scheme. Further research could comprise a case study into the urban integration of a domestic terminal.

- *The Modular Airport;*

As the airport is an ever-expanding edifice, the provision for expansion should be proactively accounted for, unless the design strategy is for over-compensation. The trend for hap-hazard, incoherent expansion can impact negatively upon the overall experience of a terminal [i.e. the generally accepted ‘rabbit-warren’ nature of terminals 1-4 at Heathrow International]. Although the design case study instigated a specific system for expansion, the prospect of a ‘modular’ airport, initiating cohesive expansion, could be another avenue for further research.

- *Linear Edge Town Centre;*

Identification of the linear tendency could inform a design case study based on uninhibited linear expansion on the runway’s edge. This form of development could investigate the prospect of a decentralized airport terminal, with terminal gates spaced incrementally upon the runway axis.

Conclusion

The body of research observes that the airport terminal as an urban entity presents a possible amalgamation of two supposed antithetical environments. Although the design case study at both the architectural and urban scales sought a reasonably high level of resolve, in order to evaluate the implications of the hypothesis, the outcome serves to present further opportunities in highly specific, untested areas of the airport program. Working with a heavily prescriptive program, identifying opportunities to challenge its accepted norm provided satisfying architectural implications and new opportunities in light of an overall passenger experience. Key findings emerged as a result of testing the typically isolated airport terminal against an urban, pedestrian oriented environment, producing a vastly different programmatic form. Specifically the ‘cut’ strategy and the directive access to the domestic terminal present a fair argument for the pedestrian oriented terminal. In baring it’s innards to an urban setting the terminal transcends beyond a captive process, revealing an established social normality, one formed in an internalized environment, in isolation; one not too dissimilar from the familiarity of urbanity.

7

Bibliography + List of Figures

Bibliography

Adler, David, Chris Blow. “Terminals and Transport Interchanges” in Metric Handbook. London, Routledge: 2007.

Airbiz. “Queenstown Airport: Growth Projections” in Queenstown-Lakes Council District Plan: Plan Change 35 [Appendix 8]. 2009. May 2013. <http://www.qldc.govt.nz/plan_change_35_queenstown_airport_aircraft_noise_boundaries/category/354/>

American Planning Association. Planning and Urban Design Standards. New Jersey, Wiley: 2006.

Anon. “New York City’s Dream Airport.” Life 18 Mar. 1946: 76-79.

Bruegmann, Robert. “Airport City” in Building for Air Travel: Architecture and Design for Commercial Aviation. Ed. John Zukowsky. Chicago: Prestal, 1996

daab. Airport Design. daab 2005.

Gottdiener, Mark. Life in the Air: Surviving the New Culture of Air Travel. Maryland: Rowman & Littlefield, 2001.

Kasarda, John, and Greg Lindsey. Aerotropolis: The Way We’ll Live Next. United States of America: Farrar, Straus and Giroux, 2011.

Koolhaas, Rem, et al. Small, Medium, Large, Extra-Large. New York, Monacelli Press: 1998.

Marshall Day Acoustics. “Queenstown Airport - Updated Airport Noise Contours and Assessment of Noise Effects” in Queenstown-Lakes Council District Plan: Plan Change 35 [Appendix 7]. July 2009. May 2014. <http://www.qldc.govt.nz/plan_change_35_queenstown_airport_aircraft_noise_boundaries/category/354/>

Pearman, Hugh. Airports: A Century of Architecture. 1st ed. New York: Harry N. Abrams, 2004.

Rationale. “Queentown-Lakes District: Growth Projections” prepared for Queenstown-Lakes District Council. 2011. April 2013 <http://www.qldc.govt.nz/images/Files/Growth_Projections/QLDC_Growth_Projections_Report_2011_web.pdf>

RMA Quality Planning Resource, The. Effects of Noise in Mixed-Use Environments. Undated. June 2014. <<http://www.qualityplanning.org.nz/index.php/planning-tools/air/noise-management-in-mixed-use-urban-environments>>

Statistics New Zealand. Auckland Projected to Dominate Population Growth. Statistics NZ. N.p., 8 Oct. 2012. Web. Feb. 2013. <http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_MR0631UpdateOct12.aspx>.

Stoller, Ezra and Mark Lamster. The TWA Terminal. New York: Princeton Architectural Press. 1999.

Sudjic, Deyan. Hundred Mile City. 1st ed. San Diego: Mariner Books, 1993.

List of Figures

Figure List

Figure 1. Map by author; derived from Google Maps

Figure 2. Queenstown International Airport runway [photograph by author]

Figure 3. Process Diagram [image by author]

Figure 4. TWA Terminal <http://cfrietch.files.wordpress.com/2012/09/img_4143.jpg>

Figure 5. Mapping every flight path [image modified by author] <http://contrailscience.com/skitch/viz_full_fixed-20121012-173143.jpg>

Figure 6. Moses King's Dream of NYC <<http://graphics8.nytimes.com/images/2010/09/26/realestate/20100926scapes/20100926scapes-custom11.jpg>>

Figure 7. London News: "On the Impulse to Fly Commercially" <<http://i.kinja-img.com/gawker-media/image/upload/18vnjutip17chjpg.jpg>>

Figure 8. Lloyd Wright's "Los Angeles Skyscraper" - Page 88: Airports: A Century of Architecture

Figure 9. Edward Robert Armstrong's "Seadrome" < http://i.kinja-img.com/gawker-media/image/upload/s--MRN2CeI---/c_fit,fl_progressive,q_80,w_636/18vnlzdx47kkjpg.jpg>

Figure 10. Hamilton Wright: "Penn Rail Station Airport" <http://airandspace.si.edu/exhibitions/america-by-air/online/images/640/S.208.p12-P.9A03965_640.jpg>

Figure 11. H. Alvater's "New York Airport" <<http://i.kinja-img.com/gawker-media/image/upload/18vnnb0iq0uuvjpg.jpg>>

Figure 12. Amazing Stories: "The Moon Doom" - Page 87: Airports: A Century of Architecture

Figure 13. Popular Science Monthly: "Thames River Airport" <<http://longstreet.typepad.com/.a/6a00d83542d51e69e201287660835f970c-pi>>

Figure 14. French Engineer [Anon]: Rotating Runway <http://blog.modernmechanix.com/mags/MechanixIllustrated/7-1938/roof_airport.jpg>

Figure 15. Lewis & Lindy's "Liverpool Street Station" - Page 91: Airports: A Century of Architecture

Figure 16. Plan Voisin: Le Corbusier <<http://lebbeuswoods.files.wordpress.com/2008/12/voisin3.jpg>>

Figure 17. Plan Voisin in Paris context [image produced by author - map derived from google maps]

Figure 18. Kings Cross Airport Sketch by Charles Glover <<http://darkestlondon.files.wordpress.com/2011/10/kingscrossairport1931.jpg>>

Figure 19. Kings Cross Airport in London context [image produced by author - map derived from google maps]

Figure 20. Manhattan Airport proposed by William Zeckendorf - Page 76-77 LIFE magazine

Figure 21. Manhattan Airport in New York City context [image produced by author - map derived from google maps]

Figure 22. Albert Speer's Berlin proposal [image modified by author]

<http://static.planetminecraft.com/files/resource_media/screen-shot/1220/gesamt-01-xl_2298389.jpg>

Figure 23. Tempelhof Airport in Berlin context [image produced by author - map derived from google maps]

Figure 24. Aerotropolis utopian representation <<http://www.evolvepedia.co.il/images/Case27420-20111018114816690.jpg>>

Figure 25. Aerotropolis book cover <http://jacketupload.macmillanusa.com/jackets/high_res/jpgs/9780374533519.jpg>

Figure 26. Ville Radiuse <http://i.kinja-img.com/gawker-media/image/upload/s--z854VDEn--/c_fit,fl_progressive,q_80,w_636/19e2aja74ugzvjpg.jpg>

Figure 27. Kai Tak Airport approach <http://31.media.tumblr.com/e4eddbd7dde91251a0a8694839fd330b/tumblr_mohmwyi0CL1qm-eq43o3_r1_1280.jpg>

Figure 28. Vertical Take-off and Landing - building platform <<http://media-cache-ec0.pinimg.com/originals/a8/bc/8d/a8bc8d64a297b15d-28e7dcac23337ea2.jpg>>

Figure 29. Aerotropolis plan graphic <<http://www.jetlifeningenia.com/wp-content/uploads/2012/12/Aerotropolis.jpg>>

Figure 30. Denver International Airport roof against the Rocky Mountain range <<http://image.architonic.com/imgArc/project-1/4/5205148/Fentress-DenverAirport-05.jpg>>

Figure 31. Denver International Airport: McDonald's - a global franchise <<http://2.bp.blogspot.com/-M0fzh-WTqzs/T8KuzXNMVhI/AAAAAAAAABew/HrkUlulitsI/s1600/mcdonalds-at-denver-international-airport.jpg>>

tional-airport.jpg>

Figure 32. Beijing International Airport: Burger King: another global franchise <http://upload.wikimedia.org/wikipedia/commons/4/49/Burger_King_Beijing.jpg>

Figure 33. The poised eagle: TWA Terminal Building, JFK Airport, NYC . Circa. 1960 < <http://www.nyc-architecture.com/BKN/TWA%284%29.jpg>>

Figure 34. Theme Building at Los Angeles International Airport; designer, Paul Williams, pictured. Circa. 1960's <http://1.bp.blogspot.com/_Pmjd5_C6-M4/TH_frF5hjDI/AAAAAAAAABds/cBWS-mYM-e_E/s1600/1994,+LAX+Theme+Bldg.,+Paul+Williams,+back+cover+of+The+Will+and+the+Way+-+Copy.jpg>

Figure 35. Buffalo Niagara International Airport Buffalo, NY, USA by KPF <http://www.kpf.com/projects/Project59/12245_hr.jpg>

Figure 36. Bilbao International Airport, Bilbao, Spain by Santiago Calatrava <http://1.bp.blogspot.com/_Pmjd5_C6-M4/TH_frF5hjDI/AAAAAAAAABds/cBWSmYM-e_E/s1600/1994,+LAX+Theme+Bldg.,+Paul+Williams,+back+cover+of+The+Will+and+the+Way+-+Copy.jpg>

Figure 37. "Hub" Airport Diagram [image produced by author]

Figure 38. "International" Airport Diagram [image produced by author]

Figure 39. "Regional" Airport Diagram [image produced by author]

Figure 40. The basic airport procession diagram [image produced by author]

Figure 41. Southampton Airport curbside <<http://www.directflights.>

com/sysimages/origimages/southampton-airport1_lan16_1_1_AR.jpg>
 Figure 42. Southampton Interior <http://www.uk-airport-car-parking.co.uk/southampton-airport/images/southampton-airport2.jpg>
 Figure 43. Southampton Airport Terminal <http://www.ferrovial.com/outside/groups/contenidos_generales/documents/imagen/~edisp/img_southampton_.jpg>
 Figure 44. Southampton Program Plan [image produced by author]
 Figure 45. Southampton Procession Isometric Diagram [image produced by author]
 Figure 46. Learmonth Airport Outside - “Airport Design” p 132-133
 Figure 47. Learmonth Airport Interior <http://www.jcy.net/wp-content/uploads/2013/01/9815_3.jpg>
 Figure 48. Learmonth Airport Terminal <http://www.airports-worldwide.com/img/au/big/learmonth_australia_04_big.jpg>
 Figure 49. Learmonth Airport Program Plan [image produced by author]
 Figure 50. Learmonth Airport Procession Isometric Diagram [image produced by author]
 Figure 51. Lille Airport Curbside <http://upload.wikimedia.org/wikipedia/commons/9/96/Lille-Lesquin_International_Airport_-_Terminal_-_Outside_-_1.jpg>
 Figure 52. Lille Airport Interior <http://upload.wikimedia.org/wikipedia/commons/1/1b/Lille-Lesquin_International_Airport_-_Terminal_-_Inside_-_2.jpg>
 Figure 53. Lille Airport Terminal < http://photos.planete-tp-plus.com/

galleries/ouvrages_divers/aerogares/1008893.jpg>
 Figure 54. Lille Airport Program Plan [image produced by author]
 Figure 55. Lille Airport Procession Isometric Diagram [image produced by author]
 Figure 56. Aalborg Airport Interior <http://fsi.shl.dk/fsi/server?type=image&tmp=ReallyLarge&format=jpeg&quality=87&source=sample%20images/SHLbilledarkiv/Web/projects/1998-036%20Aalborg%20Airport/Images/1998-036-002.tif&width=1064>
 Figure 57. Aalborg Airport Exterior <http://www.visitaalborg.com/sites/default/files/styles/galleries_ratio/public/asp/visitaalborg/t_trans-port/aalborg-lufthavn/aalborglufthavn3.jpg?itok=8D5x_VUK>
 Figure 58. Aalborg Airport Terminal <http://www.viajejet.com/wp-content/viajes/Aeropuerto-de-Aalborg.jpg>
 Figure 59. Aalborg Airport Program Plan [image produced by author]
 Figure 60. Aalborg Airport Procession Isometric Diagram [image produced by author]
 Figure 61. Graz Airport Curbside <http://www.euroburo-steiermark.com/Permanent%20images/graz_airport.jpg>
 Figure 62. Graz Airport Interior < http://austria-taxi.at/static/images/dest_imgs/at/8563074278087780.jpg>
 Figure 63. Graz Airport Terminal <http://www.rieglerriewe.co.at/projects/in_fggh/1.jpg>
 Figure 64. Graz Airport Program Plan [image produced by author]
 Figure 65. Graz Procession Isometric Diagram [image produced by author]

Figure 66. Carrasco Airport Curbside <http://www.viajejet.com/wp-content/viajes/Aeropuerto-de-Aalborg.jpg>
 Figure 67. Carrasco Airport Interior <http://www.farq.edu.uy/viaje2013/files/2013/03/f2610_hallo_aeropuerto_carrasco.jpg>
 Figure 68. Carrasco Airport Terminal <http://i2.cdn.turner.com/cnn/dam/assets/130606154300-airport-carrasco-vert-horizontal-gallery.jpg>
 Figure 69. Carrasco Program Plan [image produced by author]
 Figure 70. Carrasco Isometric Diagram [image produced by author]
 Figure 71. Gibraltar Airport Curbside < http://ad009cdnb.archdaily.net/wp-content/uploads/2013/01/50fce937b3fc4b068c0001a0_gibraltar-airport-blur-architects-3dreid-architects_bblur_gibraltar_airport_-_hufton_crow_052.jpg>
 Figure 72. Gibraltar Airport Interior <http://static.dezeen.com/uploads/2013/03/Dezeen_Gibraltar-Airport-by-Bblur-Architecture-and-3DReid_ss_2.jpg>
 Figure 73. Gibraltar Airport Terminal <http://static.dezeen.com/uploads/2013/03/Dezeen_Gibraltar-Airport-by-Bblur-Architecture-and-3DReid_ss_15.jpg>
 Figure 74. Gibraltar Program Plan [image produced by author]
 Figure 75. Gibraltar Isometric Diagram [image produced by author]
 Figure 76. Carrasco Airport - showing parking provisions <http://static.planetminecraft.com/files/resource_media/screenshot/1220/gesamt-01-xl_2298389.jpg>
 Figure 77. Southampton simplified layout [image produced by author]
 Figure 78. Graz simplified layout [image produced by author]

Figure 79. Aalborg simplified layout [image produced by author]
 Figure 80. Established “conventional terminal layout” [image produced by author]
 Figure 81. Learmonth base layout plan [image produced by author]
 Figure 82. Developed version [image produced by author]
 Figure 83. Further developed version [image produced by author]
 Figure 84. Base terminal procession diagram with observations highlighted [image produced by author]
 Figure 85. Revised terminal procession diagram [image produced by author]
 Figure 86. Formalized terminal layout [image produced by author]
 Figure 87. Simplified Lille terminal form [image produced by author]
 Figure 88. Formalized terminal layout [image produced by author]
 Figure 89. The ‘cut’ strategy [image produced by author]
 Figure 90. Departing form, plan [image produced by author]
 Figure 91. Arriving form, plan [image produced by author]
 Figure 92. Wakatipu Basin [Photograph by author]
 Figure 93. Frankton Flats Map [map derived from google maps, modified by author]
 Figure 94. Queenstown context map [map derived from google maps, modified by author]
 Figure 95. Surrounding Wakatipu Basin geography [map derived from google maps, modified by author]
 Figure 96. Centre Zones Map [map derived from google maps, modified by author]

Figure 97. Queenstown map diagram [image produced by author]
 Figure 98. Queenstown geographic restraints [image produced by author]
 Figure 99. Queenstown Contextual proximities [map derived from google maps, modified by author]
 Figure 100. Frankton Flats map diagram [image produced by author]
 Figure 101. Frankton Flats geographic restraints [image produced by author]
 Figure 102. Frankton Flats Contextual proximities [map derived from google maps, modified by author]
 Figure 103. Residual dwellings map [map derived from google maps, modified by author]
 Figure 104. Industrial Zone [image derived from google street view, modified by author]
 Figure 105. Terrace Junction [image derived from google street view, modified by author]
 Figure 106. Queenstown Rec Centre [image derived from google street view, modified by author]
 Figure 107. Remarkables Primary School <http://www.odt.co.nz/files/story/2011/06/remarkables_primary_school_photo_supplied__4df4647605.JPG>
 Figure 108. Kawarua Falls Station <<http://invol-upgrade.com/wp-content/uploads/2013/04/hilton-hotel-queenstown-new-zealand-21-580x310.jpg>>
 Figure 109. Lakes District Hospital [image derived from google street

view, modified by author]
 Figure 110. Remarkables Park Shopping Centre [image derived from google street view, modified by author]
 Figure 111. Amenity Proximities [image produced by author]
 Figure 112. Shotover Park <http://www.colliers.co.nz/Commercial_Property_14100/SH6_Frankton_Ladies_Mile_Highway_6_Queens-town_Lakes/>
 Figure 113. Five Mile < <http://www.scene.co.nz/images/image/AU-GUST%202012/230812/news-five-mile-5.jpg>>
 Figure 114. Remarkables Park Shopping Centre <http://www.remarkablespark.com/assets/Masterplans/_resampled/croppedimage696332-LR-8xLR3.jpg>
 Figure 115. Map showing development intentions [image produced by author]
 Figure 116. Wakatipu Basin Roding Context [map derived from google maps, modified by author]
 Figure 117. Arterial Route Diagram [image produced by author]
 Figure 118. Collector Route Diagram [image produced by author]
 Figure 119. Local Road [image produced by author]
 Figure 120. Arterial Route map [image produced by author]
 Figure 121. Collector Route map [image produced by author]
 Figure 122. Local Road map [image produced by author]
 Figure 123. Proposed sites [image produced by author]
 Figure 124. Proposal 1 [image produced by author]
 Figure 125. Proposal 2 [image produced by author]

Figure 126. Proposal 3 [image produced by author]
 Figure 127. Proposal Site in context [photograph my author, image produced by author]
 Figure 128. North Island Analysis [images produced by author]
 Figure 129. South Island Analysis [images produced by author]
 Figure 130. Rapid sketch design set 1 [images produced by author]
 Figure 131. Rapid sketch design set 2 [images produced by author]
 Figure 132. Rapid sketch design set 3 [images produced by author]
 Figure 133. Rapid sketch design set 4 [images produced by author]
 Figure 134. Rapid sketch design identification [images produced by author]
 Figure 135. Rapid sketch design development [images produced by author]
 Figure 136. Airside perspective [image produced by author]
 Figure 137. Town Centre perspective [image produced by author]
 Figure 138. Strategy implementation sketches [images produced by author]
 Figure 139. Developed sketch design [images produced by author]
 Figure 140. In-context plan [image produced by author]
 Figure 141. Urban masterplan perspective [image produced by author]
 Figure 142. Urban plan [image produced by author]
 Figure 143. Urban plan Isometric [image produced by author]
 Figure 144. Urban plan Isometric [image produced by author]
 Figure 145. Urban program series [images produced by author]
 Figure 146. Urban connectivity series 1 [images produced by author]

Figure 147. Urban connectivity series 2 [images produced by author]
 Figure 148. Noise Contour diagrams [data derived from Marshall Day report, modified by author]
 Figure 149. Airside perspective [image produced by author]
 Figure 150. Airport Isometric [image produced by author]
 Figure 151. Terminal Split [image produced by author]
 Figure 152. Ground Level Plan [image produced by author]
 Figure 153. Levels -1, 1 and roof plans [image produced by author]
 Figure 154. Terminal figure ground [image produced by author]
 Figure 155. Notional park space [image produced by author]
 Figure 156. Active Edges [image produced by author]
 Figure 157. External Program [image produced by author]
 Figure 158. Expansion intentions plan set [image produced by author]
 Figure 159. South Elevation Set [image produced by author]
 Figure 160. North Elevation Set [image produced by author]
 Figure 161. East-west Elevation Set [image produced by author]
 Figure 162. Internal modules exploded [image produced by author]
 Figure 163. Landside concourse exploded [image produced by author]
 Figure 164. Landside Concourse Program breakdown [image produced by author]
 Figure 165. Landside Concourse Interior perspective [image produced by author]
 Figure 166. Landside Concourse roof form development set [photographs by author]
 Figure 167. Landside Concourse through perspective [image produced

by author]
Figure 168. Roof form perspective [image produced by author]
Figure 169. International Terminal program breakdown [image produced by author]
Figure 170. International Departure tracking [image produced by author]
Figure 171. International arrival tracking [image produced by author]
Figure 172. International arrivals – perspective – first glimpse of town centre [image produced by author]
Figure 173. Vehicular Edge [image produced by author]
Figure 174. Domestic Terminal program breakdown [image produced by author]
Figure 175. Domestic Departure tracking [image produced by author]
Figure 176. Domestic arrival tracking [image produced by author]
Figure 177. Domestic Module breakdown [images produced by author]
Figure 178. Domestic Module Isometric [image produced by author]
Figure 179. Domestic Module Exploded [image produced by author]
Figure 180. Domestic Entrance from street perspective with notional park [image produced by author]
Figure 181. Domestic Entrance from edge of module [image produced by author]
Figure 182. Domestic Gate [image produced by author]

End.