I would like to express my deepest appreciation to my inspiring supervisors, Graeme McConchie, Chris Murphy and also David Chaplin, who have guided me through the year.

Thank you to my father, and also Tony van Raat, for providing me with the opportunity to visit my site in Fiji. I am grateful to the team at Airports Fiji Limited for providing me information on the airport.

I would also like to thank my family, friends and colleagues, for your unreasonable love and support and making this an enjoyable degree.
Today, the design of airports - and their success - is conventionally measured by its efficiency; by its ability to manage the arrival and departure of planes on time for the minimum of passenger effort.

Airports such as London Heathrow - the “gateway” into the UK - has seen extensive renovation over its years to facilitate the growing demand of air travel, where the passenger spends most of the time battling the queues.

The focus of this research project is the design of an airport terminal which invokes “gateway”, as a way of reflecting a nation’s unique identity. The selected context for this project is Fiji Islands, a holiday destination sought by many across the globe for its unique culture, climate and tourism attractions.

The project begins by investigating the historical context of travel, highlighting interesting facts, discoveries and achievements made through the evolution of transport, such as the emergence of the Stagecoach era in the 18th century, to the first international flight from London to Paris in 1919. The focus is then shifted towards the architecture of early airport terminals precedents, from the expressionism of Eero Saarinen’s TWA Terminal in 1962, to the celebration of regional characteristics in Norman Foster’s Beijing Airport, begun 2003. The study of precedents are of particular significance to the topic of this research, ultimately informing strategies for design.

The intention is to prepare, or perhaps re-configure, the normal processes of an airport terminal as a series of experiences which reflect and instigate the imagery and presence of Fiji.
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Introduction

Air travel has been described as the defining mode of transportation of the twentieth century. No other form of travel compares with the speed, scale and glamour of contemporary air travel. Similar to the way railways opened up continents and allowed mass accessibility across the world during the 19th century, airports of the 20th have performed these tasks at a much grander scale. Airports are deemed to be the most exciting places on earth, and whilst airports have offered us the first and last impressions of the very nations they serve, air travel has extensively diversified our experience of place and time, geography and provided us with opportunity to take flight.

Ever since Louis Bleriot crossed the Channel from France to England in a mono plane in 1909 – the first international flight – architects have been fascinated by the idea of accommodating the plane. Whether this be done in formal or technological terms, airport developers have been motivated to constantly express the building with innovative design. Consequently, airports of the future must continue to redefine new boundaries in architectural image, structural solutions and the relationship between the airport and the romantics of air travel. It is the qualities of speed, light and flight that comprise the imagery of 21st century airports. The question is, what qualities could possibly steer the future of airport design?

The airport can be seen as a transitory environment, and the architect introduces gateways which regulate the movement of passengers from the concourse to aircraft and vice versa. Ultimately the airport itself becomes a gateway to continents. Airports can be conceived as purely utilitarian transportation structures, but in fact they represent some of the most significant achievements in contemporary architecture, providing their creators the chance to imagine on a grand scale. In other words, the airport building type provides the opportunity to celebrate both the physicality of travel and its social connections. Design ethics are present in 21st century airports, particularly those in rapidly advancing countries in the East. In the Eastern world, the airport is appreciated as a part of national life/symbol and traditional culture is embedded as part of it. New airports in Hong Kong, Shanghai and Kansai showcase culture with the combination of advanced technologies and traditional architectural forms. Over in the Western world, the motive of design is induced of nature and organic characteristics. Terminals such

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2 Ilсид, x.
4 Steven Bode and Jeremy Millar, Airport: The Most Important New Buildings of the Twentieth Century, Netherlands Design Institute, 1997, p. 54.
5 Pearman, Airports, preface.
as London Stansted, Madrid Barajas and Sondica Bilbao, are shaped by ecological principles, resulting in a softer, more climate responsive architecture.\(^6\) Airports have come to symbolize progress, freedom, trade and the aspirations of their host nations on the international stage.

In his *A Modern Airport Terminal*, written in 1998, Brian Edwards highlights that, “the internationalism of air transportation is invariably tempered by regional characteristics in the design of terminals themselves. This is occasionally the result of climate, and sometimes of the traditions of building in a particular area, but often of the sense that airports are great national gateways, where cultural differences have to be expressed.”\(^7\) In support of these views, architectural qualities do play a significant role in the success of terminals and enhance passenger experience, however, the immediate characteristics of the context in which the airport is located must not be disregarded. As a result, the question remains: what qualities could possibly steer the future of airport design?

The following research is an attempt to find architectural solutions to this question, and focus of design will be driven by the idea of ‘an airport which invokes “gateway” by exploring the expressionism in airport terminal design and the imagery of a place’.

In light of site selection, Edward’s views of gateways emphasizes on the importance of passenger experience at an airport. Nadi International Airport (NAN) is the selected site for this research. The existing airport is currently Fiji’s main gateway and also a prominent transit hub which connects many Trans-Tasman flights. The reason behind selecting this particular site has much to do with childhood experiences of the airport, but the dominant reason which makes this selection credible is the fact that the airport has greatly overlooked its ability to embrace within it, Fiji’s unique local identity. However, there are a few attributes of the airport which attempt to unpack ones immediate experiences of Fiji, later discussed in the research.

Inevitably, how is the exploration of expressionist terminal design and the imagery of “place” important, and what are its implications to this research? In a special issue of *The Architectural Review* on Kansai Airport, published in 1995, Peter Buchanan addresses two cherished ideals of expressionism in terminal design – organism and machine - which have instigated the design of even the earliest airports: Gatwick, London 1936 and John F. Kennedy Airport, New York

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\(^7\) Ibid. 27, 28.
1963. He emphasizes the two ideals and states, “for more than a century and a half, theorists have dreamt of an architecture that might approximate to the efficiencies and formal integrity of an organism or machine, or better yet, to manage to fuse the qualities of both. Some critics thought that because architecture does not move, as do organisms or machines, this quest is impossible and irrelevant.” However, the identified ideals have governed both the success, and failure of airports till date, therefore:

Tracing back to the earliest examples of travel and terminals, a historical study will provide an insight on the topic. A study of precedents will then draw upon existing terminals which are particularly special to the topic. The first part of the study will identify how the expression of organism and machine have been conveyed in terminals, and the second, how airports have come to express “gateway” - embodying local imagery and identity (place).

An explorative study will be formulated through an exercise of physical built models and sketches to generate a ‘feel’ and elaborate on expressionist design and place, ultimately informing as strategies for the subsequent design process.

---


**Research question**
An airport which invokes “gateway” by exploring the expressionism in airport terminal design and the imagery of a place.
Fig. 1: Louis Bleriot flies over the English Channel into France in 1909.
Source: http://aviationhistory.info/i/photos/Bleriot-1909.gif
“The Wright Brothers created the single greatest cultural force since the invention of writing. The airplane became the first World Wide Web, bringing people, languages, ideas, and values together.” ~Bill Gates
Fig. 3: Terminus pictured as a bust of a human figure. “Yield no ground”.
Source: http://images1.wikia.nocookie.net/__cb20111004204049/olympians/images/3/30/Terminus.jpg
Terminus, in Latin, has the definition of ‘end, limit, and boundary’. The word terminus has originated in the mid-16th century, in the sense of ‘a final point in space or time; an end or extremity.’

In Architecture, particularly ancient Greece, the term is derived from the Roman God, Terminus (“boundary stone”) the protector of the limits both of private property and public territory of Rome — usually represented as a figure of a human bust or an animal ending in a square pillar from which it appears to spring, blessed with sacrificial offerings making it impervious to vandalism and trespassers.10

Terminus is a synonym of the word terminal, which shares a similar definition of ‘an end or extremity of something.’

Trade nodes: Converging of two worlds

As boundaries developed, a series of high density traffic points were created, described as ‘nodes’ for the purpose of this research. Nodes have played a crucial role for the growth, development and survivability of towns and human life. Density of human activity, types and qualities of goods and services varied and defined each node. This ultimately determined the type and location of node and the developments of townships which followed. During the first millennium, sea and land trade of goods such as spices, minerals and foods were engaged between the East and West. The sea trade was conducted on boats via the Red Sea and the Nile. The land trade was executed via nodes in the deserts of Western Arabia. Nodes are generated by trails and trade routes as intersections and points of convergence, and the first mode of travel as suspected in the early days was by foot. Humans carried goods and often followed ‘game trails’ – which offered the hunting of animals as food or sport – or trade routes which accommodated large animal-drawn wheeled vehicles such as the travois.

The Silk Route is one of the first trade routes and it joins the Eastern and Western worlds through a series of nodes.

“Along the Silk Roads, technology traveled, ideas were exchanged, and friendship and understanding between East and West were experienced for the first time on a large scale. Easterners were exposed to Western ideas and life-styles, and Westerners too, learned about Eastern culture and its spirituality-oriented cosmology. Buddhism as an Eastern religion received international attention through the Silk Roads.”

Fig. 5: Map indicating the major nodes which established trade routes.
Fig. 6: This illustration is discussion specific. It has been arranged to convey the information of people and cargo movement around the globe from one specific point, the north pole.
As people and cargo traversed between nodes, it soon became apparent that trails and trade routes from neighboring nodes were often to ‘end’ at one particular place, a hub. What defined a node as a hub? There are three conceptions of hubs that are defined by Zachary P. Neal in, *Types of Hub Cities and Their Effects on Urban Creative Economies*. These are translated as, (1) A ‘degree’ hub - final destination for large number of travellers, (2) a ‘betweenness hub’ – a node that serves as a place to get between other nodes, and (3) a ‘closeness hub’ – a node that is accessible or close to other nodes and connected to many nodes by transport networks. Significant nodes became hub cities.

Coastal positioned cities of the Ancient world such as Alexandria grew into more prominent hubs because they provided access to both sea and land transport networks. The cities largely match the ‘betweenness’ hub model, allowing travellers to connect and change between transportation modes i.e. wagons and boats. In other terms, the hubs became the place that people went to, in order to travel somewhere else, simply because non-hub nodes could not facilitate such methods of travel.

Hub cities also grew larger as they experienced growth in knowledge and economy with the vast number of trading for goods and services which were processed through them. They became centralized for business and travel, and both major and minor transport links converged at the hub, which ultimately saw civilians migrating into the hub for work and better quality of life.

The hub mentioned is supported by both close and distant nodes located in the Mediterranean and the Black Sea. With the provision of the Suez Canal in 1869, Alexandria has access to the Red Sea and the Arabian Sea.

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16 Ibid, 11.
The terminal: Developed nodes and systems

The centrality and immediate locations of hub-cities and the movement of freight and passengers through them pushed the demands of a particularly new building type. The west port of ancient Alexandria featured a ‘Ro Ro’ (roll-on/roll-off vessel) and passenger terminal in 1900BC. Terminals became the major infrastructure for the mobility, assembly and dispersal of passengers and freight in the 20th century. The canal age—water transport passages built during Victorian 19th century—gave way to the railway age, which in turn gave way to the century of the motor vehicle and the plane. The 20th century, like the 18th and 19th, are all extensively defined by rapid advances in transport technology.

There are three broad categories based on the medium that transportation modes exploit—land, sea and air—and the four types of terminals which provided services were the airport, railway, and bus and ferry terminals. Terminals are defined to process and facilitate passengers and freight. Terminals are represented as points of interchange involving either the same mode of transport or often as an interchange for different modes of transportation. Such as, travelling from Rotterdam to Paris by train requires a change of train at Brussels, or an air passenger on-route from Montreal headed to Los Angeles would require changing flights at Toronto. A main attribute governing the terminal is its convergence function—the ability to accommodate from all directions. A terminal’s geographical and immediate commercial location provided the essential points of passage for travelling.

So much like the hub-city, travellers and cargo traverse through the terminal before continuing their journeys to other transport nodes. In many cases, especially in terms of sheer size, particular terminals could often confer the status of gateways or hub to their location since they become obligatory points of transit between different segments of the transport system.

In, The Geography of Transport Systems, an analysis on the structure and types of hub-terminals is conducted, which shows how traffic growth, geographical coverage and overall efficiency was achieved. The type of terminal used for the study is a maritime shipping network and it identifies the two major systems that exist; Hub-and-spoke and relay. The theoretical applications of the two forms are not confined to maritime shipping, but are relevant to all mediums of terminals.

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17 Pearman, Airports, 9.
Fig. 7: Types of terminal developments
The stagecoach era of the 18th century

First developed in Great Britain during 16th century and continued, growing use saw the establishment of coaching through and between cities and towns. At the beginning of the 18th century, the Regency period marked the great age of coaching. During 1810 to the 1830’s, coaches ruled the newly formed roads and reached fantastic speeds of 12 miles an hour allowing free and easy flow of traffic, passengers and goods around the country. With the introduction of coaches, the result was reduced travel times across the country and transacted business.

Both long-haul and short-haul travel was introduced, similar to today’s long-haul air travel requirements, coaching passengers were often transited at inns where they were replenished before resuming travel, the coaches were maintained and the horses were rested. In order to ensure travel times were running to schedules and not hindered, each route demanded at least four coaches: an up coach, a down coach and a coach at each end in case of breakdowns. By the mid-18th century, stagecoach travel dominated in the United States. As travel expanded, there was an increase in routes to major cities. By 1832, Boston became the hub for 106 stagecoach lines.

A familiar stagecoach company, Cobb and Co was established in Australia during the late 18th century, and the first services began between Melbourne and Bendigo. The business gradually advanced, links were provided from railway stations at Penrith to local goldfields, then later expanded to Queensland which covered Brisbane to Ipswich in 1865 and there were two hotel stops on this route. In the 1880s, the business covered North, South and South West Queensland, and began to move mail and passengers into northern New South Wales. These coach services allowed for an otherwise isolated number of communities to maintain regular contact with the rest of the world. In the early 19th century, the expansion of the railway network made the operations of Cobb and Co seem obsolete, and the large debt that was taken for the expansion of the wool industry brought an end to the company in 1924.

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21 C. F Munn, The Way We Were, Volume 3, s.e, (South Melbourne: Brooks Waterlook Publicaters, 1987), 240.

22 Environmental Protection Agency (QL), Heritage Tales of the Queensland Outback, (State of Queensland, 2002), 11.

Fig. 8: Stagecoach
Glass and iron sheds of the 19th century: Railway stations

It has become the starting point in today’s design for airport and ferry terminals, to compare with the best of the great glass-and-iron European train sheds of the 19th century. Here, the practicality of the large-span, high-tech railway transportation spaces accommodated the logistics of passenger and freight systems, and the specific British model of train terminal design was capable of mixing people and trains in one huge space.

Although the British railway model cannot be directly applied to airports, early examples such as the Grand Central Station in New York and the Philadelphia Station anticipated air terminal design by carefully differentiating functions within an all-enveloping canopy. Both places clearly conveyed the romantics of travel and provided the necessary infrastructure to accommodate the machine and its passengers, however, there was a clear distinction of the segregation between the grand, uplifting interiors of the concourse and the bustling points of departure.

On the contrary, Paddington Station of historic London was designed to celebrate the machines which served the station, where passengers and trains were facilitated on the same level. The influence of transport technology, the romantics of travel and the interaction between passenger and machine have been acknowledged and celebrated even in the earliest terminals.

24 Pearman, Airports, 16.
25 Ibid. 16.
Grand Central Terminal

New York 1913 by Reed and Stem, Warren and Wetmore.

The land which Grand Central Terminal occupies today has seen an array of historical train buildings. In the earlier years, the first transport building that took shape on site was the Grand Central Depot in 1871, followed by a re-constructed, Grand Central Station in 1900.

The Grand Central Depot of 18th century was designed by John B. Snook with the expression of an enormous train shed, constructed of steel and glass which measured 30 meters wide by 200 meters long. The structure rivalled the Eiffel Tower and Crystal Palace for primacy as the most dramatic engineering achievement of the 19th century.26 However, baggage and train-turnaround issues with the previous terminals did not benefit terminal efficiency, which induced a completely new terminal dressed with the Beaux-Arts style in 1913. The crowded main concourse is the central focus of the building, and it facilitates ticketing booths and an information booth which is located in the centre of the concourse. Waiting spaces are located towards the back of the building above the grand stairs which takes passengers to the floors beneath. The dining concourse is below the main concourse, surrounded by lounges, retail and restaurants. Train platforms are located in both upper and lower levels, numbered according to the services they serve – local and off-peak trains depart from the lower level while express, super-express and peak trains depart from the main level.


Fig. 10: Plan of public concourse, Grand Central Station NY
Fig. 11: Development of Grand Central Station over its years.
Source: http://www.grandcentralterminal.com/#history
London Paddington Station
London 1854 by Isambard Kingdom Brunel and Sir Matthew Digby Wyatt.

The site of London Paddington Station is historical. Train services commenced in 1938, when it served as the main terminal for London of the Great Western Railway – a rail network which linked London to West England and Wales. London Paddington also served the world’s first underground railway in 1863, before being modernized and designed in 1998 to serve the additional role for transporting passengers to London Heathrow Airport on its dedicated Airport Express line.

The design of Brunel’s station constituted an arrangement of three barrel vaults of clear arch construction. The ribs and ornamentation are original, and are made of wrought iron. The fourth span looks similar but is constructed of steel. The roof of the concourse was re-clad and re-glazed between 1985 and 1990.27

The roof of the station concourses stretches across platforms 12 to 14, readily defining access to the platforms. The remaining two external platforms which facilitate 2-3 car trains for local service, are accessible by platform 12, or by a footbridge on the north western end of the station. The Lawn, traditionally a buffer zone between the station and the public realm was remodeled to become part of the station as the first pedestrian concourse. Originally the zone was unroofed and open in plan. A remodeled scheme by architects Nicholas Grimshaw and Partners in 1998 featured a glass wall which segregated the two spaces – possibly with the intention to cancel train noise -, and the space was later occupied with shops, restaurants and seating for passengers.

The Heathrow Express airport link has provided flight information display screens and self-check-in facilities for airline passengers.28 Baggage check-in facilities for airline passengers were also provided in 1999 but progressively closed, later replaced by retail. In 1999, the ability to check-in baggage at the station rather than the airport was provided. Therefore, passengers could spend time in the CBD, rather than immediately boarding the trains. However, check-in systems were shut down shortly after the 9/11 attacks due to security reasons.

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Fig. 12: Development of London Paddington Station over its years.
Source: http://www.networkrail.co.uk/london-paddington-station/history/
From depot to terminal

Introduction to the study of precedents

The airport terminal was born when airline operators needed facilities in which to queue and shelter waiting passengers. Built in 1928, Miami’s Pan American Terminal is an existing example of the first terminal type, which was then called a “depot.”

As popularity for commercial air travel grew, so did the need for space and more importantly, a means to create convenient, functional and symbolic gateways. Architects of this era, beginning in 1929, translated train stations into air stations as they sought to embody the gateway ideal and provide linkage to the central business districts they served. New York’s LaGuardia Airport was developed during this time and, notwithstanding numerous modernizations, remains an example of both the successes and shortcomings of this translation.

Fig. 13: Inauguration of the Pan-American Terminal at Miami in 1928.
Source: http://upload.wikimedia.org/wikipedia/commons/3/37/PanAm_KeyWest_terminal.jpg

Fig. 14: Aerial view of the LaGuardia Airport in 1930's.
Precedents
Saarinen combined the seductive curves of biomorphic shapes with incredible feats of engineering to create a “building in which the architecture itself would express the drama and specialness and excitement of travel.”

The form of the building explores a metaphor, as did Saarinen’s other great airport building, Dulles International Airport (1958-63) in Washington, Virginia. The former is avian in the sense of bird-like and expresses the imagery of flight; the latter is more of an expression of the uplift of flight through the ordering device of a great aerofoil roof.

Saarinen’s illustrious TWA Terminal is admired by architects and others for its sculptural qualities in light of its thin-concrete-shell construction. Departing passengers were greeted off the curb by a cantilevering shelter, addressing the tail of a bird in-flight. The linearity of the terminal, and the composition of the bird strongly suggested the direction of departure and the “spirit of flight”. The careful displacement of light also raises the romantics of the architectural spaces and the notion of travel. Strips of lighting trace the floors and suggest directionality through the terminal. Saarinen wanted passengers passing through the building to express the essence of flight;

The avian imagery

TWA Terminal, New York USA by Eero Saarinen 1962

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experience a fully-designed environment, and this was enabled by the splitting of passenger flow through levels. The ground floor was largely publically used, with the location of ticket and check-in counters and an area isolated from circulation enabled a lounge to watch aircrafts on the apron. The top floor caters for a café, bar, restaurant and several private meeting rooms. A staircase, coupled by two galleries took the passengers from the terminal to their boarding gates. The galleries were vaulted and lit to suggest the interior of an aircraft. Departing passengers utilized the same galleries, and the baggage claim could be accessed from the terminal.
An interesting Spanish version of the TWA terminal
Sondica Bilbao Airport, Bilbao Spain by Santiago Calatrava 1990

Designed almost 40 years after Saarinen’s TWA Terminal at JFK, Calatrava here explores a similar avian metaphor, expressing the tail of a creature which swoops over the curbside, and the ‘beak’ of the bird points over the airside apron, thus the form of the structure suggests directionality towards travel.

The main terminal for which Sondica Airport in Spain is famous was designed by Santiago Calatrava in 1990. His firm, Calatrava Vals, has supplied the necessary uplifting imagery: there is the characteristic of avian motif, with the roof of the central terminal building resembling a bird with its wings folded back. Such a concept provides the required spatial emphasis for a departure concourse and gestures towards the act of flying. This large area is predominately glazed which orders other functions such as clarity and light. It rises from an almost triangular plan to a prow high above the airside corridor. The prow resembles a giant bird of prey with its beak hanging above the airports standing at their gates. The terminal has a sleek design, with two symmetrical “wings” that provide access to planes and trains. Unlike many other airports, Sondica Airport closely engages with the public car park in its architectural language. It is orientated on the central axis and the canopy of the terminal creates a ‘swooping’, inviting gesture over the car park entrance.

Rather than laterally separating arrival and departure lounges, Calatrava places them both in a great central space. This creates harmony between the space and the issue of interchange control does not hinder ones experience of the space. As the former terminal could not expand any further, Calatrava’s design provides the powerful structural and architecture vision necessary to accommodate future growth without sacrificing the clarity of the concept.

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33 Ibid.
Fig. 20a: The layout of the terminal suggests directionality and clarity of movement.  
Source: http://goo.gl/ziM1D0

Fig. 20b: Baggage reclaim hall resembles avian skeletal.  
Source: http://goo.gl/ziM1D0

Fig. 20c: Combination of structure and light at the ‘beak’.  
Source: http://goo.gl/ziM1D0

Fig. 20d: Similar to TWA fashion, the sweeping tail curb-side.  
Source: http://goo.gl/ziM1D0
The new airport in Osaka displays the emergence of a new generation of airport architecture. The characteristics that give it this importance are complexity, scale, technological splendor and engineering prowess. The design of the airport exploits open curvaceous forms, manipulates light and structure as a form of way-marking for passenger routes, gives the skin of the building the qualities of those of an aircraft and integrating multi-mode transportation systems.

The assembly of enormous curved beams and braced columns give the terminal clarity and order. Columns, beams, lattice girders and sweeping lantern lights become the guiding elements that direct, deflect and assemble weary passengers. Another important method of suggesting key routes through the terminal are different forms of structural and spatial articulation in each zone, thus suggesting hierarchies of use.

“The Terminal has an undulating roof, whose wave-like profile rises and falls to reflect the importance of the accommodation inside.”34 The sense of journey (direction) towards airside is created through the uplift in the roof structure, as that movement an aircraft makes during take-off. The roof then drops just before the departure hall, creating the required buffer zone before passengers are released into the long, narrow curvaceous departures wing at the end of the terminal. Instead of being roof lit, the departures wing is lit by curved windows which overlook the operations on the apron.

A sensuous approach to mechanical ventilation is also strategized in design of the ‘air’ inspired roof form. “This is most evident in the relationship of the roof profile to the ‘natural curve of a jet of air blown into the departures hall from the land side.”35

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Influence of movement on design.

Fig. 21: Format of the mechanistic roof
Source: http://www.japan-guide.com/g3/2033_01.jpg

Fig. 22: Structural expression of the great roof
Source: http://goo.gl/pckY9F

Fig. 23: Sectional diagram illustrating passenger movement in relation to the roof
Source: http://goo.gl/sIHAbz
Derived strategies: An exploration of forms

Physical modelling and sketching to generate and analyse strategies associated to expressionist qualities

Fig. 24 and 25 are explorations which embrace the “bird-like” characteristics as ways to derive space and form. The purpose of this physical model is to convey the facilitation of air travel whilst acknowledging methods of way-finding. Thin strips of card are cut and installed to represent the structural body of conceptual terminals roof, and black foam represents the functional body of the terminal. With the introduction of light, the strips of card cast shadows onto the ground which induce patterns across the floor. This exploration features a combination of strategies derived from the earlier airport precedents: Light as a guidance mechanism (TWA) and expressive structure as a system of orientation (Kansai and Bilbao). The strips of card also feature a rise which leads from curb-side to gate-side, expressing the escalating romantics of air travel. Although there is no evident symmetry through the arrangement of the strips - opposing the “bird-like” intention - this was a method of testing the spatial experience of the form and its way-finding attributes. As the current stage of explorations have informed that light and tectonic expression are strong elements on the form and spatial feel, they have been explored at a later stage in the document.
[Fig. 26] The sweeping curb-side roof in the earlier precedents conceived experiences of being generously accommodated into the terminal whilst being reminded of air travel through its uplifting expression. An exploration model was made in which two pieces of card - one translucent - are over-lapped and arched over a scale human figure to simulate the experiences one might encounter. The model also conveyed composure with its sweeping form, and the drama of light and dark spaces as the result of the multi-material roof correlated different interior experiences.

Kansai indicated a form that was inspired by the movement of people and the expression of the aircraft as a machine, taking off. The first exploration, Fig. 27, simulates the multi-level floor and how movement and space is generated. Fig. 28 is a physical modelling exercise using aerofoil tape - used for aircraft body maintenance - to create a roof which relates to a machined and engineered finish. Fig. 29, illustrates a merge of the two previous explorations, informing a draping roof form over the conceptual floors generating spaces.
Fig. 30: Air movement and the aircraft aileron.

Fig. 31: Conceptual sketch of air movement.

Neutral

Raised

Lowered
The movements of an aircraft's aileron - also known as flaps, a control mechanism on the end of an airplane's wings - is explored through a series of sketches (Fig. 30). Flaps allow one wing to generate more lift than the other, allowing aircrafts to bank left and right, represented as the raised and lowered position. When an aircraft is not turning, the ailerons are in the neutral position. The second sketch (Fig. 31) is a conceptual sketch which highlights the different patterns of air movement that generates as an aileron alters its position. This drawing formed analogies of passenger movement, the ability of integrating the movement of air between solid forms and how multi-positional surfaces could configure and amplify movement.
Fig. 32: Airport Transport & Travel Limited (AT&T) pioneer the first International flight carrying passengers - A daily service from Hounslow Heath Aerodrome (London) to Le Bourget (Paris) in 1919.

Scenes of a new city: The airport terminal

Critical regionalism

Airport terminals are, and should be monumental portals - gateways to communities, countries, and adventures. As the world has become smaller through technological, political, economic and social metamorphoses, passenger terminals have become civic buildings. Along with being designated “civic” facilities comes profound responsibility: to promote a greater sense of humanity by representing the culture, geography and human spirit in which they are rooted.\textsuperscript{36}

Denver International Airport

Denver, Colorado USA 1995 by Fentress Architects

Announced in 1985 as the replacement for land-starved Stapleton Airport, DEN was the answer to the city’s growing demand for air transportation, the resolution to national congestion issues caused by runway sequencing in inclement weather, and the means to establish an internationally-recognized landmark for the region. The terminal’s general plan is composed essentially of a linear layout, folded back on itself. The terminal’s design draws inspiration from its breath-taking backdrop (Fig. 35) and the abundant sunshine that the site’s high plain desert environment bestows upon the building.\footnote{\textit{Fentress, 10 Airports}, 15.}

Initially, concepts of design investigated optimum ways to incorporate both natural light and mimic the angular nature of the Rocky Mountains. Studies involving a series of models indicated that a fabric roof, rather than a traditional one, would not only express design goals, but it would be easier to maintain and quicker to construction.

A mixture of light-filled roofing materials and the solid, earth-toned base spoke to the confluence of mountains and plains, constituting the imagery of land and air, and the poetry of flight. As such, the image of downtown Denver has been improvised in the design of the terminal as a combination of innovative building technologies, aesthetic vision and an efficient operational design, enabling the airport to achieve a timeless, enduring quality.

Small, mirrored versions of the fabric canopies that arch over the great hall reinforce the buildings contextual inspired design, providing shelter for embarking passengers. Once inside, spatial characteristics and subtle signage direct passengers to various facilities. Ticketing halls span within a daylight washed, column free space.

On average, 38 million passengers that have passed through Denver terminal experience the Great Hall, a space that is 67 meters wide and 18 meters tall which offers panoramic views to the Rock Mountains’ Pikes Peak and downtown Denver (Fig. 33). The massing of the Great Hall, which rises like the barrel-vaulted roofs of Manhattan’s Grand Central Station and Washington, DC’s Union Station, encourages a moment of repose.\footnote{\textit{Ibid}, 17.}

[Fig. 34] Earth-toned colours of materials inside the ticketing area are reminiscent of the context. Inside the Great Hall, a combination of greens, blues and browns dot the floor in an abstract pattern reflecting an aerial perspective of the eastern
Colorado agrarian landscape.

In light of structural materials, the terminal has one of the largest structurally integrated tensile membrane roofs in the world. Coupled with its striking roof structure, the sheer magnitude of the building captivates travellers as they approach from both land and air. The translucent Teflon coated fiberglass membrane roof conformed to span requirements and also allowed hot air to escape through the fabric. Daylight penetration was enabled through the translucent fabric.

Witnessing an average of 300 days of sunshine per year, careful consideration was given to ensure passenger comfort (Fig. 37). The roof controls much of the direct sunlight to eliminating glare and directs light into spaces through curtain walls on overcast days.

39 Ibid, 18.
Fig. 36: The illuminated canopy roof at dusk.
Source: http://www.fentressarchitects.com/portfolio/aviation/denver/

Fig. 37: Diagrammatic section illustrating systems of daylight and sunlight integration.
Source: http://image.architonic.com/imgArc/project-1/4/5205148/Fentress-DenverAirport-07.jpg
Beijing International Airport

Beijing, China 2003 by Norman Foster

In the design of the Beijing Airport, Norman Foster acknowledges traditional Chinese architecture by emulating a ‘sweeping’ high-tech roof. In Chinese architecture, the roof is a dominant feature of buildings, not only as protecting its residences, but also carrying spiritual values. Foster also expresses the structural columns that support the vast roof by imitating traditional Chinese columns. Originally, the columns are constructed of wood and painted red to symbolize good fortune and joy. Foster’s version is painted red, but constructed of concrete instead.

The terminals unifying and soaring roof features a dragon-like form, celebrating the poetry of flight and evokes Chinese colours and symbols. Skylight systems are imitated to create the appearance of dragon-scales, and the innovative use of yellow or ‘gold’ and imperial red colour (the two colours of the Chinese flag) are used to distinguish the two terminals as international and domestic, giving the building a strong sense of place.

In construction terms, the building was designed to optimize the performance of materials selected on the basis of local availability, application of local skills and local fabrication. The terminal was specially designed to be a landmark and gateway to China, planned to open in 2008 for the Beijing Olympic Games. Thus, the aim was to create ‘a new icon’ which would in Foster’s words were, ‘symbol of place and togetherness.’

42 Ibid, 10.
44 Ibid, 203.
Fig. 38: Dragon scale inspired skylights in the roof  
Source: http://goo.gl/Qh6uPz

Fig. 39: Typical Chinese column  
Source: http://goo.gl/ScN2pw

Fig. 40: Foster's version of traditional Chinese columns for the airport entrance  
Source: http://www.fosterandpartners.com/projects/beijing-airport/
Pilgrimage to Mecca is considered as the most important act of the Islamic Faith. Every Muslim is required, at least once in their life to perform the annual Hajj; the Islamic pilgrimage to Mecca.\(^{35}\)

With the advancements of modern transport, there resulted an annual growth of pilgrims arriving into Jeddah airport, which created the need for a separate facility which would cater for the Mecca-bound travellers. As a large group of the pilgrims decide to remain here for some time, the needs of highly diversified passengers must also be met through the new terminal. As the area symbolizes the “gateway to Mecca”, there was a search for a peaceful environment to make the transition into the realm of spirituality as tranquil as possible. Practical requirements to provide shelter from the heat and meet the diverse needs of the large group were the main objectives of this terminal.

At the terminal, the sudden passage from a highly individual to a collective spiritual experience is symbolized by the ritual donning of white garments on the sacred ground. The shape of the white roof (Fig. 43) is inspired by the visual impact of large-scale nomad settlements as a response to the severe, local climate.\(^{46}\) A study of air movement (Fig. 41) generated a curved double-tent which manipulated cool air underneath its surface and pushed hot air through the openings at the tip of the fiber-glass Teflon coated roof membrane. As the terminal is used only for six weeks in one year\(^{47}\), this system provided the pilgrims adequate climate comfort whilst eliminating the requirements of mechanical ventilation.

The tent-like roof structure also imitates the appearance of typical mosque domes (Fig. 42), creating further symbolic references to the Islamic religion and the Holy City of Mecca.
Fig. 42: The main hall - Interior of the Hajj Terminal
Source: http://images.businessweek.com/ss/07/05/0525_middleeast/image/haji_terminal.jpg

Fig. 43: White Mosque - Jeddah
Source: http://susieofarabia.files.wordpress.com/2008/09/dscf5767.jpg

Fig. 44: The tent-like composition of the roof.
Expression and articulation of volumes

Exploring strategies of way-finding and the sensation of flight through natural light and structure.

“Modern airports are so large that they cannot be readily comprehended. The use of streets, malls and gardens inside the terminal allows the passenger to grasp the sense of direction or location. But formal and spatial geometries are not enough: the volumes created need to be expressed and articulated.”

-Brian Edwards in, *Modern Airport Terminal*

Information derived from the study of precedents has instigated a further study into expression and articulation of volumes. The expression of flight, and the articulation of way-finding has been haunting the design of the airport terminal since mass-tourism in the 1960s, thus it has become important to this research to trace which strategies are utilized to deal with certain requirements.

Brian Edwards defines in *A Modern Terminal: The search for place in design*, the qualities of airport terminals which bring a space alive, and allow the traveler to grasp the sense of direction, the speed of movement through the terminal, and the functional hierarchies present. Edwards calls out the design of Kansai as a good example, highlighting that the significance of its great high-tech roof goes beyond that of constructional need, rather it communicates meaning and function through the language the roof speaks. Inevitably, structure and space are important in the design of terminals, but light - especially the white light of sunlight and the dappled play of daylight - provides a further element in the designer’s repertoire. Edwards proposes that light has become a tactile material, shafted and molded to delineate spaces and its functions, and as a method to guide passengers. It is the mere feature of introduced natural light into buildings that has distinguished first-and-second generation terminals. The array of techniques in which light can be utilized can range as a method of drawing passengers towards the direction of flow – from landside to airside – or to suggest in its opposite direction exit routes and baggage reclaim halls. Daylight can also be manipulated to distinguish festive from tranquil, noisy from quiet, and public to private spaces. Edwards’s comments on the employment of sunlight into terminals as a means to bring alive exhilarating and lofty volumes, animate structure and to provide sparkle.

In the design of Kansai, the linearity of the roof structure suggests – from landside-to-airside – a clear articulation of the process of movement. The roof raises in height and poetically expresses the separate functions of spaces on the floors below (Fig. 45). In light of tectonic expression, the search for weightlessness in the choice and construction methods, the preference of thinness over thickness

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50 Ibid.
conveys an architecture that defies gravity, just like an aircraft that the terminal serves. As early as Saarinen’s TWA Terminal, the implementation of light - as a strategy to guide passengers and animate structure - is already present. Shafted daylight through the openings in the roof above, creates a distinguishable path that guides passenger’s landside-to-airside. The play of sunlight as it reflects and rebounds off surfaces within becomes sufficient to light and bring to life the curvaceous interior. Daylight entrance is filtered through vast windows, while the overarching character of the sweeping roof prevents glare.

Fig. 45: Roof lighting at Kansai in the public concourse, highlighting route towards departure gates. Source: http://www.japan-guide.com/g3/2033_01.jpg

Fig. 46: Strategically shafted light creates paths on the concourse floor at TWA Terminal at JFK International, NY. Source: http://www.greatbuildings.com/buildings/TWA_at_New_York.html
In conjunction with light, roofs have changed their shape or form. The important role of interior volume in accommodating the function diversity of modern terminals is complemented by great wavy roofs which open and fold to bring in daylight. Light, both artificial and natural, is used to penetrate to dark cores of the terminal building. As such, the key principle to the design of Terminal 4 at Madrid Barajas Airport in Spain by Richard Rogers is ‘clarity and legibility’ of passenger movement. Way making through the spaces is provided through the exploitation of the terminal roof, where particular importance is given to the ceiling over the lower areas given over to retailing, bars and security barriers. The repeated undulating of the roof provides daylight entry to the upper levels, and a series of canyons cut through the flows allows light to penetrate into the lower levels. The wave-form roof, louvers for solar control and the enormous ‘V’-shaped structural columns provide an architectural order which is sufficiently robust to withstand the visual pollution which is the inevitable consequence of retail outlets. There are three canyons that cross the movement flow of the terminal. The split level system is integrated to make the destination – the departing aircraft - either visible or readily perceived. Shops and other attractions are located within these streets (canyons) so rather than passengers having to walk around the shops, the journey is made clear. The canyons are also well lit by their own roof lights, giving passengers the pleasure of passing through high-level bridges over canyons.

Fig. 47: A combination of daylight and mechanical light animate the interiors - Madrid Barajas, Spain.

51 Edwards, The Modern Airport Terminal, 263.
Fig. 48: Diagrammatic section indicating natural light systems.
Source: http://www.richardrogers.co.uk/Asp/uploadedFiles/image/2642_Nat%20Barajas/design/BarajasAir_6.jpg
Derived strategies: An exploration of light

Physical modelling and sketching to explore strategies informed by light as an attribute of ‘place’.

Much about light has been said in the previous chapter as part of the essential architectural experience of terminals, passenger cognitive orientation and the animation of structure.

An exploration of light sees its manipulation and implications through exercises of physical modelling and sketching. Both natural and electrical light were utilized in this study, and scaled model figures were added to better render the experience of light in various scenarios.

Fig. 49, was an exploration of sunlight. The light was shafted through an opening on the top of the model, admitting sharp guided light into the space. The light gave the space a public feel, also making it feel noisy and festive. However, long periods of occupancy seems very unlikely due to extensive glare and heat.

Fig. 50, is similar to the previous, but the light is now diffused using translucent plastics. Here, the light refracts as it travels through the plastic, creating a subtle glow into the interior. A comparison of the two shows that the diffused light is capable of illuminating a larger surface area, and the space starts to convey a tranquil, comfortable place to dwell. Light and heat are also less likely to become problematic here.
Fig. 51, makes sense of fragmented light to represent areas which constitute a sense of gathering, such as the baggage claims hall and security. This exploration is appropriate especially in zones which are typically darker, such as customs and security and often the baggage hall. Thus, one may presume that the space is often occupied by many, or that it is an area for forming queues.

Fig. 52 and 53, explore light as a tool to suggest the direction of passenger flow. The light here is cast through openings between an arrangement of structural beams above the space. The first image uses the floor surface to guide the passenger, and the other uses the wall as a surface to project the rays of light.

Fig. 54, is an exploration of a shafted spot light, which highlights the importance of a particular place or position. This system can be used to mark important facilities such as information kiosks and exit routes, or to distinguish next-in-line position of awaiting passengers.
Text: The Modern Airport Terminal

Embedded as a precedent, *The Modern Airport Terminal: New Approaches to Airport Architecture*, by Brian Edwards is a comprehensive guide to the planning and design of airport terminals. The use of his literature is intended as a source of guiding principles and inspiration for the design aspect of this research.

**Master planning typical terminals**

The layout of the airport is determined by numerous related factors. As in all design exercise there are no precise rules, but rather the balancing of one factor against another to arrive at the best compromise. The principal factors to consider, evaluate and organize are:

- Number and orientation of runways (especially with regard to meteorology)
- Number of taxiways
- Size, shape and organization of aprons
- Area of available land
- Topography and soil conditions
- Phasing of development and possible future expansion
- Strategies for public transport connections
- Topography and soil conditions

![Diagram of Terminal and Runway Layout Types](source: Brian Edwards, Modern Airport Terminal)
Vertical segregation in typical terminals

There is close correspondence of the concept in plan and the arrangement in section of the terminal building. To distinguish between those arriving and departing, certain plan types necessitate passengers to change in level. Level changes can also assist with security and baggage handling, often provided by a private intermediate floor between the two main terminal levels. Four basic plan/section arrangements are commonly adopted.

- Single-deck road, single-level terminal, and apron access to aircraft
- Single-deck road, one-and-a-half or double-level terminal, and elevated access to aircraft
- Double-deck road, double-level terminal, and elevated access to aircraft
- Elevated double-deck road, double- or triple-level terminal, and elevated access to aircraft.
Fig. 57: A traditional Fijian structure - ‘Bure’
Nadi International Airport
Nadi, Viti Levu Fiji Islands.

Nadi International Airport is currently the main gateway into Fiji, an island country destination sought by many holiday seekers from across the globe. Fiji is a republic, consisting of an archipelago of 332 islands in Melanesia in the South Pacific Ocean, roughly 1,100 nautical miles north east of New Zealand. Of the 332 islands in total, 110 are permanently inhabited and there are over 500 islets (a small island). There are two major islands, Viti Levu and Vanua Levu, which account for 87% of the 850,000 total population. The capital city, Suva, is located on the former.

Nadi International Airport is located in the Western division of Viti Levu, north of Nadi Town, and is the largest airport in Fiji, followed by Nausori International which is located in the East closer to Suva. Since Nadi airport was first established in 1940, the history of the airport has seen a turn of events from when it first operated as a USAF (United States Air Force) base during the Early War in 1941, to when it served as a transfer and refueling airport for passengers and aircrafts from Auckland’s Whenuapai until today, where the airport has become a major Trans-Tasman transit hub. Since the early years of operation, many of the existing old features of the airport have been diminished under new construction. Original white washed paving which transported passengers from terminals to aircrafts had been covered under the concrete of newly designed aprons which facilitated modern aircrafts. While the motive of this research deals with the ideals of ‘gateway’ that offer glimpses of one nation’s identity, it becomes of equal importance that the site carries qualities that are not only significant to the immediate context, but are in fact exclusive on the international stage. The grounds of Nadi Airport have been identified through its historic purposes through to its contemporary use.

The site becomes fascinating in the sense that it has become a major attraction since then, especially because it caters for the 2.3 million passengers that utilize the airport annually. Fiji is known as an attraction that comprises some of the best beaches and friendliest people in the world, therefore the role of Nadi Airport escalates from its primary function of a transport interchange to rendering a gateway which should articulate experiences that remain with passengers, similarly as architect Tadao Ando suggests, “You can’t really say what is beautiful about a place, but the image of the place will remain vividly with you.”
Wind summary
As of the tropical climate category, the characteristics of wind flow patterns in Fiji are not similar to New Zealand. At Nadi, wind is distributed in a circulating east-to-west or vice-versa direction. Fiji is sought as a holiday destination is its weather reputation. The average annual air temperature in Nadi is 27°C.

Annual sun and rain summary
It is important to highlight that Fiji does have a wet season. This is normally from November to April and this period contributes most of Fiji’s annual rainfall. The wet season is characterized by brief, and heavy local showers. Cyclones are probable during the wet season.

The remainder of the year is confined to significant warm, tropical climate which gives Fiji the reputation for being one of the world’s most preferred holiday destinations. The highest temperature in Nadi is 31.6°C (January) and lowest 18.3°C (July).

Circulation

The road which runs adjacent to the airport site is known as Queens Road, one of two major road networks that encompass the island of Viti Levu – the latter is known as Kings Road. Queens Road provides public access to the airport for travellers stretching from Lautoka to Suva. There are two bus-stops in the airport vicinity – the public bus stop is located outside the airport entrance and the tourist oriented bus stop is located within the airport car parking. A double road system provides clear indication of entry and exit into the airport complex, and a security booth disguised in the appearance of a traditional Fijian ‘Bure’ becomes the entry/exit threshold into the airport.

A useful strategy derived from the existing layout of the circulation systems is the notion of splitting the road into two major uses. The first road handles airport and cargo services, the second road circulates around the centralized car park, providing as an access road to and from the terminal, returning to the security booth. The car park which the road encompasses is largely underutilized through the year, and prevents any expansion of the terminal towards the road.

A railway track intersects the site just before the entrance Bure. During the sugarcane season (June or July) the track is frequently used by locomotives which export sugarcane from many locations around Viti Levu to a mill in Lautoka. During the off-season, the track becomes out-of-service. The placement of the track causes no major issues to airport access or the gradient of the roads.
Topography and orientation

There is very minimal change in the height of contours on the site, and this is largely due to the fundamental pre-requisites which serve the airport typology. The highest point is 13 meters above sea level and this is at the entrance of the site. There are two drainage ditches which are located at the center of the grass plains, which are the lowest points on the site at 7.5 meters. However, this is not directly related to aircraft operations. Therefore, the lowest point which facilitates aircraft operations is the Western boundary of the apron at 11 meters. At the scale of the large site, the 2 meter difference in contours is not significant. The center of the car park is roughly 13 meters, but descends to 12.5 meters at the entrance of the encompassing buildings.

All service related buildings are situated on the Southern portion of the site. These are catering, cargo and the airport operations headquarters.
Site Visit
Describing and analysing the experiences derived at Nadi Airport

Scope
A trip to Fiji was organized in May 2013. The dominant reason of the visit was to experience and analyse the existing airport terminal in its architectural, and cultural aspect. Ultimately a summary of the site visit will suggest both positive and negative qualities/experiences of the existing airport/site. This will inform strategies to be integrated into the design element of this project.

The structure of the site visit is sequenced to simulate the experiences of a passenger arriving into Fiji, disembarking the aircraft and progressing out of the airport. Experiences of other important features such as the public concourse and domestic travel areas are then highlighted, subsequently concluding the analysis with the passenger experiences on the departure journey.

Arrival
As the aircraft emerges out of the clouds, the first glimpses of Fiji correlate to a vibrant array of greens, blues and whites. From the sky, the view conjured a vision of lush green islands, bordered by white sand beaches encompassed by a turquoise sea. Descending lower, the abundance of beaches fringed by coconut palms become apparent, enhancing the anticipation of arrival. After disembarking the aircraft and setting foot on the exposed air bridge (Fig. 62), the first impression of Fiji is the refreshing and awaking heat of the tropics. The sudden change in temperature, from the cool comfort of the aircraft cabin to the warm, humid Fijian climate is an experience which reassures one’s arrival into Fiji.

[Fig. 63] From the air bridge, the journey towards the arrivals hall provides glimpses of the ocean to the West, while travellers cool off to the coastal breeze. The views of the water and islands in the distance are just visible over the horizon but the views of the spectacular mountains on the North (Fig. 64) are notably overlooked – due to the direction of travel towards the arrivals hall. The internal corridor leading to the passport controls area is substantially darker and extensively decorated with advertisements promoting local beverages, resorts and shopping. At the end of the corridor, a group of locals chanted Fijian songs to the strumming of the Ukulele and welcomed us into the immigrations hall where a large queue of travellers had developed.

A small passport controls booth is established on the opposite site of the arrivals hall for transit travellers, who are processed into the international departures lounge. After 40 minutes, unpleasant – it was very hot and the air was stale – wait, we finally cleared the immigration check and descended a floor into the baggage claims hall below. A variety of duty-free shops located in the hall kept travellers
occupied as they awaited their luggage.

Customs control is located towards the end of the hall, at which the security officials politely processed travellers through. We were then guided through the sliding doors into the arrivals hall where we were greeted by awaiting friends and family. It is important to highlight the selection of shops in this zone, which offered services such as car rental, accommodation and telecommunications.
Departure

Travellers arriving at the airport are dropped off at the departures concourse curbside. The space is sheltered by the generous cantilever of a flat roof, comprised of skylights which allow light to penetrate through. Travellers then trolley their luggage through the automatic doors into the adequately ventilated concourse area.

[Fig. 65] The public circulation oriented zone within the terminal is generous in volume and adequately lit, making it a comfortable space to occupy. Structural columns throughout this area are encased in plaster and used as surfaces to advertise local businesses. The abundance of the thick columns throughout the concourse give the space a heavy, grounded feeling. The check-in areas are located under a low ceiling, which is acknowledged as one moves from a well-lit and open to a dark and enclosed volume. In light of internal climate, the queuing area is shaded from the sun and adequately ventilated, however, the low ceiling traps heat – especially during the day - and lengthy occupancy can become unpleasant. Premium class travellers on Air Pacific – the national airline - are provided the luxuries of a shorter and much more efficient queue than that of economy travellers. For premium travellers, the posts which constitute the zigzagging check-in lines are also crafted to emulate local significance, offering a reflection of their recent experiences, whereas economy travellers are presented with the typical chrome type posts (Fig. 66). The implication is that, the experiences may tend to vary depending on the travellers class.

After checking-in, travellers progressed across the public concourse towards the pre-departure passport control, while possibly stopping to enjoy the variety of cafeterias/shops or visit the Bureau de Change on their way. Boarding passes and passports are then verified by officials before being permitted to progress through to security check. Airport staff politely guided travellers through the security screening processes (Fig. 68). It is important to note that counters with generous surfaces were provided for travellers to gather personal items. The security realm portrayed a bright white interior and featured a frame which displayed pictures of local experiences that encompassed along the perimeter of the space. Travellers then progressed to the immigration check before advancing into a hall offering duty-free shopping. A set of escalators at the end of the hall took travellers up onto the first floor departure lounge. Immediately beneath the departure lounge and located past the escalators were the airline lounges, which were kept distant from the busy travellers routes. The departures lounge offered a variety of duty-free shops, restaurants, electronic services such as Wi-Fi and TV, keeping travellers occupied as they awaited their boarding call. The recent addition of a large skylight located at the center of the lounge over a bar, allowed natural light to penetrate through.
into the space as travellers gathered around for drinks while enjoying the sun. However, problems such as overheating – despite the space being mechanically ventilated - and passenger discomfort had resulted in the skylight being masked to control overheating issues (Fig. 67). Seats and tables encompass the skylight atrium and bar. Most travellers seemed to prefer to relax within the central space, whilst others explored the range of duty-free shops that surrounded the greater lounge. Departure gates are located on three sides of the lounge; routes are adequately highlighted through the use of ceiling suspended signage. Queues at the gates begin to develop as departure calls are announced. Similar to arrival experiences, departure passengers utilized an aerobridge which is exposed to external climate to get to the aircraft.
Domestic aspect

The domestic travel section of the terminal was important to visit as this is the airport’s main way of reaching out (providing flights) to small island destinations. Frequent services between Nadi International Airport and Levuka, Vanua Levu, Taveuni, Suva and even Rotuma are offered. Domestic travel comprises a large portion of travel both in-and-out of the hub airport. Majority of the travellers travelling into the airport are utilizing the services for work, or as an international transfer – due to their local airports being incapable of facilitating large aircrafts. A large portion of travellers on domestic flights out of Nadi are tourists, venturing to the local islands.

The domestic section is located on the southern portion of the terminal, at the end of the check-in facilities and it is accessible through the public concourse. After checking-in, passengers progress towards an enclosed room, where a light security check is conducted. The qualities of the interior here are mundane, similar to the dull experiences of the check-in area. As a result of its south orientation, the space is low lit but the prospect from a window which points towards the runway allows light to filter into the space. The experiences derived here were “cave-like”, especially in the sense of a contrasting cool, dark interior to a hot, bright exterior. (Fig. 70). Domestic aircrafts at the airport are of small/light class, and these are mainly ATR’s and Beechcraft’s. As a requirement of the departures process, passengers are provided with the excitement of walking across the tarmac in order to reach the aircraft (Fig 69 & 71). For many travellers – especially overseas – this would be a first time experience. The sheer excitement of flying to an island packaged with the extensively open experience of the tarmac conjured a memorable experience of domestic travel at the airport.
Fig. 70: Domestic departure lounge and views of the tarmac. Looking west.

Fig. 71: Walking across the tarmac to board the ATR-42
Culture within the terminal

As addressed earlier, culture within the terminal is an important element as it conjures one’s first and last impression of the nation. Arriving passengers are presented with an excellent first impression of Fijian culture through music and friendly smiles, but the dull departure experiences tend to steal from the experience as a whole. The uniqueness and excitement of local culture does not flow through the terminal; instead surfaces and spaces are used as advertising means. Small scale, mediocre, motifs can be found across the terminal, but nothing spectacular or significant: For example, the premium class bollards mentioned earlier and the woven mat which drapes around the helpdesk counter (Fig. 74). Many of the “culture-capable” surfaces are dressed with advertisings, and this occurs from the arrivals hall (Fig. 75) to the public concourse (Fig. 72) and the departure security checks. Small scale planting is also simply a means of disguising surfaces and an attempt to convey a sense of local vegetation (Fig 73).
Analysis of airport and flight statistics

The statistical data in the graphs have been attained from the *Airports Fiji Limited Annual Report 2011*. In the document, statistics relevant of total passenger and domestic movements have been recorded. The analysis could indicate future trends which may be integrated into the design.

[Fig. 76] Total passenger movement, indicates that there has been a constant increase in passenger numbers since after the -12.7% drop in 2009. The total passenger increases for 2010 was recorded 1,412,399 (up by 27.2% from 2009) and a further increase in 2011 by 4.9% to 1,686,217.

[Fig. 77] Total domestic passenger Movement, both total and movement figures have dropped since 2009 with a slight increase seen in 2011. In 2009, Nausori Airport became capable of handling international flights and passengers preferred the option to fly direct rather than taking a transfer domestic flight from Nadi to Nausori. Nausori was shut down in 2011 for renovation. Domestic flights out of Nadi serve Levuka and Kadavu and Nausori.

Although there has been steady increase in passenger numbers at the airport, [Fig. 78], provides contrasting results indicating a decrease in total international and domestic aircrafts at Nadi. There are two factors that govern this change in pattern. First is the introduction of new, wide-body aircrafts which are capable of carrying more passengers means fewer flights into Nadi with more passengers on board. The second is code sharing, an airline business term for selling space on the same flight, i.e. Air Pacific flies in partnership with American Airlines. Passengers that are flying to Fiji on an American Airlines flight are ultimately flying on a single code-shared Air Pacific flight.
Design

Fig. 79: Conceptual sketch of terminal interior
Exploration 1
Prospect - Existing buildings.

This exploration is to make sense of the prospects for existing infrastructure on the site. As the site is already occupied with buildings, car parks and a pair of runaways, this exploration will identify whether the infrastructure is to remain or be removed.

During site analysis, it was evaluated that the current car park is now largely underutilized and restricts any expansion of the current terminal. The relatively large car park stretches far into the site, posing issues for future design therefore it can be decreased/removed. The existing terminal which encompasses the “now removed” car park is to be removed also, and this is decisions is supported by a multitude of reasons.

In regards to the immediate context, the terminal conveyed insignificant relationship with its surroundings, extensively overlooking its ability to frame captivating views or utilizing prevailing winds and natural light. The terminal promotes the bare minimal of Fiji’s unique culture, tradition and weather, and its abundance of business advertising detracts from the experience of the airport. The terminal has undergone multiple renovations to facilitate the growing number of travellers, and this is the airports only remaining strategy. Due to its inefficient “U” shaped configuration, the terminal has been identified by Lawrence Liew, CEO of Airports Fiji Limited to become “obsolete in the next 20 years.”

Way-finding is also an issue for travelling passengers as facilities and functions are segregated and dispersed around the terminal; sequenced functions such as check-in to pre-departure security are spread apart.

Located adjacent to the northern perimeter of the site is a medium scale business/industrial zone, comprised of a few buildings that pose no significant interference with the selected site. Therefore, these buildings will remain.

The runways are strategically located to function cohesively with aircrafts and the four taxi-ways which supplement the aircraft apron. As the architectural solution is much to do with passenger experience, infrastructure relative to aircraft operations will remain.

The existing railway line which borders the eastern edge of the site could become a potential transport connection to the site, and it does not obstruct any on-site operations. This will remain.
In this exploration, a new axis of movement - towards the direction of travel - is embraced as an initial design point for a new passenger terminal. In his *Modern Airport Terminal*, Brian Edwards dictates the three types of airport terminal layouts with respect to runway configurations. The type most suitable for the selected site is Fig. 55, the cross-over method. The newly established axis is marked as an orange dash in Fig. 81.

As the primary function of the airport is to cater for air travel, the conceptual experience of setting off into the wind - similar to a bird or an aircraft - is enabled through use of the new axis. The imagery is appropriate and route towards travel is now clear and comprehensive to the traveller.

The axis is located to intersect at the apex of the curving Queens Road and the centre of the two runways, highlight two points of convergence. Prospects of future expansion have also been enabled through use of the new axis, discussed later in this document.
Exploration 3
The new axis and site features

A closer view of the site highlights the new axis in relationship to various immediate features on the site, such as the existing road and train infrastructure, existing building fabric, aircraft aprons and taxiways, and the runways.

The possible build area for the new terminal is highlighted as a red box. The ideal form is currently represented as a rectangular block, which offers strategies to various issues which relate to the airport typology. These are: the facilitation of aircrafts, access and movement of people, and anticipating future expansion. The existing aircraft apron represented as a grey fill, is to remain in its current state as it supplements the terminal and the runways adequately. This allows aircrafts - of all civil classes - to occupy the outer perimeters of the new terminal more efficiently and effectively, as more aircraft parking spaces are provided (marked yellow fill). The existing airport in Nadi can accommodate only four Boeing 777 aircrafts. The result of this exploration has enabled generous facilitation of six 777's and numerous small class aircrafts (ATR's and Beechcraft). For aircraft sizes, refer to Appendix A.

As mentioned previously, access to the terminal is to be provided via the road and train systems on the East boundary. The suggested path of travel for passengers is represented along the new axis in Fig. 82. As the taxi ways, the possible placement of aircrafts and departure gates may be located on either sides of the axis (yellow fill), the flow of movement directed towards the runway seems to further make sense of circulation patterns.

To highlight some strategies of future expansion, the public oriented section of the terminal (closest to the road) can expand along the curvature of the road. However, existing buildings on the north limit as to how much expansion may occur along this edge, as opposed to south, where no obstructions are present.

A convergence point where travellers may enter or leave the terminal is created where the predominant axis intersects the road and train infrastructure. This point will be selected as the primary entrance/exit to the terminal.

The existing train infrastructure is to be incorporated as part of the airport, and utilized to transport passengers to-and-from the airport.
Fig. 82: The axis establishes a connection with existing features and infrastructure.
Exploration 4

The terminal as a movement system

This exploration makes sense of the movement of passengers that are essential to airport terminals. There are two main flows that occur and both move in opposing currents: inwards and outwards. It is important to highlight the fundamental functions and facilities that are required for a functioning passenger terminal. The overall efficiency of passenger movement and the affectivity of the spaces will ultimately be governed by the final design of the passenger terminal. However, understanding how the flow of movements for arrival and departure with correlation to both international and domestic travel is vital to the overall success of the design. The movement schematics are utilized as analytical diagrams which will guide the design process but this specific analogue will not govern the overall design of the terminal.

For this exploration, two schematic diagrams are drawn and analysed. [Fig. 83] demonstrates the function associated to the passenger flow for departure and Fig. 84, indicates information for arrival flow.

Functions marked red are the prerequisite functions that a travelling passengers endure, and marked yellow are functions and activities that are optional and may be included along the journey.
Fig. 83: A schematic diagram which indicates the fundamental functions and passenger flow for departure.

Fig. 84: A schematic diagram which indicates the fundamental functions and passenger flow for arrival.
The previous schematics have been translated to represent the fundamental functions and facilities with an added sense of realism; duration of the journey, i.e. international travel is longer than domestic due to heightened security and procedure protocols.

This exploration further made sense of how passengers moved across the passenger terminal, highlighting which functions/facilities could overlap as one. Both international and domestic departure passengers are required to go through the prerequisite check-in and pre-departure security before being summoned airside. In the schematic, the international departure (marked blue) and domestic departure (marked black) are shown to cohesively utilize a single check-in and security facility. There are a few implications: the level of security check for domestic travellers is now increased due to international travel standards, this specific pattern can be repeated numerous times to facilitate airport requirements (passengers/aircrafts), and a clear route for airport operations is established along a central axis.

Past security, domestic and international diverge to indicate the individuality of the flows, also drawing upon the contrasting length of the respective journeys. The deviation of the flows develops a central “space” which has been exploited to integrate the transit transfer passenger flow (marked green), which coincides with international and domestic enabling passengers to go to-and-from the flows. Staff will adapt a centralized axis to access all realms of the terminal.

On the international flow, arrivals functions have been arranged to complement departures functions. Arriving transit passengers exit the customs control, where they then either proceed towards a domestic flight or an international via the emigration function.
The derived analogue is then translated into a sectional diagram comprised within a conceptual building form to better articulate the movement diagram across the terminal. The vertical segregation type selected is a combination of types, the public realm (landside) features a single-level and the passenger realm (airside) is a double-level type.

The change in level distinguishes between arriving and departing passengers, while providing a baggage handling and security area immediately below at apron level. With the provided double height space, daylight, sunlight and structural elements can be exploited as navigation aids to gesture the presence of major routes and concourses, creating architectural clues which encourage passengers to find their way around.

The central “space” that was developed in the previous schematic has been translated as a double-height void here. All movement flows convene in this space before diverting. This space functions as an airside concourse where transit passengers are admitted before they proceed to a different flow.
Thresholds can be characterized as concentrated gateways, the immediate spaces which anticipate one’s expectations and/or impressions of previous and future events. An example of a threshold can relate to the experience of local climate one encounters when disembarking the aircraft in Fiji. Or that when you enter the cool concourse interior from curbside, or go landside-to-airside.

Thresholds thus become integral to the airport’s relative gateway experience, and the experiences will often always differ depending on the competency and qualities of the thresholds, i.e. long waiting queues within an unpleasant space will detract from the overall experience. However, with an emphasis on specific qualities such as functional efficiency, legibility of space and the architectural image are heightened to increase these experiences.

Five thresholds are generated along the derived movement diagram, and these are:
1. Entry and exit into the landside concourse
2. Transition between landside-and-airside
3. An airside concourse shared by international and domestic passenger flows, and the final threshold for domestic passengers.
4. Transitory space between emigration and the departure concourse (departure) and baggage claim to customs control (arrivals).
5. Threshold between the departure concourse and gate lounges (departure) and immigration and baggage claim (arrivals).
6. The final threshold identifies the threshold between all passenger terminal functions to the boarding of the aircraft.
Exploration 5
Establishing the form of the terminal

The primary axis has developed into a predominant element of design, through which questions regarding the movement of passengers, functions and facilities (including thresholds) have been addressed.

This section will delve into the circulation aspect of the terminal in an attempt to answer the following question: How do travelling passengers, airport staff and the general public move about the terminal?

The layout of the building form has been influenced by two factors. The primary axis helped establish a clear and adaptive approach to the restrictive site. Movement schematics which identified strategies to accommodate diverse flows and functions accordingly to levels, have aided with horizontal and vertical planning, i.e., the functional preference of departures floor level over arrivals and domestic concourse on ground level.

Fig. 88: An overview of circulation systems and their implications on a building form
Strategies of movement

Relative to the primary axis and derived movement systems, the form has comprised the shape of a rectangle with two “C” shaped wings on either ends. The public concourse is located on ground floor and comprises airline offices and check-in counters. Pre-departure security, the domestic concourse and the arrivals facilities are also located on ground floor. The international arrivals concourse has been elevated – to provide aircraft access - by 3 meters which has created a space immediately below for baggage and aircraft operations. The elevated floor will still be considered as part of ground floor.

The functional aspect of arranging check-in (departure) and baggage reclaim (arrivals) on ground floor enables a straightforward processes of getting baggage from carousels to aircraft, and vice-versa. Similarly, mandatory access to aircrafts on the tarmac – due to the use of light aircrafts for domestic travel – is enabled through the strategic arrangement of the ground floor communal airside concourse; equipped with non-duty-free shops, catering services and a baggage carousel (domestic only). This communal space, otherwise identified as threshold 3, converges the international flow. The substance of diversity is admitted to the space, where traveling passengers of all flows are encouraged to interrelate.
The first floor is dedicated to the flow of international departure travellers. The floor has been elevated by 4 meters to sit above the international arrivals directly below. Circulation shafts are positioned against the glazed facades to uplift the spirits of tired passengers and provide views of the exterior, also enhancing the drama of international travel. The emigration (out-bound passport control) is located prior to the departure concourse, as a system to control passenger types. The passenger then advances through an assortment of duty-free shops and catering before escalating a meter, arriving into the elongated “C” shaped departure lounge.

The arrivals halls is immediately below the departure lounge, and this is where passengers will converge to endure immigrations (in-bound passport control) before descending into the baggage claims hall. Access for disabled travellers will be provided through vertical circulation systems on either sides of this space. Duty-free shops are located parallel to the baggage carrousel, followed by customs control at the end of the hall. The exit route is located on the dominant axis.
Summary

The planning and arrangement of spaces have pushed on a few aspects, which may ultimately instigate experiences of the terminal. Having put the idea of an inter-relating departures concourse into the perspective of a physical model, it became clear that a harmonized relationship between the two flows of passengers can inform unique ways to develop both the experience of air travel, and Fiji; in the notion of locals and visitors travelling through the same space could provoke conversation.

Planning intelligence has been acquired from previous explorations, which have addressed the issues of Nadi’s existing airport and has provided an improved connection to the context and intercepted its ecological aspects. Thus the derived acknowledges a synthesis between people, aircraft and its unique context.

Thoughts on future expansion have also been rendered through a form that capable of anticipating and facilitating more passengers and aircraft gates and parking.

Fig. 97: An image comprising of all movement patterns.
Ground Floor

key:
1. public concourse
2. check-in
3. pre-departure security
4. domestic concourse (threshold 3)
5. customs
6. baggage claims hall
7. immigration
8. arrivals hall
First Floor

key:
9. emigration
10. international departure concourse
11. international departure gates/lounge

Fig. 99: Model - First floor
Exploration 6
Passenger dwell times at fundamental functions and zones.

This exploration was to make sense of how passengers spend time at airports, in particular comparing the duration of the journeys for international arrival and departure. This data will be used to determine the size, quality and experiences unveiled at certain places and thresholds in correspondence to the journey of the passenger.

A few aspects of this exploration that will impact the following design strategies are the implications that departing passengers have more time to spend within the terminal, whether this is dominantly airside or in the public concourse before progressing to the security checks. Therefore, in the three hour duration, passengers are looking at ways to spend this time before departure.

Arriving passengers on the other hand, spend 30 minutes-to-an hour at the latest, due to control or baggage delays. With the sheer excitement of having arrived into a new place the implications are reversed as the priority is shifted from spending time airside, to exiting the airport as soon as possible where friends, family or holiday await.

This analysis has identified the spaces in which passengers are most and least likely to stop and acknowledge things that will constitute their first and last experiences of Fiji. The experiences on arrival would be brief and readily comprehended as “teasers.” Comparatively, experiences on departure should intend to occupy the passenger’s attention for a longer durations.

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Fig. 100: Diagram indicating passenger dwell patterns
Exploration 7
Spatial hierarchy in relation to passenger dwell times

This model conveys the information derived from exploration 6 into conceptual space. A roof has been added into the model, which rises according to the time travelling passengers spend within each function. Fig. 101, illustrates how passenger occupancy has developed spatial hierarchy, which will directly relate to one’s perception, experience and journey though the terminal. For example, passengers roughly spend 1.5 minutes in the public concourse before spending 20 minutes checking-in, therefore the roof above the public concourse space gradually sweeps up toward check-in. This change in spatial characteristics thus implies the direction towards “flight” while issuing a generous and spacious place to occupy. This strategy is utilized through the terminal, and the results of spatial hierarchy vary where floor levels change, such as the international departures floor.

The model conveys the arrivals concourse as a low and concentrated space accordingly to Fig. 100, but as passengers duck down into the baggage claims area, the ceiling is heightened offering a slightly more generous space for passengers to await their baggage, before dispersed into the vast and highly occupied domestic airside concourse.
**Exploration 8**

**An undulating roof**

In this exploration the roof is further developed with an emphasis on spatial experiences at identified thresholds.

The roof takes on an undulating form which dips and rises above its respective threshold, enhancing its intended experience. From the exterior, the strategic roof will appear as if it is responding to the prevailing winds, giving it the impression of inaugurating flight. The dialogue – of the roof taking flight - is relevant especially as the international departure flow is located on the upper most level. The activity of the roof translates as a readable indicator of the immediate functions and facilities below.

The undulating roof readily conforms to the requirements of airport security within controlled zones, such as emigration and pre-departure security, where contained volumes are eminent. The roof is devised to dip low above these spaces, emphasizing on the transition between secure and unsecure zones. The dip will limit ones prospect out of the controlled zone, but will also increase the expectation of the subsequent space.

Fig. 102: Diagrammatic model illustrating the thresholds and the undulating roof
Control zones

The characteristics of darker, more enclosed security related areas are enhanced by the falling and rising nature of the undulating roof. While the primary intention is to deliver the feeling of containment as passengers undergo security checks or await their baggage, the secondary intention relates to anticipating passenger experiences at the identified thresholds. The poetic transition of dark and light architectural space encourages passengers to embrace the glimpse of Fiji’s climate as it soon disappears at the next control zone. With consideration to long waiting queues at control zones and high heat nature of Fiji, the roof canopy functions as a shading mechanism from the direct heat of the sun.

Ventilation

On the Western elevation of the terminal is the international arrivals hall on the first floor and the international departures lounge on the second floor. Fenestrations on the Western elevation allow the prevailing winds to pierce through the envelope, delivering the cool sea breeze during the day and land breeze during the night. The sweeping form of the roof manipulates and enhances the flow of the wind (similar to that of an aileron of an aircraft) and channels it towards curbside. Departing passengers experience the prevailing breeze as they travel towards it to board their flight and the connotation is reversed for arriving passengers. The major environmental implication of wind implementation is to expel surface heat within the terminal, as excess heat could cause passenger discomfort. North and South elevations are extensively open, which will see a constant supply of fresh air entering the spaces. This method also provides solutions to handle hot air that has accumulated beneath the roof.
Exploration 9
Further manipulations for light and ventilation.

In this exploration, the roof is split into three major parts and is manipulated in height and position, offsetting to create strategies to implement and control natural light and to increase wind performance into the terminal. The vast roof canopy is split at two points, one above the check-in facilities located in the public concourse and the other above threshold 5, located between immigration and baggage claim (in-bound) and departures concourse and gate lounge (out-bound).

The roof elements are identified as roof 1, roof 2 and roof 3 in Fig, 105. Roof 1, which is the roof for the arrival/departures functions, has been determined to remain in its existing position.

Roof 2, has been treated to a 1 meter offset over Roof 1, creating an aperture for natural light and wind to enter the interiors. This strategy helps to exhaust out hot air which may accumulate below the roof canopy through openings on the North and South elevations. As a solution to direct sunlight exposure on the North face, an overhang of 2 meters has been incorporated to resolve issues of glare, discomfort and eliminate overheating.

Roof 3, which provides for the public concourse/check-in has been raised to create provisions for wind entry into the spaces from the West, whilst also allowing natural light to refract off the surfaces of roof 2 into the internal volumes. On the Eastern edge, the roof features a cantilever which provides generous shading for arriving passengers at curbside and the brim is given an upward slant, effectively allowing warm internal air to escape. The characteristics of the brim promote an inviting gesture towards the airport, and also allow morning sun to filter into the interiors.

Summary
The terminal is extensively ventilated through provincial on-site winds, which has been enhanced and manipulated to provide cool and fresh air into the spaces, whilst exhausting pollutant air through fenestrations between the underside of the roof and the glazing skin.

Along the international arrivals flow, passengers are most likely to linger within the baggage reclaim and customs control spaces. These areas are extensively enclosed, and its “underground” location makes it difficult to naturally ventilate. These spaces will be mechanically ventilated.
Fig. 105: Aerial view of the split roofs

Fig. 106: Model showing light and wind penetration into the public concourse

Fig. 107: Model showing light and wind penetration into the international departure concourse

Fig. 108: Diagrammatic section illustrating the movement of air

Natural ventilation
Mechanical ventilation
The shading provided by the undulating roof canopy can be related to the way Fijian locals and tourists seek the comforting shade of coconut palms to escape the intensity of the sun. As such, the vast roof of the terminal can be emulated to perform and express the imagery of the island’s abundance of coconut palms. The trunks of coconut palms are distinctive as they vary in height, width and most significantly posture (Fig. 109). Some coconut palms grow naturally straight, where others may tend to greatly slender, depending on site conditions or the density of foliage the palm comprises.

As the floors of terminal are predominantly flat, the roof is subsumed as a series of curves which responds to procured winds in numerous ways. Therefore, arrangement of the columns can be interpreted as nodes of coconut palms through the terminal, and the density of the column work will depend on the structural requirements at particular zones; where more support is required. Each individual column slender in posture and varies in height, and a cluster of these columns depicts the presence of coconut palm trees throughout the terminal. With the variation in the height of columns within each zone, there is a sense of hierarchy which corresponds to the functions associated to that particular zone. This architectural interpretation of local imagery as structural systems is similar in the way Norman Foster incorporates a contemporary concrete version of the traditional Chinese columns at Beijing Airport.

The evening light cast from the setting sun on the west animate the palm columns into silhouettes (Fig 111) as they cast shadows across the surfaces of the terminal (Fig 112), emulating the enticing experiences of the Pacific sunset; the cliché image consisting of silhouette coconut palms against the orange sunset.
Column and roof

Through an exercise of physical modelling, the palm column concept is further developed. Dowels are used to emulate the columns, glued to a cardboard base (floor) and photographed in different lighting conditions to render intended qualities. Model people are used to provide a sense of scale.

[Fig. 110] Explores the composition of columns through a framed aperture, further illustrating the acquired bouquet effect on the background by focusing view on the columns.

Column and roof detail

From the exterior, the PTFE roof will appear to “float” through its dominating presence over the columns, floors and walls. In terms of the interior, the roof will be conceived as a large shading device which is supported on the palm influenced columns. The ceiling is devised to give the dense, detailed impression of palm tree foliage. The columns penetrate through a thin perforated lightweight steel ceiling before connecting to the beams on which the roof rafters are supported. The perforated ceiling will be fascinating to observe for the detail it semi-conceals beyond it. Services are also tucked away, leaving the ceiling sleek. Components such as rafters and beams are revealed according to the relief and level of the roof. The white rafters are adequately visible through the perforation.
While the experiences driven by local principles is important, it is essential to ensure that movement through the terminal is easy, in other words, free of confusion and ambiguity. Often, the complexity and hardship of way-finding around a terminal can hinder one’s experience of the airport, and most importantly the first and last impression of the nation. In this exploration, it is described and illustrated how the roof is given tectonic expression through the its structural systems (Fig. 115) and the surfaces which are manipulated to create apertures for light (Fig. 114), both of which are strategies of way finding.

In the previous explorations, it is highlighted that the columns within the terminal are arranged asymmetrically, and as a result they do not assist orientation and movement but rather the columns may confound one’s sense of direction. However, the curvaceous symmetrical form of the draping roof is capable of conveying the implied direction of route and also function, such as: the dropping and rising roof to indicate control zones in exploration 8.

The PTFE roof and steel rafters are supported on beams which span across the width of the terminal. The beams are supported on the columns that transfer primary loading to the ground. On the wings of the terminal, rafters are arrayed along the projection of the curving “C” shape roof, orientating ones vision and path into a particular direction. For instance: when a departing passenger ventures into the international departure lounge, the “fanning” rafters suggest the location of aircrafts and gates on either sides. Similarly, in the public concourse, the rafters are able to convey on which side aircrafts operate and on which side the exit/entrance is.

The impression of the beams and rafters being at lower heights and closer centres as opposed to the higher, generously centred beams conveys the hierarchy and emphasizes activity and function associated to the particular space. Low volumes can contain minimal experiences, whereas high volumes can offer prospects out of the terminal whilst allowing natural light into the spaces.

Exploration 11
Expression of structure and light

Fig. 114: Apertures in the roof cast light across the terminal floor as a medium of guidance. Notice the consistency of the light from check-in to departure lounge.

Fig. 115: The roof strategically allows light to illustrate a path towards departure security. The undulating structure dramatizes the volume of the space and indicates directionality.
The overall form of the vast and wavy roof has largely been shaped by ecological principles. The primary function of the roof is a shelter for its occupants underneath it. The secondary function is its innovative ability to catch and incorporate prevailing winds, an energy efficient strategy for ventilation.

The principle of a lightweight roof which is split into two places created openings for daylight and sunlight penetration, and pushed the strategies of wind access into the interiors. From the outside, the composition of the free flowing roof over a multitude of different activities resembles the terminal as one, rather than individuals.

The glass skin which comprises the exterior walls of the terminal are light in its construction. They are barely visible if viewed from afar, giving the impression that the roof is floating in thin air – in the sense it is taking off into the wind.
Dialogue of the draping roof - perspective

Fig. 117: Exterior view of the existing terminal

Fig. 118: Exterior view of the new terminal
Threshold 1 relates to the entrance/exit experiences of the terminal. It reflects the zone prior to entering the public concourse, as the buffer zone which facilitates and anticipates travellers who are arriving and leaving the airport. For passengers arriving at the airport, the upward sweep of the curbside roof conveys an inviting gesture similar to that expressionism of both TWA terminal and Sondica. The brim of the roof cantilevers over the exterior formation of palm columns, sheltering motor vehicle arrivals, providing a generous space below to gather luggage. As much of the arriving traffic at the airport may comprise of tourist buses and vehicles, the eight meter curb provides a solution to handle swarming passengers without obstructing other travellers. An external row of palm columns entices departing travellers with glimpses of what is to be experienced in the following space (public concourse and check-in).

For passengers leaving the terminal, the up-ward sweep of the roof has a reversed implication. The sweep of the roof and the structural beams - which passengers could have visualised as guidance systems - discontinue at the curbside brim, projecting their gaze into the open, free and blue sky which can correlate to the “getaway” sensation of travel into Fiji. Climate here is purely external, offering a unique climatic experience prior to departing the extensively shaded and cool naturally ventilated interiors.
The public/check-in concourse is a dominant enclosure often shared by both flows of travelling passengers. Those who are checking-in (departing) and those who are arriving after baggage reclaim, thus making the concourse a large gathering space. A third group of users such as non-travellers utilize this space for business and leisure (plane spotting). With this generalization, a space which is capable of accommodating users of all types and density is demanded.

The strategic arrangement of central columns in conjunction with the undulating roof forms which features rises and drops to inform the hierarchy of use. The columns provide as a buffer zone between the public realm (adjacent to curbside) and the passenger realm (check-in counters). The two spaces are distinctive in use and experience. The height of the roof above the arching public path is at its lowest point, forming the interpretation that it is not compelling to the uplift motion of flight. However, as passengers proceed towards check-in past the columns, the sudden up-ward sweep of the roof which creates apertures of aircraft tails and the sky enliven and entice the excitement of anticipated flight.

For the arriving passenger, the emphasis on the role of the concourse is the final airport experience which constitutes as a “gateway” to Fiji. The concourse will be an area where friends, family and holiday await. By arranging the four meters wide arrivals path between the two departure security enclosures on either sides of the central axis, a transitional space is formed between the concourse and “the village” (threshold three). As the arriving passengers go from airside-to-landside, they are welcomed under the draping concourse roof which descends towards curbside and frames a panoramic view of the East through what would appear as coconut palm (columns) trunks arranged across the concourse floor.
Landside and airside - Threshold 2 and Pre-departure

Threshold two deals with the spaces which sequence immediately after the check-in function and prior to the pre-departure security. The space is largely conceived as a transitional space between public and private, and in aviation terminology better described as landside and airside. Setting apart the semipublic semi private nature of the check-in facilities, threshold five invites a collaboration of architecture, light and shadow to distinguish the extensively controlled pre-departure security space. An offset of the roof planes above the space allows natural light - both daylight and sunlight - to enter the interior spaces, recalling the bright external qualities of Fiji.

The array of structural beams and rafters which constitute the roof above the threshold become visible, addressing directionality. The piercing light animates the beams and the white hi-tech columns, composing the sensation of containment within a palm plantation before passenger’s progress into the much darker, controlled character of the security space.

The second roof begins to descend in height as a means to lessen daylight admission into the space as a strategy to maximise security surveillance and control the freedom of space. So the implied drama and transition of light to dark space works coherently with the purpose and functional requirements of both land-side concourse and air-side security.
Fiji is known around the globe for charming and friendly locals who welcome visitors to their shores. The sound of ‘Bula’, a greeting meaning ‘hello’, which is almost always accompanied by a smile, is an experience which remains with travellers during and after their stay in Fiji. This particular airside concourse is arranged to intersect the movement pattern of the two types of travel, forming an inter-relating zone where international and domestic passengers converge before leaving the terminal. This enabled a cohesive relationship to be formed, allowing the passengers to interact as they occupy this space. In this space, local domestic travellers may demonstrate to international arrivals their unique skills such as weaving or dancing, share local fruits such as mangos and sugarcanes or even share stories and experiences. Transit (layover) passengers who are not permitted to leave the terminal, are offered the experiences of “the village” within airside. A small range of stalls will offer passengers handicrafts and foods and drinks.

As this space follows immediately after the enclosed customs control zone, arriving passengers are overwhelmed with the excitement of being admitted into a lofty space where the gradient of the roof strategically enables alluring views of the open sky and frames the “mountains of the sleeping giant” on the north. The structural columns within this space have been designed to portray the imagery of tall mainland coconut palms, which feature thick trunks which slender drastically.

This conceptual imagery of passengers arriving at a village is logical in the sense that it is mainland, whereas international passengers have come from overseas, and the notion of arriving at the beach is conveyed at the arrivals hall. As domestic travellers remain within Fiji, the experience of arriving mainland works consecutively.

Route is adequately established in this space through the dominant arrangement of the structural members which traverse the span of the airport are strong in presence in conjunction with the descending roof, correlating the path towards the exit.

Transit travellers - those who are travelling from one flight to another - are usually required to remain air side by authorities, prohibiting passengers from visiting external towns and settlements. Through the strategic arrangement of this village encounter, these groups of passengers are able to experience the local town within airside.
Fig. 123: The communal, international and domestic concourse airdside. Looking north.
Emigration
Although the experiences are of prime importance of this particular airport terminal, it is equally important to ensure rules and regulations of airport security are met effectively and efficiently. The dominant undulating nature of the vast roof places particular emphasis on how it responds to the emigration control area, also described as threshold four. As a solution to reinforce security surveillance and control in this zone, the roof above the emigrations platform has been ordered to dip past the space to portray a considerably confined space. In contrast to previous full-of-life and lofty volumes where the passenger felt “free”, this zone functions as a transitory space where they may take repose to gather travel documents.

Proceeding towards emigration, it is likely that passengers will experiencing either the dull feeling of an ending holiday, or, be excited to take flight and return home. A gradual ramp connects the emigrations floor to the departure concourse to emphasize the change in space and function. The ramp leads the travelling passenger past a row of natural palms, which are reminiscent of those outside the airport, further implying that one is still in Fiji. The wind which flows across the terminal will animate the palms, creating subtle movements and sounds as the leaves brush against one another. The atmosphere is content, and functions as a buffer zone, lifting the spirits of travellers before they arrive into the departure lounge.

International departure lounge
The common departure lounge is where most travelling passengers congregate after clearing passport control, including those who are transferring between flights. The general quality of this departure concourse conveys a wide, spacious and leisurely atmosphere which is dramatized by the large openings on either sides formed by the vast roof. The roof above this space ascends to its highest point, reinforcing on the hierarchy of occupancy and allowing ample daylight to filter the interiors. Adequate roof overhangs on the northern boundary control glare and direct sunlight exposure, but are devised to provide an area for passengers to bask and soak-in the tropical sun. Relaxation provisions as such are highly important for the Fiji experiences for transit passengers who have been required to remain airside.

Some passengers may wait here for a few hours. A mixture of shops, cafes, duty-free areas and bars are amongst the things to occupy. Seating areas are provided where the lounge captures good views over the airport and also of the aircraft apron. Retail and catering facilities are located as modules which are arranged in a scattered manner to resemble the imagery of Fiji’s abundant islands and islets. As travelling passengers go from store-to-store, they are exposed to new and unique goods and services at each stop, similar to travelling to various islands around Fiji.
The stores may offer things such as woven mats, wood carvings, and tapa cloth or even massage and relaxation services. The concourse floor is finished with highly reflective tiles to mimic the presence of water - reflecting light and the sky - and the modular units sit on an elevated platform to distinguish a change in level, giving travellers the impression of stepping onto an island.
Shaped to incorporate the curving beach front fabric of the Western shore line, the spatial experiences of the International departures lounge have been crafted to simulate one’s experiences of arriving at a beach; from where they may initially have arrived. Extensively open - but protected by the overhanging roof - the space provides a consistent refreshing breeze for passengers arriving into the terminal via threshold 5. To emphasize the beach experience, the slender structural columns form a fringe to encompass the curving edge, reminiscent of coconut palm trunks, and the opening between the floor plane and the draping roof frames a view of the coast and islands in the distance.

The intended qualities of this space are relative to an adequately lit and tranquil zone, where passengers may bask under the admitted sunlight or read or relax under the shaded spaces and savor the prevailing breeze.

A slight drop is incorporated in the floor plane, casting the impression of walking towards the beach as passengers proceed towards aircraft gates.

Route here is also enabled through the expression of roof structure, with its main emphasis to guide passengers towards departure gates. Instead of arranging the rafters symmetrically, they are altered to complement the roofs geometry, hinting towards seating and gate areas. The height of the roof at either ends of the lounge appear noticeably lower, addressing that the passenger is at the end of the space.
The climate experience - Threshold 6 (International)

This space can be described as the circulation realm which greets arriving passengers and farewells the departing. It was drawn that arriving passengers spend the least time within this particular zone, so the space must briefly and effectively unpack through its qualities the experiences that will constitute one’s first, and final, impression of Fiji.

In the site visit section of this document, it was addressed that one experiences a great deal of heat - even on a dull day - when one disembarks the aircraft, conjuring an instant sensuous reaction to local climate that confirms arrival into Fiji. Thus, a similar encounter is the prime objective of this space to drive ones immediate impression of Fiji’s climate. Threshold 6 is open to its top, and can also open on western elevation – windows on the outer skin can be closed to control harsh climate conditions. Prevailing coastal winds are funneled across the aerobridge into the arrivals hall, giving passengers a taste of local climate conditions.

The journey along this path provides spectacular views of the coast, although at a lower level. Looking up, the draping roof and its “guiding” rafters are clearly visible, orientating passengers into the direction of the arrivals hall. Although the aerobridge is technically sheltered by the roof, the inclusion of daylight illuminates the roof and enhances the volume of the space as it appears to blend in with the vast external sky. This is significantly effective in contrast to the spatial qualities of the adjacent space (arrivals hall).

In regards to departure, the jet way – component which connects to the terminal and the aircraft – has been laid out specifically over the arrivals aerobridge to render the experiences of “walking across a plank” in order to get to the vessel; in this instance, the aircraft.
Threshold 5, otherwise described as “the reef” for the purpose of this exploration, is a space which imposes qualities that correlate to the imagery of Fiji’s aqua beauty. The space primarily functions as a “cool off” zone, where tired and exhausted passengers are refreshed through the architectural articulation of water, anticipating them for the following gateway experiences.

Descending from the immigrations check and into the baggage claims area a floor below, passengers are enlivened to notice the reflections of water cast by the cooling cascade adjacent to the stairs/escalator. A transparent panel in the roof plane above enables light to penetrate into the space below and animate the body of water as it shimmers down the stairs, casting reflected patterns onto the faceted wall above to give one the impression of diving experiences in Fiji.

The walls form an enclosure to eliminate noise and light transmitted from the exterior and two adjacent spaces on the floor above. The space then essentially comes to resemble “cave-like” darkness, and a shaft of light is strategically appointed onto the water surface to provide the desired sparkle.

For departure, the experiences are inverted as the passenger is entitled to visually experience this space from above as they progress across ramps into the departures lounge. However, the sound and light eliminating aspect of threshold 5 indirectly complements the tranquil nature of the departures lounge.
Fig. 129: Section through threshold 5, indicating light through the roof.
The baggage claims hall is where arriving international passengers retrieve their baggage from the carousel. Passengers spend, on average, 20 minutes in this hall of which most involves awaiting the bags to appear on the handler. During this time, passengers may want to shop at the range of duty-free stores located parallel to the two large carousels.

The ceiling predominately comprised of Corten panels which constitute the experience of being enclosed within the faceted interiors of Fiji’s “Nahenahe Caves.” Beams of light penetrate through the upper-level floor (departure concourse), casting spots of light across the baggage floor. This is to emulate the experiences of exploring a cave with flashlights. Recessed lights are incorporated into the ceiling above, directed at the carousel to make baggage identification easy. This is to mimic the light that travels through the cracks and crevices of cave roofs, enhancing the cave-like presence within this space. The floor is constructed of concrete and polished to create reflections of the faceted feature above and bounce light back onto the ceiling. Climate within this space is controlled by means of mechanical ventilation units located, and hidden above the duty-free shops. The columns continue through this space, but are finished to match the appearance of the corten roof.
Conclusion

It is too often that, when we arrive at an airport for the first time, we feel like we could be anywhere in the world. Why is that? It is primarily because airports are designed around aircrafts, and not people; or, the emphasis is to celebrate departure and not arrivals. The design of this new airport in Nadi, works against this practice, and attempts to create a harmonized relationship between the departures and arrivals, further incorporating its unique and exotic setting, thus giving it prominent “gateway” qualities.

The concept of the building is inspired by precedents which are significantly special to the topic, and the scenes and imagery of the nation in which it is delicately embedded.

The establishment of a new axis, embraced as the starting point for design, enabled a gentle approach to the immediate site, whilst conforming to adjacent infrastructure – roads, runaways, aircrafts aprons – and most importantly, informed strategies for the movement of people and aircrafts.

By re-configuring the normal processes and functions of a typical airport terminal to match the intentions of the new, the journey through the terminal itself became a catalyst which revealed glimpses and experiences that reflected the unique imagery of Fiji.

The dominant roof which drapes over the terminal is evocative across a multitude of flight related metaphors, through which it is given the appearance of “taking-off” into prevailing winds. The imagery is appropriate in the sense that the roof implies directionality towards flight. In terms of the interior, the vast, shading roof is supported across an abundance of slender structural columns which vary in position, height and width, forming strong visual analogies which are reminiscent of Fiji’s palm-trees. This roof is split at two significant points, and the skin of the structure is extensively open, allowing wind and natural light into the spaces. Through this strategy, passengers are given a sensation of the external climate indoors.

The strategic shape of the public concourse, coupled with its expressive roof, arcs around Queens Road, conveying an inviting gesture for travellers, and leisure/business seekers who are arriving at the airport from the east. On the west, the international arrival and departure wing performs as a large wind catchment, enabling the cool coastal breeze to funnel through the terminal.

In response to the objectives of a “gateway” into Fiji, I believe that the airport should be a structure which celebrates the traditional thrill and poetry of air travel and also has a symbolic role as a gateway to its nation, as a window on the world. Having weaved these two strands together, the new terminal has combined a sense of
spatial clarity with strong visual identity to its context, and ensures that the passengers experience are efficient, secure, welcoming - and above all uplifting.

Fig. 131: Aerial perspective of the terminal - the international departure wing.
Appendix A:

Aircraft sizes

This section highlights the types and sizes of aircrafts that most frequently service Nadi International, and also provide an hypothesis on which aircrafts are likely to continue service in the future.

Covered under site analysis, analysis of airport and flight statistics illustrated that the introduction of wide-body aircrafts capable of carrying more passengers has resulted in fewer flights into Nadi. Modern, efficient civil aircrafts such as the Airbus A380, have a seating capacity of 850 passengers - two times that of a Boeing 777-200, which Air New Zealand fly daily into Fiji as of July 2013. With the continuity of this trend, the existing airport will not be capable of facilitating such large number of passengers and aircraft sizes.
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