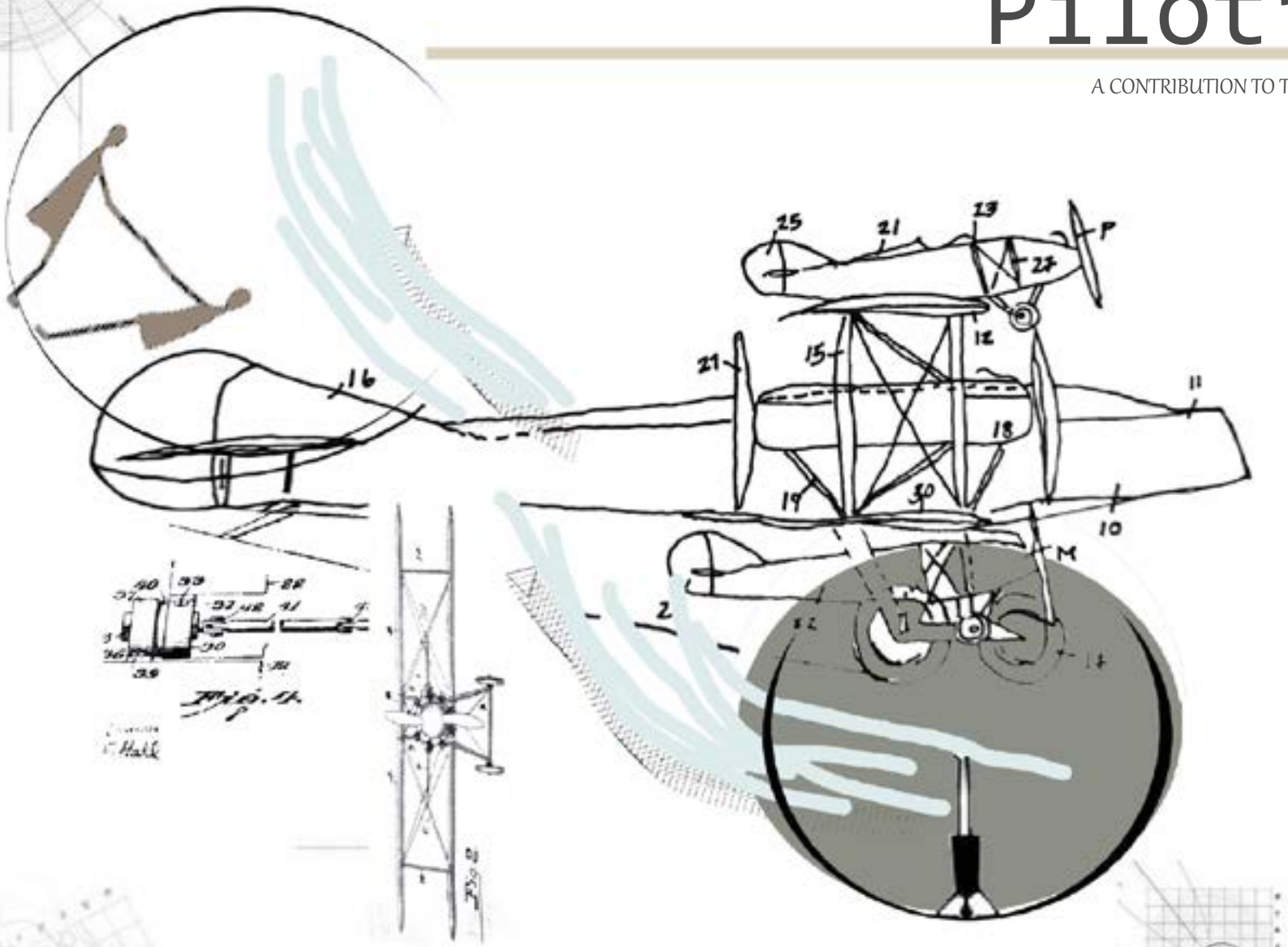
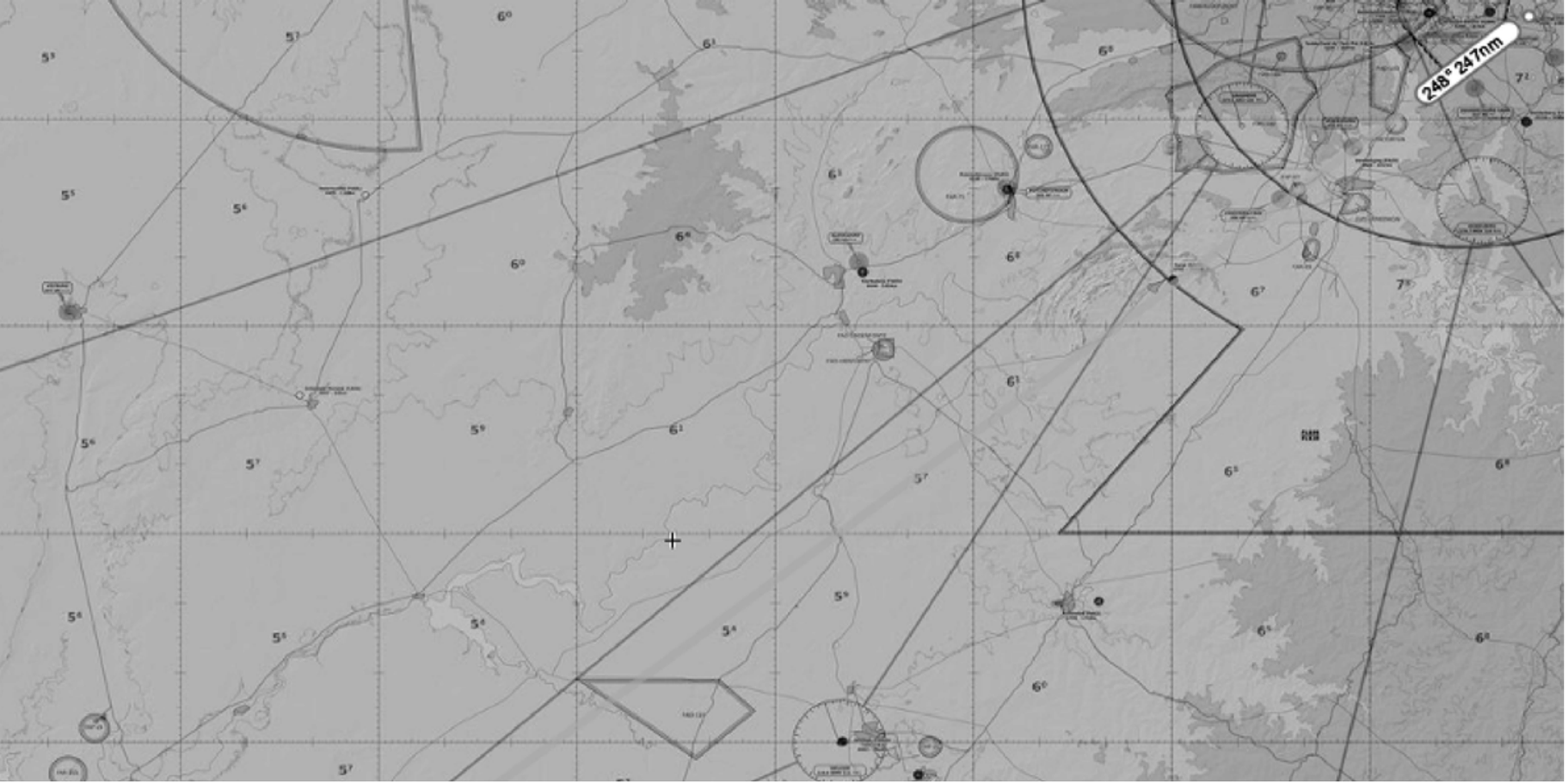
Pilot's Hub

A CONTRIBUTION TO THE PIONEERS OF AVIATION MUSEUM

Jacenca Swart
2016016111

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Plagiarism declaration

Declaration:

This thesis is submitted in partial fulf1ilment of the requirements for the degree Masters in Architecture at the Department of Architecture, Faculty of Natural and Agricultural Sciences, University of the Free State.

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15 October 2021

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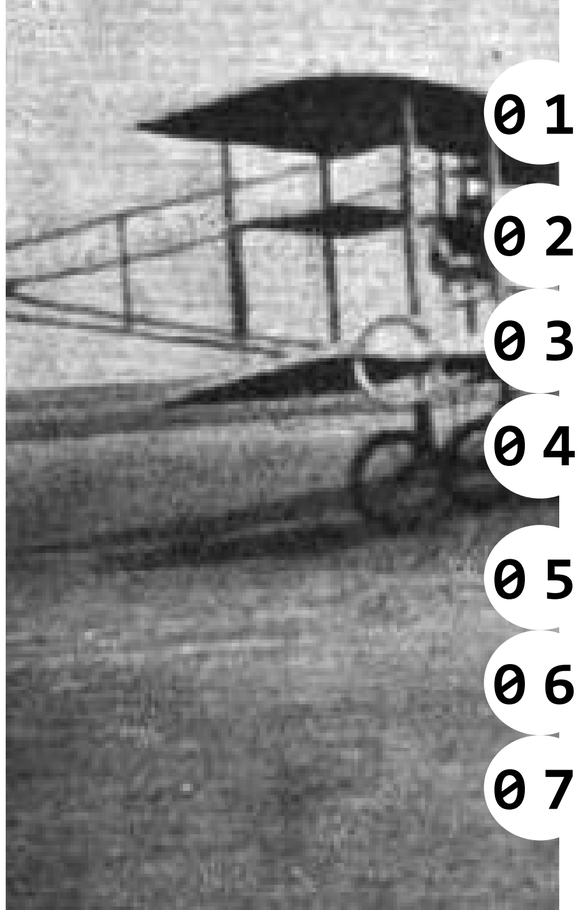
Declaration of original authorship:The work contained in this thesis has not previously been submitted to meet the requirements for qualification at this or any other institution of higher education. To the best of my knowledge, this thesis contains no material previously published or written by any other person except where due reference is made.

Signed: 



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(SkyTime, 2021: online)

The scope of this dissertation is directed at exploration of and experimentation with methods to design and build a structure. These methods are based on investigated theories that enhance the concept of standardisation (Le Corbusier, 1923) and the process of "making" (Allen, 2010: online) in order to emphasise the poetic implication of these theories into architecture. Furthermore, this study is aimed at exploring the development of a process that frontstages the idea of synchronising the poetical use of materials, the composition of joints and individual elements, and the nostalgic essence of historical elements.

A Pilot's Hub is proposed on the Southern outskirts of the city of Kimberley, Northern Cape, South Africa (figure 1). Currently, this site's aesthetic value comprises a historical representation in the form of a museum, the Pioneers of Aviation Museum as well as a stone monument on site (figure 2). This specific site marks only the memory of what had once been the birthplace of the South African Air Force (SAAF). This Museum exhibits the first hangar, built to uphold the airplanes used by the SAAF along with the long line of historical figures that made this possible. The stone constructed monument, located next to the Museum, commemorates the death of E.W Cheeseman (one of the founders of the first flight school in South Africa) (Lunderstedt, 1966).

The proposed Pilot's Hub will be fulfilling the dual purpose of celebrating the rich history of the site and becoming a place for educating aviation students and the public the ways of flight and aerodynamics, specifically in South Africa. Therefore, the Pilot's Hub aims to become a point of interest for aviation students and for members of the public to learn and interact.

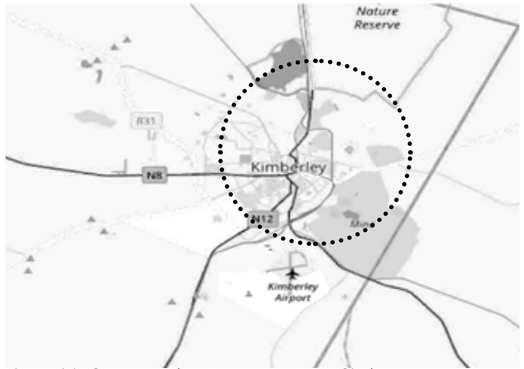


Fig 1: Kimberley context (CapeFarmMapper, 2021: online)


Fig 2: Existing Museum and monument (Historical Society of Kimberley and the Northern Cape, [n.d.])

Abstract

The process of dissecting the concept, theory and design of the Pilot's Hub will be explored by means of the following perspectives: the Readable perspective, the Memorable perspective, and the Writable perspective (figures 3 to 5) that suggest the different chapters formulated to become a storyline. The Readable perspective introduces the essence of the project and elaborates on the aims, research question, intended users and structuring programme of the Pilot's Hub. This perspective forms the introduction of the book in order to orientate the reader. The Memorable perspective pertains to a spiritual and three-dimensional experience of the design process that captures the concept and theoretical discourse of designing and building the Pilot's Hub. This perceptive holds the body of the story that keep the reader entertained in order to capture the entire process. The Writable perspective renders self-reflection on the feelings and attitudes towards the proposed design as a whole, thus, transforming into the concluding chapter that captures the outcome of the entire process.

This dissertation aims to depict a holistic, representation of designing and building a structure from initiation to planning and design stage, then to execution from laying the foundation to full completion, referring metaphorically, to a process resembling the systematic development of aviation and the exploration of flight.

Keywords: aerodynamics, exploration of flight


Fig 3: The Readable interpretation (Author, 2021)


Fig 4: The Memorable interpretation (Author, 2021)


Fig 5: The Writable interpretation (Author, 2021)

part a

the readable

Fig A: Airplane (Aviation Central, 2021:online)

The Readable Perspective is the introduction to this dissertation, which orientates the reader on the essence of the Pilot's Hub project. The word, "Readable", represents all the written content in order for the reader to understand the aims from which the design grows.

01 PROJECT INTRODUCTION

01

Project introduction

1.1 INTRODUCTION

The essence of the proposed Pilot's Hub is to present the idea of incorporating aerodynamics into architecture in the best way possible as stated in the Preamble. Currently, technology and transportation modes are increasing at a rapid pace (Rodrigue, Notteboom, 2021: online). According to Writer (2018: online) the need for pilots is constantly increasing. Therefore, the establishment of a Pilot's Hub (flight school) is justified. As explained in the Preamble, the site contains a rich history. Unfortunately, the historical value goes unappreciated as the museum (figure 1.1.A) is currently closed down and sits behind a locked gate. The proposed project aims to revive public interest towards the site and its history through construction of the Pilot's Hub.

The establishment of a flight school will not only celebrate important historical events; it will also recreate this place where people used to prepare themselves in pursuit of futuristic goals that formed part of a bigger picture. Topological, typological, and morphological elements are taken into consideration so that new opportunities can be formed by reconstructing that which once was.

Fig 1.1.A: The existing (Lunderstedt, 1966)

1.2 LOCATION

Located in Kimberley, Northern Cape, South Africa, the chosen site (figure 1.2.A) forms the basis of the first flight school of the SAAF. Today, this historical site is represented by the Pioneers of Aviation Museum that preserves the memories of traditional methods of flying aeroplanes, and commemorates the roles played by early aviators in founding the SAAF. This chosen site is located on the western side of General van der Spuy Drive and is surrounded by a large area of open landscape with a scenic view of the Kimberley Airport.

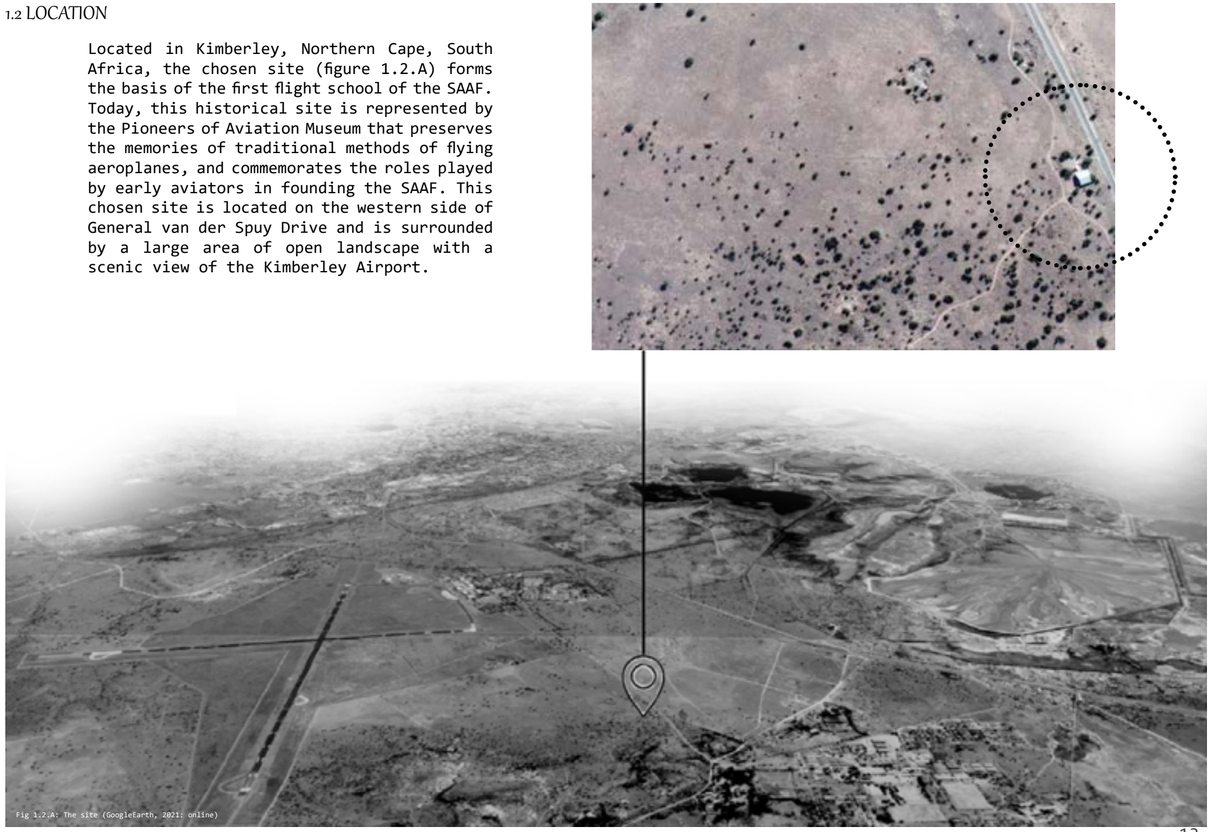


Fig 1.2.A: The site (GoogleEarth, 2021: online)

1.3 ORIENTATION TO THE PROJECT

Development of personal interest

The idea behind the project theory and architectural interpretation started with a personal interest in the field of aerodynamics/ aviation and the intriguing notion of 'touching the sky'. The goal was to make use of some elements of aerodynamics within the layout and three-dimensional design that should be portrayed in a metaphoric way. This metaphoric interpretation of aviation has been formulated in alignment with certain architectural theories (to be later discussed).

"Aerodynamics" is defined as primarily being *"concerned with the forces of drag and lift, which are caused by air passing over and around solid bodies"* (Lucas, 2015: online). The words indicate the notion of forces that cause elevation which sparked a deep-lying interest in aircraft and specifically, fixed-wing aeroplanes (figure 1.3.A).

Problem statement

The process of determining the problem statement and aims was initiated by research on the history of aeroplanes in South Africa and the role they play in people's daily lives. Findings chronicled after conducting an interview (to be discussed in section 1.6) highlighted the essence and demand for pilots in South Africa and on the African continent.

In terms of the typology and topological layout of the existing site, the museum and stone monument are currently surrounded by dilapidated pathways; overgrown by weeds.

Aims

With reference to the problem statement, the outcome of the proposed Pilot's Hub is anticipated to revive the historical value of the existing structure. Close encounter with the theories of Le Corbusier (1923) and Daniel Libeskind (2000), foregrounded their theories on standardisation and the implementation of machine-like elements that can be effectively incorporated into the planning and design stages of the Pilot's Hub, thus encompassing a poetical process of design (to be discussed).

The ultimate goal of the architectural outcome is to interoperate that standardisation has a broader meaning than just being an element of mass production. Furthermore, the proposed project aims to become an experimentation process that outlines one of multiple methods in which the concepts of standardisation and its poetical implication into architecture can be successfully integrated by means of metaphoric reference to the dynamics of flying an aeroplane.

Fig 1.3.A: Fixed wing(Temple, 2015: online)

The aims are divided into the following table (1.3.B):

Aims in terms of the Hub's contribution toward the aviation community:

- To deliver a beneficial contribution towards enhancing the aviation community in South Africa.
- Teaching all interested parties more of the aviation community.

Aims in terms of the typology:

Once the chosen site was identified, the problem statement became quite clear: formulating design and planning strategies to conserve the site; integrating architectural theories that embrace the idea of a 'working machine'; and aligning the context and concepts of architecture and aviation into a poetical whole. Therefore, this proposal aims to explore different methods in which architecture can be applied to figuratively, 'take flight'.

Aims in terms of the existing topology:

The entire layout process of the Pilot's Hub aims to transform the existing Pioneers of Aviation Museum into a facility that encompasses more than just a visual and chronological exhibition of aviation history. The proposed Pilot's Hub endeavours to utilise this historical site as a platform representing architectural development and growth.

The proposal further aims to create a facility that will vividly illustrate the idea that architecture can play a conducive role in the unity between the dynamics of the aviation industry, aviation students and museum visitors.

1.4 RESEARCH QUESTION

How can the usage of standardised tools in architecture enhance a form of poetics through the analysis of aerodynamics whilst considering the creative integration of the existing?

1.5 CLIENTS AND INTENDED USERS

Clients

The main party to be involved in the functioning of the Pilot's Hub is the Kimberley Airport community (figure 1.5.A). The proposed Pilot's Hub intends to fall under the regulation of the Kimberley Airport managing staff. Managers, of the Pilot's Hub, will typically network with the Airport team in terms of shared usage of flight facilities in virtue of aviation training, by functioning within the framework of their rules and regulations.

Intended users of the Pilot's Hub

The programme of the proposed Pilot's Hub aims to provide a training platform offering courses towards a Private Pilot Licence (PPL), Commercial Pilot Licence (CPL), Integrated Commercial Pilot Licence (ICPL), as well as an optional night rating for students or public persons wishing to further their skills. This student Hub accommodates for all parties who want to form part of this aviation community by pursuing a professional career in aviation or simply sharing one's love and interest for this community with other interested parties.

Offering education and training opportunities to student pilots is the main but not the only intent of the proposed Pilot's Hub. A further objective is attracting and hosting members of the public to visit the museum, to interact with the pilots, and to experience the

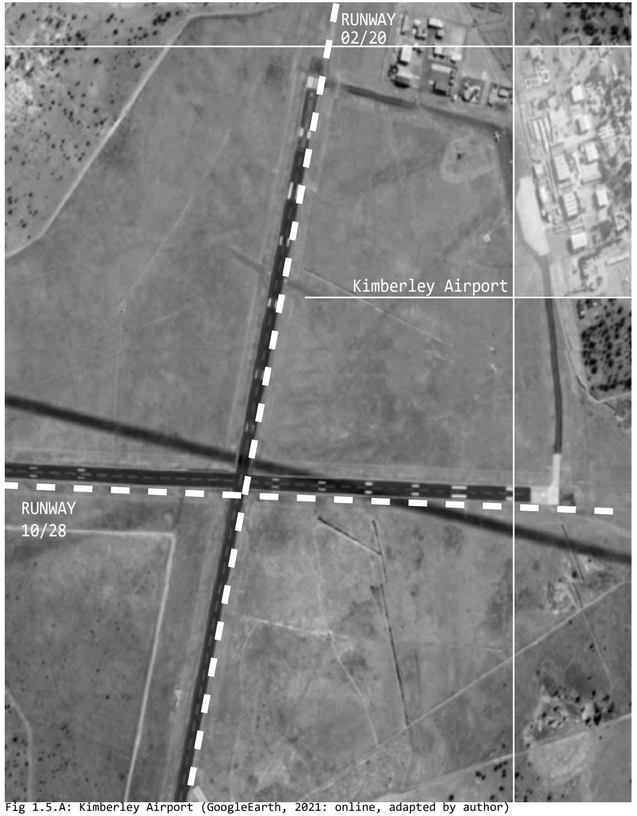


Fig 1.5.A: Kimberley Airport (GoogleEarth, 2021: online, adapted by author)

1.6 INTERVIEW EXPLORING THE PROGRAMME AND REASONING

Interview with Xane Naude (figure 1.6.A)
(Frozen Airline Transport Pilot Licence and Grade 2 Instructor)

Fig 1.6.A: Xane Naude (Naude, 2021)

This interview took place with the purpose of establishing the importance of pilots within the community and further considering the basic facilities needed within a pilot training school by taking into consideration the functioning of the Thompson Aviation flight school located at Wonderboom Airport.

Question 1: ***What is the status of the current aviation situation in terms of pilot requests?***
Answer: "Without taking the impact of Covid-19 into consideration, there is a shortage of commercial pilots in South Africa. In terms of the broader spectrum (looking at the whole of Africa), a higher number of pilots is requested due to the high intensity of dangers and difficulty that come their way and due to the fact that they travel away from home causing little number of pilots to accept such job."

Question 2: ***What airplanes do you make use of for training purposes?***
Answer: "Pipers" [similar to a Cessna 172 that is a single-engine, turboprop airplane].

Question 3: ***How many students do you accommodate for?***
Answer: "About 60 students"

Question 4: ***What do you cater for?***
Answer: "Mainly for pilot training but I do charter flights for private individuals at request and based on availability of an airplane unless the airplane is provided by them."

Question 5: ***What are the different facilities found in Thompson Aviation flight school?***
Answer: "hangars, a kitchen, restroom facilities, a reception area, classrooms, a bar area, exam location, offices, and a coke machine."

Question 6: ***How many airplanes do you have to accommodate 60 students?***
Answer: "Six"

(Naude, X. 2021: interview)

1.7 PROGRAMME

The proposed facility for the training programme will be planned to accommodate 80 to 100 aviation students. The programme, planned to be facilitated at the Pilot's Hub, will make provision for pilots, the public, and a communal space where the pilots and the public can interact with one another.

In terms of learning, the aim of the Pilot's Hub is to provide all the necessary facilities for students to have the best possible learning experience whilst being able to live comfortably during the course of training.

Fig 1.7.A: 43 Air School (Musson & Niemann, 2021: online)

precedent study

43 Air School, Port Alfred including PTC Aviation, Port Elizabeth

LOCATION:

Port Elizabeth & Port Alfred

REASON:

Programme and facilities

Within two dedicated Training locations, 43 Air School (figure 1.7.A) specialise in Basic, Corporate and Airline Training. Seamlessly providing courses with a success rate of over 6000 Aviators trained in the last 30 years (STL, 2020: pdf).

Providing for 300 students a year, this flight school is mainly located in Port Alfred where the Basic courses are offered. Students have the chance to further their career by making use of the facilities provided by PTC Aviation (in Port Elizabeth) for the training of Airline courses (STL, 2020: pdf).

The history of the Air School dates back to Word War II where it was used as an Air Observer School for the SAAF. Today, it is known as one of the most successful schools for teaching aviation students (STL, 2020: pdf).

Flight training

The Flight School provides a safe training environment that allow basic to more advanced training to take place. Figure 1.7.B incorporates the training environment where basic and airline training can take place between the two training locations (namely, Port Alfred and Port Elizabeth). This operational training environment further allow students to apply their skills over a broader spectrum when flight training are conducted to various centres.

PTC AVIATION (Musson & Niemann, 2021: online)

43 AIR SCHOOL NEXT GENERATION TRAINING (Musson & Niemann, 2021: online)

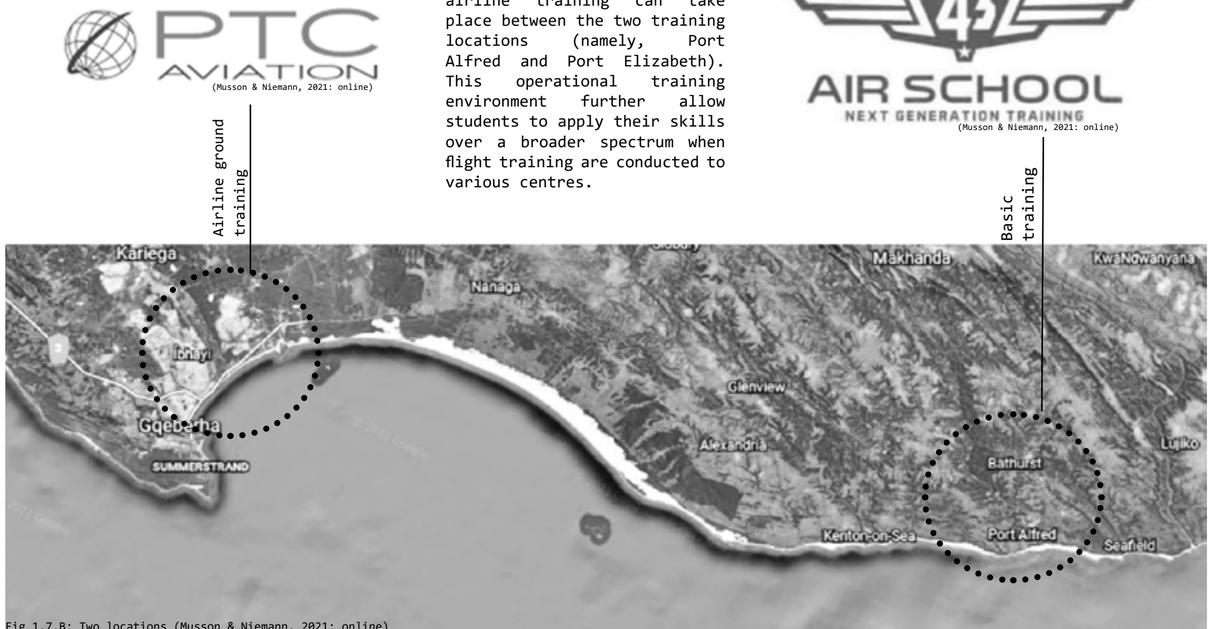


Fig 1.7.B: Two locations (Musson & Niemann, 2021: online)

Port Alfred facilities

Figure 1.7.C show the spatial layout of the main campus in Port Alfred:

The layout of the design is placed into certain “areas” in order to accommodate for the specific users of each “area”. Student accommodation with recreational facilities give the students a chance to experience the full training programme provided. At Port Alfred, the Basic aviation training courses take place where students can make use of flight training to fly to Port Elizabeth (PTC Aviation) to complete further Airline training.

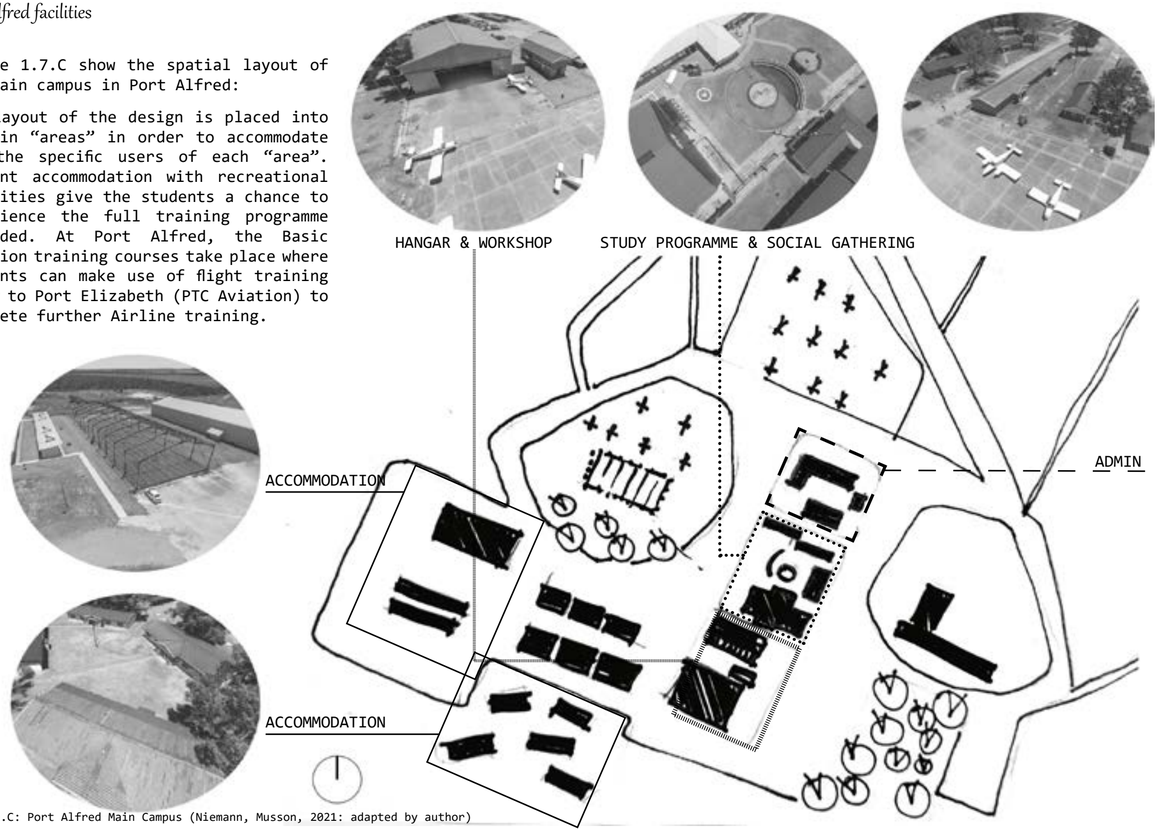


Fig 1.7.C: Port Alfred Main Campus (Niemann, Musson, 2021: adapted by author)

Fig 1.7.D: Port Elizabeth Campus (Niemann, Westoby, 2021: adapted by author)

Figure 1.7.D show the design of the PTC Aviation building, in Port Elizabeth, that accommodate for Airline Training (that are more advanced courses than that of Basic aviation training):

The facilities incorporated into the Flight School specifically accommodates for the training programme of aviation students. The programme comprise of ground training facilities:

- Classrooms;
- exam room;
- lecture rooms;
- computer room; and
- study halls; etc. (STL, 2020: pdf).

This programme also accommodates for flight training that include:

- Simulator hall;
- briefing rooms;
- the necessary aeroplanes; and
- provision for the establishment of an aerodrome; etc. (PTC Aviation, 2021: online).

Personal approach toward 43 Air School

In terms of the training environment, the Pilot’s Hub will have a professional and safe environment that forms part of the Kimberley Airport (to be further discussed).

The programme of the Pilot’s Hub is based on the courses offered, the members forming part of the Hub’s team, and the facilities and equipment needed for these training courses.
Based on the analysed Flight School, a list of **courses and services** are offered at the Pilot’s Hub. This includes:

01

Private Pilot License

This Pilot Course allow for the use of business and/or recreational purposes (which excludes commercial use) and is the first step toward achieving a Commercial Pilot License. This course takes place in a time frame of four to six months and include the qualification of a PPL and Radio License.
This course include academic ground training and flight training (STL, 2020: pdf).

Based on the activities included within the course, the following facilities must be provided in the layout of the Pilot's Hub:

- Classroom for ground training
- Briefing room for preparation before flying
- A single-engine aeroplane
- Hangar facilities
- Medical station to obtain one's medical certificate to prove that one is competent.

The single-engine aeroplane will be a Cessna 172 (figure 1.7.E) that is a fixed-wing, single-engine, turboprop aircraft that are mostly used for flight training as it is lightweight and allow for better performance during take-off (Lund, 2020: online).

02

Commercial Pilot License

This is a General Aviator Career course taking place in a time frame of fourteen to twenty months in order to obtain a career as a Professional Pilot. Such qualifications include a PPL and Radio License, as well as a Multi-Engine Class and Instrument Rating (STL, 2020: pdf).

Based on the activities included within the course, the following facilities must be provided in the layout of the Pilot's Hub:

- The above-mentioned facilities for the provision of the PPL
- And further including a twin-engine aeroplane; and
- Flight simulator

The twin-engine aeroplane will be a Seneca 1 PA 34R-200 (figure 1.7. F) that is also a fixed-wing aircraft with two engines that allow for further development in training. Along with the aeroplane, a flight simulator is used for training for more extreme weather conditions and emergency instances that might take place whilst flying. The similar type of simulator, used at 43 Air School (STL, 2020: pdf), will be used for training.

The ALS 250 Simulator is adaptable to specific flight training needs. Figures 1.7.G to 1.7.I shows its layout and build:

03

Integrated Airline Transport Pilot License

For students wishing to become a full-time Career Airline Pilot, this fourteen-month course provides the best training for students to achieve an Airline Type Rating (STL, 2020: pdf). This course further includes a Commercial Pilot Licence (CPL) with a Multi-Engine Instrument Rated (ME+IR) Licence including the Airline Transport Licence Theory Credits.

Based on the activities included within the course, the following facilities must be provided in the layout of the Pilot's Hub:

- The above-mentioned facilities for the provision of the PPL
- And further including a twin-complex aeroplane;
- Cockpit Procedure Training device; and
- Standard MCC Simulator for training for the use of larger Airbus aeroplanes

A twin-complex aeroplane provides complexity and skill in the use thereof and is, therefore, important to practice before becoming an Airline pilot. The Pilot's Hub will provide a Cessna 340/340A (figure 1.7.J), a piston-powered, cabin-class pressurized twin, for training (Temple, 2021: online).

04

Night rating

This additional course allow the PPL License holder to be able to expand on his/her privileges by being able to fly during day and night-time.

Fig 1.7.E: Cessna 172 (CessnaAirfractCompany, 2009: online)

Fig 1.7.F: Seneca 1 PA 34R-200 (Peltier, [n.d.]: online)

Fig 1.7.J: Cessna 340 (Temple, 2021: online)

Fig 1.7.G: ALS 250 Simulator (Nerlinger, 2021: online)

Fig 1.7.H: ALS 250 Simulator (Nerlinger, 2021: online)

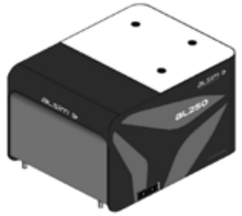


Fig 1.7.I: ALS 250 Simulator (Nerlinger, 2021: online)

PTC Aviation makes use of the Cockpit Procedure Training device (figure 1.7.K) to allow the students the opportunity of learning flight deck layout and practice drills before taking part in the simulator training. Thereafter, an A320 Airline Simulator (figure 1.7.L) , that is a MPS MCC device with a direct projection dome (van der Heijden, 2021: online), is used for advanced training. Figure 1.7.M and 1.7.N show its layout:

The above-mentioned simulators will be registered in order to be SACAA recognised.

Based on these provided courses, the **members** that help with the functioning of the entire programme, include:

Professional Flight Training Instructors that provide flight and ground-based training;
Administration staff;
External lectures participating in public events and presentation seminars/ workshops that communicate more of specific topics relating to aviation;
Flight Safety Officer (doing monthly inspections); and
Other staff members for maintenance of the building.

Fig 1.7.K: Cockpit Procedure Training Device (Benes & Michl, 2021: online)

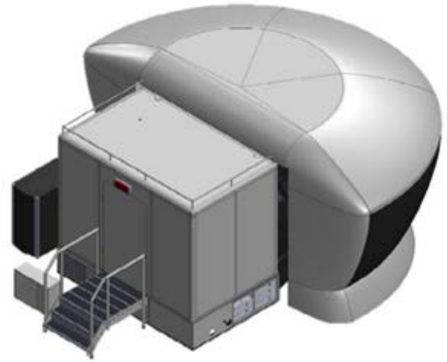


Fig 1.7.L: A320 Airline Simulator (MPS, 2021: pdf)

Fig 1.7.M: A320 Airline Simulator (MPS, 2021: pdf)

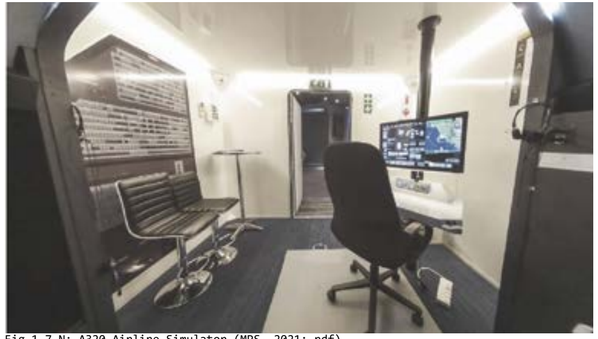


Fig 1.7.N: A320 Airline Simulator (MPS, 2021: pdf)

Therefore, the **programme** comprise of:

A. PROVIDED FACILITITIES:
Kimberley Airport
Existing Pioneers of Aviation Museum and Monument

B. TRAINING FACILITIES:
Two simulator rooms
Ground training classrooms for separate courses and individual groups (when needed)
Study pods
Student lounge with a viewing deck
Instructor crew room with a viewing deck
Briefing rooms
Hangars holding four aeroplanes
Machine workshop
Examination room
Taxiway and apron (to be discussed in 1.8)

C. ENTERTRAINMENT:
Reception and lobby
Museum
Multifunctional hall for staff, students, and the public
Exhibition/ lounge for staff and students
Pilot shop
Air show viewing pavilion
Viewing towers
Restaurant and kitchen
Outdoor model plane flying

D. ADMINISTRATION:
Manager office
Flight instructor admin
Accounts and logbook collection point
Medical station

E. ACCOMODATION:
Single room unit for public visitors
Shared unit for students divided into 2 or 3 rooms with shared bathroom, kitchen and living area. Each room has a study desk.
Laundry facilities
Courtyard
Braai
Recreational facilities including a soccer field, television lounge/ games room, and table tennis
Storage

F. OTHER FACILITIES:
Locker rooms for staff members
Locker rooms for students
Showers and toilet facilities for both male and female
Storage and electrical room
Parking for staff, students, and public visitors

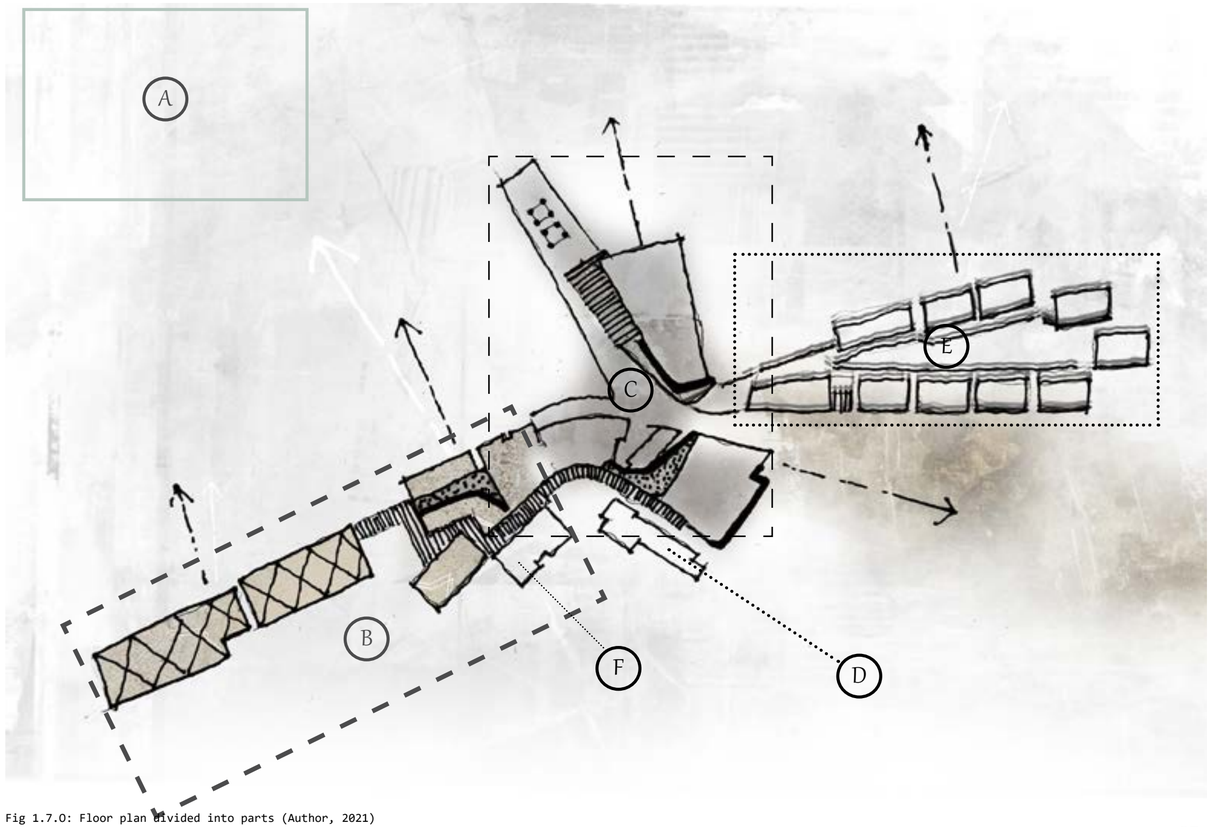


Fig 1.7.O: Floor plan divided into parts (Author, 2021)

Requesting approval to build on this specific site

Requesting to build based on the proposed Aviation Training Organisation

Construction of buildings at an airport in South Africa, is subject to national regulations as stipulated in the South African Civil Aviation Act of 2009. Hence, compliance to the national regulatory system is imperative with regard to the planning, design, and construction of the Pilot's Hub (located near the Kimberley Airport).

In order to obtain approval for the construction of this flight school, the proposal will need to reflect complete adherence to the South African Civil Aviation Act as outlined below:

"PART 141: AVIATION TRAINING ORGANISATIONS
SUBPART 1: GENERAL" (South Africa. Civil Aviation Act 2009: 964)

- Step 01- Description of the proposed institution
- Step 02- Safety inspections and assessments

"SUBPART 2: APPROVAL OF AVIATION TRAINING ORGANISATION (STANDARD AVIATION ORGANISATION)" (South Africa. Civil Aviation Act 2009: 967)

- Step 03- Requirements for approval
- Step 04- Personnel requirements
- Step 05- Accommodation, facilities, and equipment
- Step 06- Issuing of approval after all the information has been inspected and understood
    - This approval will under [141.02.8] be approved and allow the Organisation to conduct standard aviation training.

Finally, under section [141.02.15], this Training Organisation programme will be able to provide for PPL (Private Pilot Licence), CPL (Commercial Pilot Licence), and instrument rating (South Africa. Civil Aviation Act 2009: 964-975).

The planned construction of the proposed Pilot's Hub **will comply** to the above-mentioned regulations in order to ensure approval by the Department of Transport.

Requesting to build based on Aviation Obstacle Limitation Surfaces

Based on the importance of safety and aircraft protection, the objective of the Obstacle Limitation Surfaces is to permit good safety rules and regulations of any intended aeroplane operations. These rules allow for every effort to be made to solve conflicts found in the national airspace. Therefore, in terms of the Pilot's Hub, the (ICAO CAIRO, 2017) agrees that any structure located within the boundaries of the aerodrome, may not have a height extending above 45 meters.

Within the OLS [CAR & CATS Part 139.01.30]-
Any buildings that are found under the height of 45 meters and located within 8 kilometres of the aerodrome, are to be approved by the Director before the building process can start. These buildings are further marked as specified in Document SA-CATS-AH (Stroh, 2017: online). Lastly, The South African Civil Aviation Authority (SACAA, 2021: online), requires that all the property owners must give formal notice of any proposed structure which may penetrate on obstacle limitation surface based on [CAR 139.01.30], (Stroh, 2017: online).

In conclusion, the Pilot's Hub is to be registered according to the above-mentioned protocols and will follow the vertical height restriction to prevent itself from becoming an obstacle to the aviation environment.

Requesting to build based on the site being situated on the owned property of the Alexanderfontein Game Farm

The Pioneers of Aviation Museum has been built on a piece of land between the Kimberley Airport, Generaal van der Spuy Drive, and Mauritzfontein. This land is owned by a game farmer, Mr. Martiens de Beer, a retired commercial pilot.

In addition to the request of approval directed at the Kimberley Airport, approval to construction of the proposed Pilot's Hub will be requested from the farm owner as well. This request will be motivated against the backdrop of certain aspects which could be beneficial to the farm owner. The proposed Pilot's Hub on the farm could encompass the following advantages:

- A source of income from the public and pilot training students.
- Improved security once the students start training and making use of the facilities.
- An increase in the value of the Game Farm.

Based on these advantages, the farm owner has agreed to allow for the build of the proposed Pilot's Hub on the chosen site.

Kimberley Air Traffic Control

The Civil Aviation Authority of South Africa states:

"The Air Traffic Maintenance (ATM) system should provide an operating environment that:
a) ensures that all airspace users have the right of access to ATM resources needed to meet their specific operational requirements; and
b) ensures that the shared use of the airspace for different airspace users can be achieved safely." (CAA, 2017: 221)

Due to the proposed Pilot's Hub that is situated within 2 km of the existing Kimberley Airport, the same Air Traffic Control (ATC) is used. In order to prevent obstruction or hazardous traffic between the Kimberley Airport owned Airbuses and the Cessna's (owned by the Pilot's Hub) it is the duty of the proposed Hub to request approval in order to fall under the control of the Traffic Tower. According to the above mentioned, the ATC Tower is obligated to make provision for access for all parties that need to make use of the facility.

In accordance with the South African Civil Aviation Act of 2009, the movement of all airplanes in this specific air space **will be controlled** by the Air Traffic Control Tower at the Kimberley Airport [PART 172: AIRSPACE AND AIR TRAFFIC SERVICES [172.01.2] (ICAO, 2009: 1021).

The proposed Pilot's Hub will fall under **FAKM** (the abbreviation identifying the Kimberley Airspace) where The Kimberley Air Traffic Control Tower will regulate the following aspects:

- Prevent collisions between aircrafts
- Maintain an orderly flow of the air traffic in that area
- Provide best advice for the safety of all pilots
- Provide search and rescue services (South Africa. Civil Aviation Act, 2009: 1022)

Table (1.8.A) depicts certain air space specifications to illustrate that close cooperation between the proposed Pilot's Hub and the Kimberley Air Traffic Control Tower will be of paramount importance.

Table 1.8.A:

ATS UNIT: CALL SIGN	KIMBERLEY TOWER
LANGUAGE	English
FREQUENCY	118.2 MHz
POSITION OF TRANSMITTING ANTENNA CO-ORDINATES	284759.82S 0244537.32E
AIRSPACE CLASSIFICATION	Class C
OPERATIONAL USE	Open to the public
CO-ORDINATES	S28°48.29' / E24°45.84'
MANNING THE USE OF	Runway 02/20; Runway 10/28

(AIP South Africa, 2021: pdf), (ARINC, 2021: online)

As previously mentioned, the Pilot's Hub aims to revive the historical value of the existing Pioneers of Aviation Museum. Nevertheless, with further investigation into the landscape and surroundings of the existing site, it has been found that there is more to this specific landscape than that of the existing Museum.

The landscape further holds an openness that allows the Pilot's Hub to be free from any restrictions in designing the layout. This exposed landscape allows the Pilot's Hub to open its "wings" and stretch its "body" out over the landscape. Whilst stretching the design out onto the landscape, the aim of this proposed design finds further clarity: to make use of this landscape by appreciating and taking note of all that it has to offer.

Hence, the **Kimberley Airport makes its appearance into the desicion making of the Pilot's Hub.**

This Airport has formed a point of hierarchy within this landscape for many years. It holds various business opportunities for the entire Kimberley district and increases possibilities of interaction. The Airport provides various possibilities of aviation performance and therefore, renders an oppurtunity towards linking with the proposed Pilot's Hub.

Whilst considering the creative integration of the existing into the proposed Pilot's Hub, the Pilot's Hub will also work with the Airport to allow the Hub's students to receive the best learning experience possible. This will be done by building a taxiway (seen in figure 1.8.B) that links the Airport and the Pilot's Hub with one another to allow the students to travel in between these two places to make use of the Airport's runways for flight training.

Through the existence of this taxiway, the Pilot's Hub will make use of the facilities provided to expose each student to the aviation environment in the best way possible.

Permission to build the taxiway

FAKM (Kimberley Airport) is an ACSA (Airports Company South Africa) registered airport where permission is needed from the ACSA for the construction of the taxiway. This taxiway will link the Kimberley Airport runways with the Hub's proposed apron (the part of the Airport Movement Area where the aircraft are parked and refuelled), (ACSA, 2019: online).

The first step is to consult the ASCA with regard to permission for using the Kimberley runway facilities. This is done for safety purposes and the protection of all the Airport's facilities and its people. By gaining permission from the ASCA, the Hub will comply with the strict rules on-

- The movement that takes place within the aerodrome,
- Safe and secured entrance and exits (gate control)
- Speed limitations,
- Safety plan and controlled routes, and
- Radio communication to receive clear instructions (ACSA, 2019: online).

After ASCA approval has been granted, the taxiway can now be built.

Design of the taxiway

Based on the Civil Aviation Regulations (SA-CARS Part 139), [139.02.2 AERODROME DESIGN REQUIREMENTS] -
there are certain aerodrome design standards that need to be taken into consideration for the safety and legality of any proposed air space (SOUTH AFRICAN CIVIL AVIATION TECHNICAL STANDARDS, 2011: 1207).

These standards are applied throughout various parts and divisions of the aerodrome/ air space and include the following:

- [Annex 14: Aerodromes, Volume I: Aerodrome Design and Operations]

To ensure safe surface movement within and around the Kimberley Aerodrome, the proposed taxiway need to be designed in such way that it takes all possibilities of safekeeping into consideration (ICAO, 2018: 3-18). These design considerations are further explained in the Aerodrome Design Manual (International Civil Aviation Organisation, 2005)

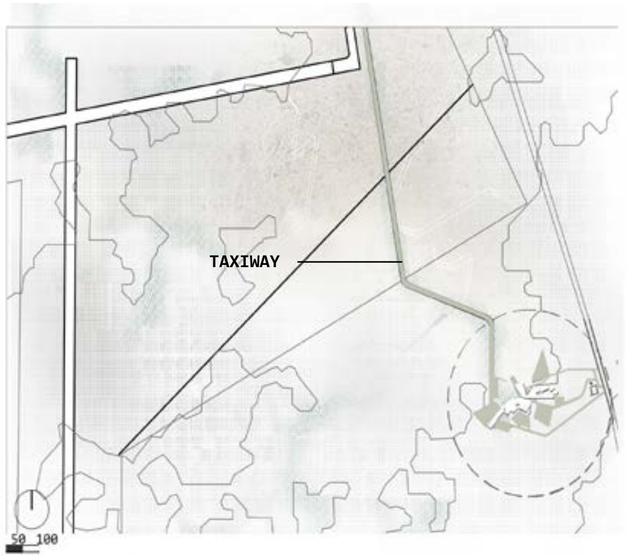


Fig 1.8.B: Area plan (Author, 2021)

where it depicts the importance of designing a non-hazardous space by taking the various standards into consideration. These standards are clearly analysed and indicated on the layout of the proposed Pilot's Hub. Seen in figure 1.8.C.

- [Annex 17: 'Security - Safeguarding International Civil Aviation Against Acts of Unlawful Interference']

Annex 17 outlines all rules, regulations, practices, and procedures for the safeguarding of civil aviation against acts of unlawful interference by taking the safety, regularity, and efficiency of flights into consideration (SACATS, 2011: 2).

By complying to the above-mentioned rules and safety regulations, the taxiway can now be built. With respect to the Pilot's Hub, the taxiway will have a manned automated gate that gives it access to the Kimberley Airport. From there on, the aeroplane will be able to taxi all the way to the Pilot's Hub built parking aprons and hangars. The Kimberley Airport now renders the Pilot's Hub an opportunity to have a full experienced learning process and will also allow visitors to make their trip to the Pilot's Hub via plane.

From the Pilot's Hub, a full 360-degree view offers the students and the public a chance to experience the activities that take place on the Airport runways and in the sky. Air shows will be held on the Kimberley Airport (through requested approval) where the programme will include the pilots to taxi their aeroplanes to the Pilot's Hub. The apron parking will provide space for these aeroplanes to park and further allow visitors to interact with the aeroplanes. Thus, giving the visitors a close-up experience.

The request for seasonal air shows will be based on the approval by the Central Airspace Management Unit (CAMU) who takes responsibility for the management of traffic flow in the Aerodrome (Civil Aviation Authority, 2017: 221-223). An application for the Flexible Use of Airspace will be administrated via an online application form where an automated tracking number will be given and sent to the CAMU processing office for approval. Based upon the approval, the air shows will have the permission to make use of the Kimberley airspace for a particular period of time period (CAA, 2017: 223).

The layout and design of the taxiway, aprons and hangars will be built similar to the following **case study examples:**

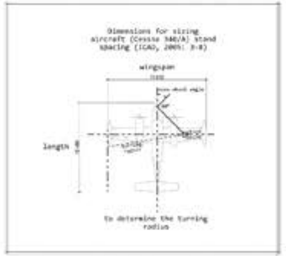
REGISTERED: AVIATION TRAINING ORGANISATION [under part 141 of Civil Aviation Act of 2009]
AVIATION OBSTACLE LIMITATION SURFACES: under 45 meter (ICAO CAIRO, 2017)
SITE PROPERTY: Alexanderfontein Game Farm
AIR TRAFFIC CONTROL: FAKM (Kimberley Airport)

01. Viewing pavilion
02. Viewing tower
58. Parking apron
59. Taxiway
41. Instructor crew room with viewing deck
42. Classroom
43. Student lounge with viewing deck
44. Study pod
45. Announcement board
46. Basic training briefing room
47. Exam room
48. Airbus briefing room
49. Cockpit procedure training rooM
53. Simulator room
55. Semi-open walkway
56. Hangar
57. Workshop and general storage

Wonderboom Airport analysis: fencing

9.10.1 A fence or other suitable barrier shall be provided on an aerodrome to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft (ICAO, 2018: 9-16)

Kitty Hawk Aerodrome analysis: aeroplane parking during an airshow



Minimum taxiway sight distance of 150m achieved (ICAO, 2005: 1-2)

Clearance area required for stand ingress and egress (ICAO, 2005: 1-11)

1.3 km from Kimberley Airfield Runway 02

Parking limit line

Apron taxiway

Minimum distance between taxiway centre line and object (ICAO, 2005: 1-11)

VIEWING TOWERS VERTICAL HEIGHT

Aircraft stand minimum clearance between other ircraft/ buildings/ other objects (based on code letter A) (ICAO, 2005: 1-10)

Fig 1.8.C: Taxiway design (Author, 2021)

Wonderboom Airport analysis: fire extinguisher

Wonderboom Airport analysis: distance between hangars

Surface material: asphalt (tarmac)

Taxiway pavement widths under code letter A (ICAO, 2005: 1-2; 1-11)

Taxiway centre line

Separation distance for code letter A (ICAO, 2005: 1-14)

180° turning circle

Aircraft stand minimum clearance between other ircraft/ buildings/ other objects (based on code letter A) (ICAO, 2005: 1-10)

Blast Fence (mesh material) (ICAO, 2005: [APP] 2-5)

TRAINING PROGRAMME

Cessna 172

Cessna 172

Cessna 208/208A

Cessna 172

Temp Aerodrome analysis: example of hangar

Wonderboom Airport analysis: example of hangar

Wonderboom Airport analysis: example of hangar

Fig 1.8.D: Wonderboom Airport (PAS, 2019: online)

case study

Wonderboom National Airport

LOCATION:

Pretoria, Gauteng

REASON:

Regulated aviation environment

This National Airport first established during World War I, started with only one airfield located on a small portion of a farm (known as Koedoespoort). The development led to the airfield being transformed into an Aerodrome as the increase in flights started to take place. The Airport, today, strives to increase aircraft movement and become an alternate departure point to various destinations in South Africa (PAS, 2019: online). This Aerodrome (FAWB) was designed to provide space for both visitors and pilots to dwell and interact with the flight community, which the Airport aims to create.

This Airport was chosen as a case study to analyse how the layout of hangars, heights, and other factors play a role in the design of the Pilot's Hub to ensure a safe and regulated aviation environment. The following aspects were considered and translated into the design of the Pilot's Hub:

There are numerous ways of designing an aeroplane hangar (seen in figures 1.8.D and 1.8.E) that is dependent on the type of aeroplane utilizing the space. Based on the analysis, the Pilot's Hub aeroplane hangars will make use of similar sliding doors (figure 1.8.L) that are supported by a column and beam structure. This type of structure contributes toward saving indoor hangar space.

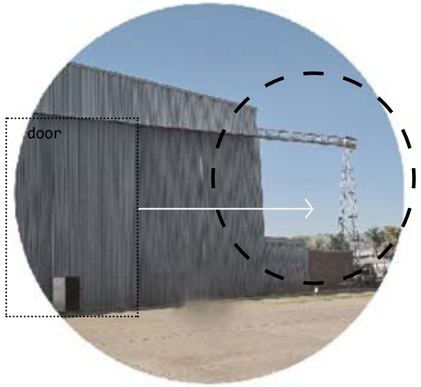


Fig 1.8.D: Sliding doors (Author, 2021)

Fig 1.8.E: Sliding doors (Author, 2021)

Figure 1.8.F show the distance of 25m clearance space for ingress and egress. This was analysed (figure 1.8.G) and applied in the layout of the Pilot's Hub aprons.

Fig 1.8.F: Ingress and egress space (Author, 2021)

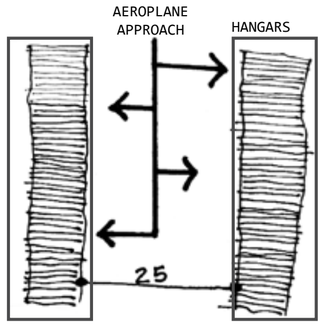


Fig 1.8.G: Ingress and egress space (Author, 2021)

A unique aspect was added to the layout of the Airport: a separate taxiway and hangar space that does not form part of the Wonderboom Airport facilities. This taxiway and hangar space is privately owned and has a controlled linkage with the Wonderboom Airfields. Figures 1.8.H to 1.8.K show the regulated approach of connecting the Wonderboom Airfield and private-owned taxiway with one another.

Fig 1.8.H: Manned gate between Wonderboom Airport and private taxiway (Author, 2021)

Fig 1.8.I: Gate (Author, 2021)

Fig 1.8.J: Private space (Author, 2021)

Fig 1.8.K: Another gate between Wonderboom and the private owned hangars(Author, 2021)

Figure 1.8.L show the view from the Wonderboom restaurant that attract visitors to have an open view of the approach, landing, and taxiing of the aeroplanes. Within the Pilot's Hub, the restaurant opens up toward the Kimberley Airfields to have the same type of experience.

Fig 1.8.L: Restaurant view (Author, 2021)

Fig 1.8.M: Kitty Hawk (Pretorius, 2021:online)

case study

Kitty Hawk Aerodrome

LOCATION:

Pretoria, Gauteng

REASON:

Regulated aviation environment

The name of this Aerodrome refers to aviation pioneers all over the world and was established in 1997 to form a place where aviators come together and “live their passion for flying true to the spirit of the Wright brothers at Kitty Hawk” (Pretorius, 2021: online).

This Aerodrome comprises 24 aeroplane hangars with a fuel bay and a clubhouse. The aeroplanes are provided with an 800m x 18m tar runway that allows for daily fly in’s and social events that include yearly air shows.

This Airport was chosen as a case study to analyse the layout of the hangars, the design of the taxiway, as well as its connection with the clubhouse. The following aspects were considered and translated into the design of the Pilot’s Hub:

The Pilot’s Hub aims to invite the public in by allowing them to interact with the aviation programme provided. Therefore, a viewing pavilion forms an integral part of the Hub’s layout to accommodate for large groups of people to come and experience the 360-degree view of the Kimberley Airfields. In addition, the Pilot’s Hub will also programme public events. These events include seasonal air shows, that will cause the viewing pavilion to be fully utilised. As part of the experience, the layout of the viewing pavilion (figure 1.8.N) is done in such a way as to provide enough breathing space for a large number of people and follows the flow of movement toward the Hub’s proposed taxiway. Approaching the design of the viewing pavilion in this way also gives the visitors a chance to have close-up interactions with the pilots and their aeroplanes.

Kitty Hawk forms a good example to show the close encounter the visitors have with the runway and taxiway (seen in figures 1.8.O and 1.8.P).

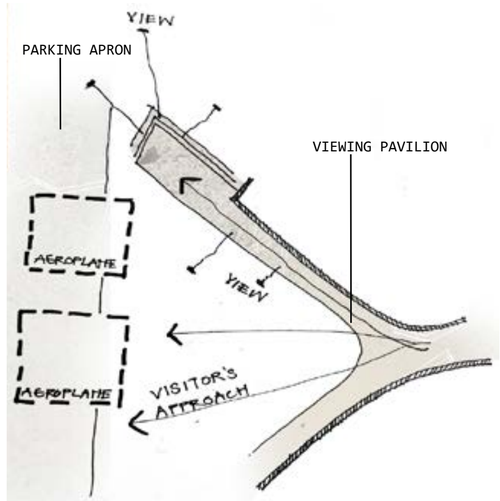


Fig 1.8.N: Viewing pavilion connetion with taxiway/ parking apron (Author, 2021)

Fig 1.8.O: Clubhouse connetion with taxiway and runway (Author, 2021)

Fig 1.8.P: Clubhouse connetion with taxiway and runway during air show (Pretorius, 2021: online)

Figure 1.8.Q show the layout of the hangars that provide in-between space for vehicles and aeroplanes.

Fig 1.8.Q:Hangar layout (Author, 2021)

Fig 1.8.R: Tempe Aerodrome (Author, 2021)

With the emphasis on training, this Aerodrome comprises two asphalt surfaced runways, two glider trips, and parallel landing strips that give the pilots the chance to explore and experience (Lemons, 2021: online). Similar to the previously mentioned case studies, Tempe offers space for both public and pilots to make use of.

This Airport was chosen as a case study to analyse the specifics concerning aeroplane hangars.

Tempe Aerodrome

LOCATION:

Bloemfontein, Free State

REASON:

Regulated aviation environment

The height of the hangar depends on the type of aeroplane that utilises the space. Figure 1.8.S shows an example of a hangar built for small aeroplanes. The Pilot's Hub necessitates only aeroplanes with a maximum height of 3.83m and will need a hangar with a minimum height of 6m.

Further investigation into the construction of the hangar (seen in figures 1.8.T to 1.8.V) show the type of roof truss, steel columns and materials used and are to be considered during the construction of the Pilot's Hub aeroplane hangars.

Fig 1.8.S: Tempe Hangar (Author, 2021)

Fig 1.8.T: Sliding door (Author, 2021)

Fig 1.8.U: Steel column (Author, 2021)

Fig 1.8.V: Roof truss (Author, 2021)

FUELLING:

For the Pilot's Hub to allow Avgas refuelling, an application is done to request permission thereof. Once agreed upon, the operator will have a documented procedure for fuel management and fuel supply (Kung, 2021: online).

The main refuelling process will take place on the grounds of the Kimberley Airport by making use of their fuel bay. A secondary fuel supply will be held at the Pilot's Hub for cases of necessity. This will be done similarly to the way Tempe Eagle Flight approaches the refuelling of their aeroplanes (shown in figures 1.8.W and 1.8.X).

[Appendix 6.2] of CAA (2017) explain the basic procedures that should be taken into consideration when refuelling. This includes:

- Refuelling must take place outside of the aeroplane hangar
- Refuelling must be done by the operator
- The tank must have a fire extinguisher attached
- Personnel engaged in refuelling shall not carry lighters or other flammables
- The aeroplane should be switched off

An example is shown in figure 1.8.Y.

Fig 1.8.W: Avgas (Author, 2021)

Fig 1.8.X: Avgas (Author, 2021)

Fig 1.8.Y: Refuelling porcess (Author, 2021)

MAINTENANCE:

Following (SACATS, 2011: 50-21), a party with the holder of a valid pilot licence and a rating issued in terms of Part 61 or 62 may carry out a limited amount of maintenance on the aeroplane. In the case of extreme maintenance to certain parts of an aeroplane, an aircraft maintenance organisation will be called in for further assistance.

Recreational Model Plane Flying

In order to re-establish the aviation community, once created by the Pioneers of Aviation Museum, it is the Hub's duty to find various possibilities of enhancing the importance of such community by creating a place that is open for a large group of interested parties.

Along with the training of student pilots and other entertainment facilities, another way of increasing the interest in the aviation community is by establishing a recreational model plane flying centre (figure 1.8.Z). Thus, designing a space for interested parties to come together and fly their time away. This gives way to a large open field with pergolas for parties to spend their days in comfort. According to the South African Model Aircraft Association (2012: 2-7), approval must be requested.

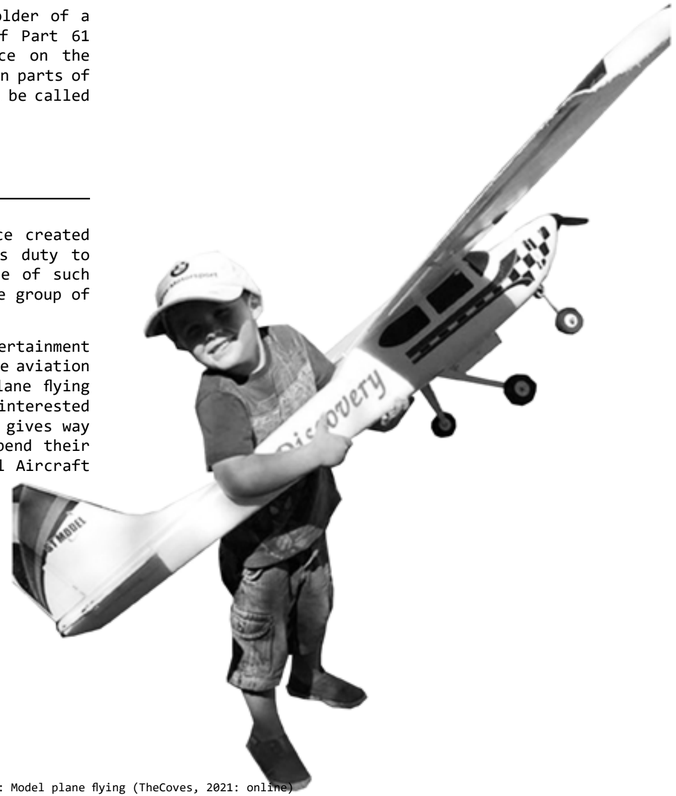


Fig 1.8.Z: Model plane flying (TheCoves, 2021: online)

1.9 CONCLUSION

The first part of this dissertation relates to the "Reading" of the Pilot's Hub, capturing the basic layout in order to establish an understanding of what the Pilot's Hub aims for and what it will encompass. The first part also outlines the central theme, the research question, procedures for the approval of the construction as well as pinpointing the intended programme and facilities at the proposed flight centre.

Fig 8: Airplane (Aviation Central, 2021: online)

part b

the memorable

The Memorable Perspective propose the body of the book where the entire thought process is highlighted before the final product is given. The word, “Memorable”, pertains to the idea that all the aims and initial concepts of the first part/ chapter, are taken into consideration, or “memorised”, in order to take the next step into the development of the three-dimensional design.

02

walking through the landscape

2.1 INTRODUCTION

This chapter will focus on the history and ambiance of the chosen site, the Pioneers of Aviation Museum, including all spatial qualities that the broader context has to offer. This study aims to portray this chosen site as the apex of all attractions in Kimberley, discussing aspects ranging from its climate to emotional experiences with relation to the chosen site's historical and aesthetical value.

While walking on the paved grounds of the Pioneers of Aviation Museum, one breathes in the fresh air and start to appreciate the beautiful view and richness that the open landscape has to offer. Whilst standing there, between earth and sky, one becomes aware of the sharp contrast that exist between the air filled with humming aircraft and the complete silence of nature. Since road traffic is limited in this area, city dwellers and visitors to the Museum could easily get intrigued by the tranquillity of the cosmic landscape (Seamon, 1993: 165).

This cosmic landscape comprises of a dissipated and eternal order with a continuous absolute experience of the space as an individual whole.

The continuous search for a possible site to build on, covered a wide variety of places stretching from Thabazimbi in North West to Kimberley in the Northern Cape. The Pioneers of Aviation Museum was chosen as the final site based on its rich history and existing structures which form an integral part of the town and its people. The Pioneers of Aviation Museum is built in the form of a hangar, yet unacknowledged and currently not utilized to its full potential. Therefore, this historical place in the landscape served as a source of inspiration towards the planning and design of a flight school.

The ambiance of the chosen site will be depicted by an investigation into the framework of this site and its landscape qualities. This analysis is based on personal findings (qualitative elements) and contextual aspects (qualitative elements) discovered within the area of Kimberley.

2.2 HISTORY ON THE EXISTING SITE

The history of the site started in the early 1900's, when the first South African School of Aviation was established for the training of the South African Aviation Corps (SAAC). This school, known as Paterson's Aviation Syndicate School of Flying, had the best night landing facilities on the African continent and hosted an air rally in 1934 (McGregor, 2021). This specific site, located on **General van der Spuy Drive,** was built on the existing grounds of the first hangar that facilitated the teaching programme of pilots in the SAAF (Historical Society of Kimberley and the Northern Cape, [n.d.]). The museum houses a life-size replica of the Compton Paterson biplane which was used to train these pilots (figure 2.2.A). Furthermore, the Museum commemorates the role played by early aviators in founding the SAAF. These people also include John Weston (figure 2.2.B) and Anna Maria Bocciarelli (figure 2.2.C), the African continent's first female pilot (McGregor, 2021).

After the first site visit (in March 2021), a few historical moments in the aviation history came to light:

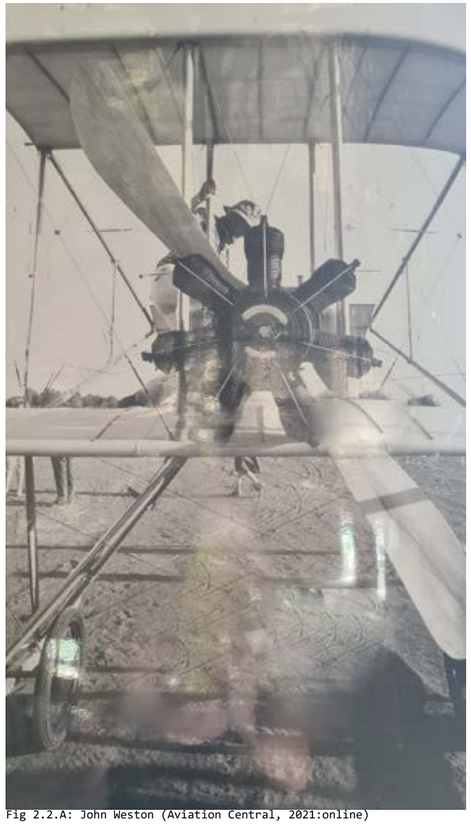


Fig 2.2.A: John Weston (Aviation Central, 2021:online)

Fig 2.2.B: John Weston (Aviation Central, 2021:online)

Fig 2.2.C: Anna Maria Bocciarelli (Naughton, 2012: online)

1903:

The first power driven aircraft was built by the Wright brothers.

1908:

An aircraft was imported to South Africa with the hope of becoming the first plane to take flight in South Africa. This aircraft had been tested, unfortunately without the success of lifting of the ground.

1909:

The first successful flight, to reach a level of 6m in height, took place in East London, by M. Albert Kimmerling with an average speed of 30 miles p/h.

1910:

Compton Paterson (an aviation enthusiast form Freshfield, England) started his flying career by designing, building, and flying his own biplane in England. From there he moved to London, England, where he had a few demonstration flights along with E.F. Driver (another aviation enthusiast).

This is where the first Paterson Biplane was built by him in England.

1911:

The success of this first flight (that took place in 1909) inspired pilots, E. Frederick Driver, Guy Livingston, and Cecil Compton Paterson, to go to South Africa (Cape Town) to form the first African Aviation Syndicate (AAS) to “promote the science and practise of aviation in South Africa” (McGregor, 2021) and this exploration and demonstration of flights brought the significance of aviation to the attention of many South Africans.

Fig 2.2.D: The real propellors (Author, 2021)

Within this year, Paterson built another Biplane and transported this Biplane to South Africa. This plane crashed at the Green Point Track in Cape Town and was reconstructed in 1912 (represented by the replica that stands in the Pioneers of Aviation Museum, today).

1912:

The AAS (that included E.F. Driver and C. Paterson) moved from Cape Town to Johannesburg to Kimberley where Paterson completed the first cross-country flight, flying from Kimberley to Klerksdorp. After a few disagreements that took place amongst the principals, the AAS was shut down. Paterson decided to continue his flight activities, in Kimberley, under the name of Paterson Aviation and along with the support of Tom Hill, a local man.

During this same time, 1910 to 1912:

E. Wallace Cheeseman, who studied aviation, developed constructional work at the Royal Aircraft Factory in England, and later became an instructor at The Grahame-White School at Hendon, London, England. This is where he attracted the attention of Compton Paterson, who secured his services for the AAS as an instructor (McGregor, 2021).

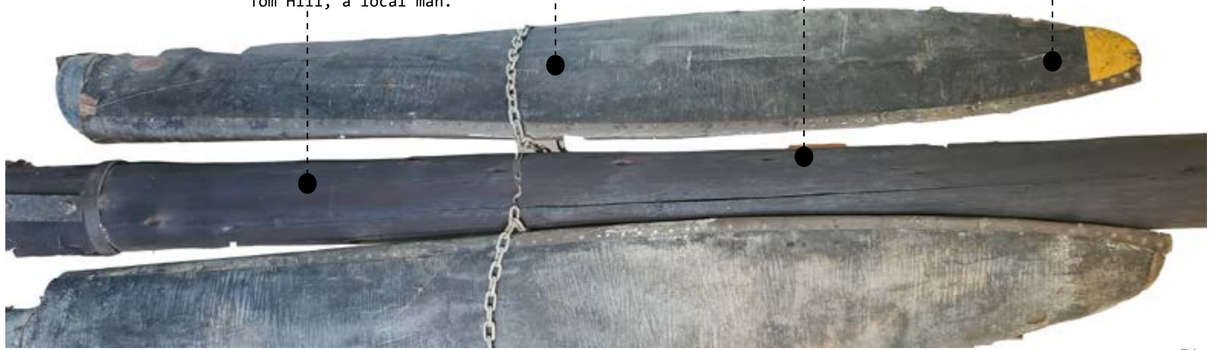
1913:

Paterson and Cheeseman registered the AAS as the first flight school at Alexanderfontein, where the Compton Paterson Biplane was used to train students. Paterson also negotiated with the Union Government to have military pilots trained at this flight school and succeeded by training ten students in becoming military pilots.

Cheeseman died later that year (McGregor, 2021).

1914:

One of the candidates, K.R van der Spuy, qualified as the first military pilot to become part of the SAAC. This was the same year that the First World War had started, and due to Cheeseman’s death, Paterson closed down the flight school and returned to England (McGregor, 2021).



1981:

The Paterson Biplane Replica was built under the direction of Stan Dawe (figure 2.2.E), at the SAAF Museum Workshop, Lanseria (figures 2.2.F to 2.2.I). The material used to construct this plane was donated by the Kimberley SAAF Association.

The 18- meter by 21-meter museum (seen, today, as the Pioneers of Aviation Museum) had been structured in the shape of the original hangar which formed part of the military Aviation Corps in honour of the first South African airmen.

This hangar-shaped Museum was erected by a few willingly citizens of Kimberley.

(Historical Society of Kimberley and the Northern Cape, [n.d.]), (McGregor, 2021).

Fig 2.2.E: Stan Dawe (McGregor, 2021: online))

Fig 2.2.G: The construction process(McGregor, 2021: online)

Fig 2.2.I: The construction process (McGregor, 2021: online)

Fig 2.2.F: The construction process(McGregor, 2021: onlinie)

Fig 2.2.H: The construction process(McGregor, 2021: online)

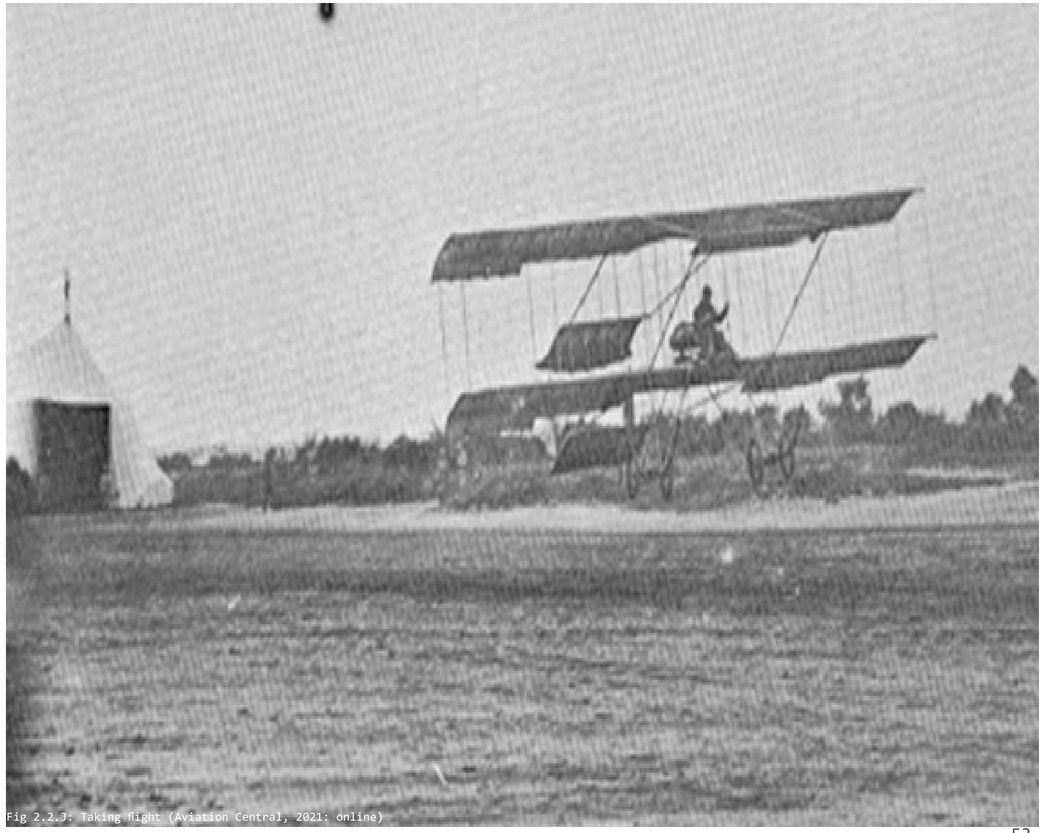


Fig 2.2.J: Taking flight (Aviation Central, 2021: online)

Fig 2: The construction process(McGregor, 2021: onlinie)

2.3 Analysing the site

The Pioneers of Aviation Museum, Generaal van der Spuy Drive, Kimberley, Free State, South Africa .

The analysis of this chosen site helps to enrich the importance of the broader context and highlight the elements (vegetation, climate, existing structures) which help to make up this chosen site. The analysis is based on contextual findings as well as personal interest into the context.

Macro context and the broad perspective

Figure 2.3. A to 2.3.C shows the map of Kimberley, Free State, with the chosen site allocated with dotted lines. This macro analysis refers to the broader context of the site and its relation to the Kimberley Airport and surrounding landscape.

The richness of this site and its greater landscape is represented by major landmarks found all-round the site. These landmarks are seen in figure 2.3.D that indicate the various thresholds in which the macro context is divided.

Fig 2.3.A: South Africa context (Mapper, 2021: online)

Fig 2.3.B: Northern Cape context (Mapper, 2021: online)

Fig 2.3.C: Kimberley context (Mapper, 2021: online)

KIMBERLEY AIRPORT GROUNDS

MINES

ALEXANDERFONTEIN GAME FARM

COSMIC LANDSCAPE

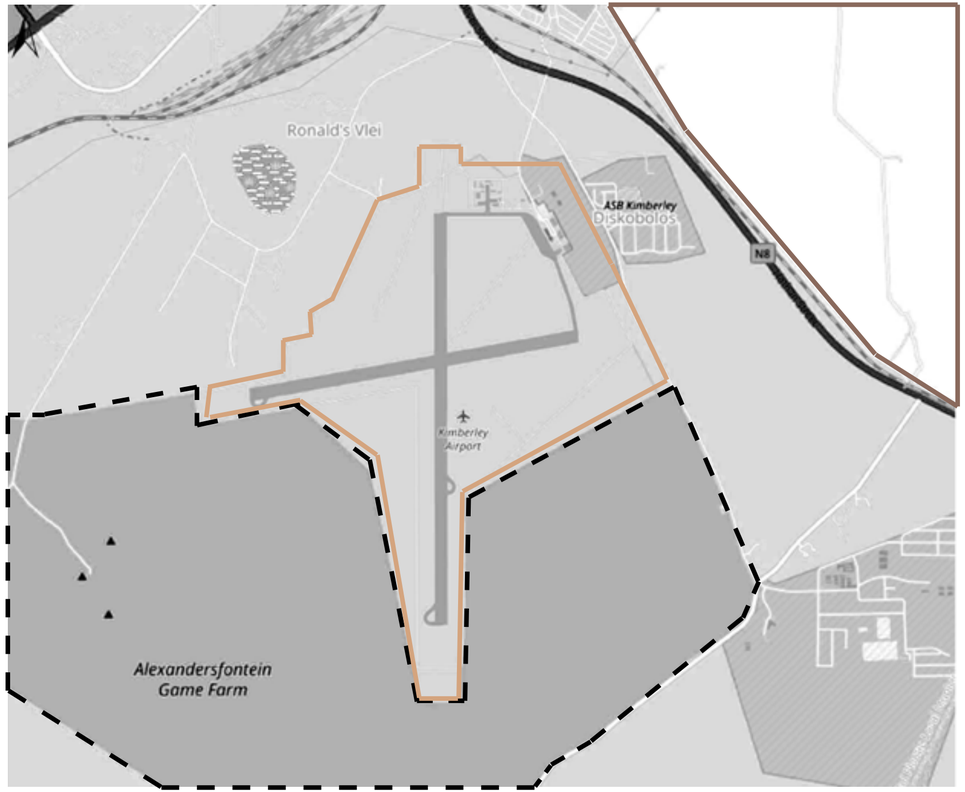
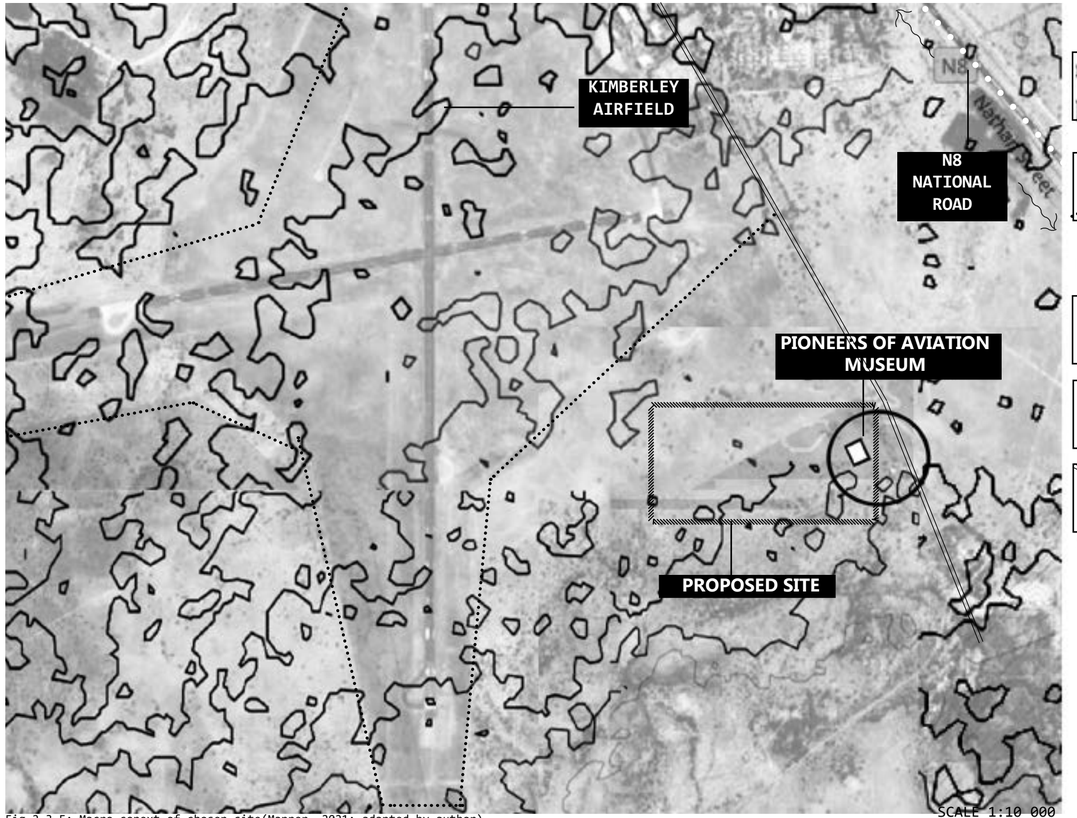


Fig 2.3.D: Landmarks (Mapper, 2021: adapted by author)



CONTOUR LINES

KIMBERLEY AIRPORT BOUNDARY LINES

ROAD LEADING TO CITY OF KIMBERLEY

ROAD LEADING TO FREE STATE

SECONDARY ROAD

Fig 2.3.E: Macro conext of chosen site(Mapper, 2021: adapted by author)

The site for the chosen project (seen in figure 2.3.E) is located on the outskirt of the city of Kimberley and placed on the Alexanderfontein Game Farm. This Game Farm is made up of a cosmic landscape and decorated with wandering wild game. Figure 2.3.F shows a map of the macro landscape with the proposed site and its surrounding contextual features (figures 2.3.G to 2.3.I).

When entering the site from the North-East direction (climbing directly of the N8), the dusty road brings one into immediate connection with the surrounding landscape. The road goes past a few residential houses until finally taking a turn up to the entrance of the Museum. When standing in front of the Museum's entrance, one immediately notice the "openness" of the landscape. This open landscape gives way to a view of the Kimberley Airport and its Airfields, as well as the Alexanderfontein Game Farm- all of which is covered by a wide-ranging view of the sky (seen in figures 2.3.G to 2.3.I).

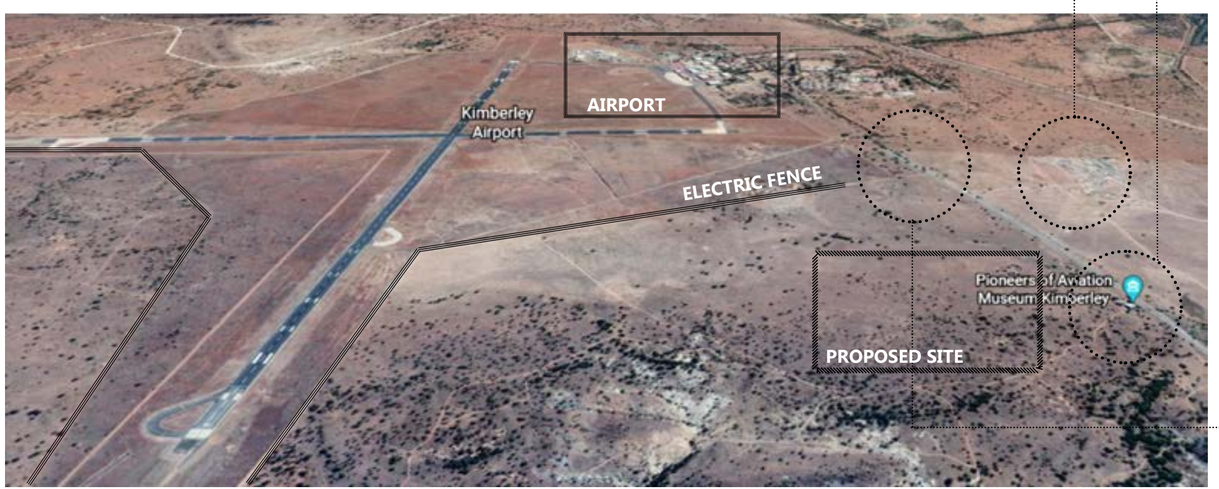
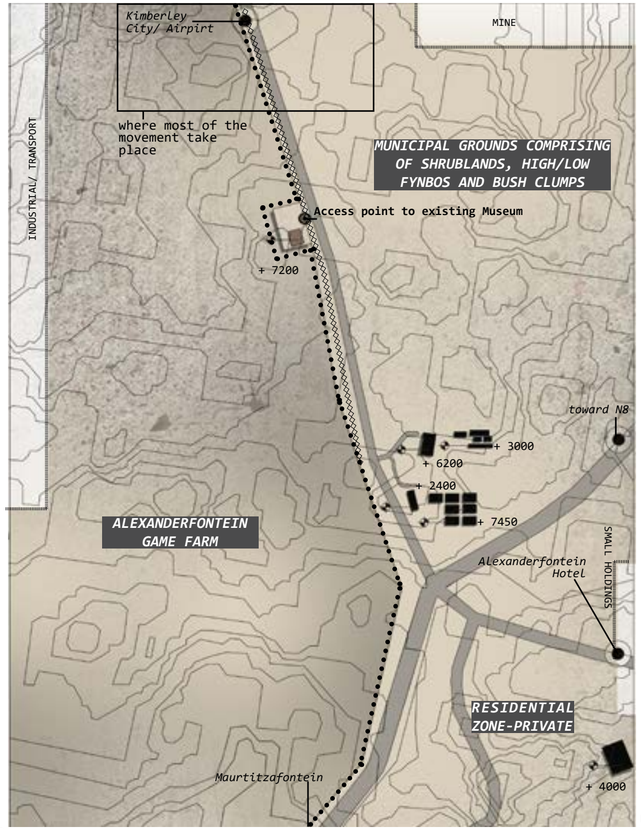


Fig 2.3.F: Bird eye map of macro context(GoogleEarth, 2021: adapted by author)

Fig 2.3.G: Museum (GoogleEarth, 2021: online)

Fig 2.3.H: Cosmic landscape (GoogleEarth, 2021: online)

Fig 2.3.I: Road (GoogleEarth, 2021: online)



DIVISION LINES

TELEPHONE LINES

GAME FARM BOUNDARY FENCES

ZONING AREAS

ACCESS TO/FROM

HEIGHT

Fig 2.3.J: Quantitative information found in the meso context (Author, 2021)

Quantitative information found in the meso context

Along with the site location and significant landmarks, town and regional information play a role in further understanding the chosen site and its context. Regarding the town and its region, the following aspects were noted (figure 2.3.J):

The Alexanderfontein Game Farm was built around the boundaries of the Kimberley Airport and makes use of fences to divide the two landmarks from one another. By making use of these electric fences (shown in figure 2.3.J), the Game Farm also prevents all wildlife from entering into the controlled environment of the Airport.

The area in which the chosen site find itself also forms part of the Sol Plaatje Municipality who, according to The Sol Plaatje Integrated Development Plan (Sol Plaatje Municipality, 2020: 6), aim for innovative new ideas by attracting:

- More housing facilities within the city
- Investment opportunities
- Job opportunities
- A city that invests in public participation
- Improvement of skills.

In terms of the proposed Pilot's Hub, it's programme and facilities will contribute toward each aspect that the Municipality strives for based on the opportunities that the Hub will create.

Due to the Pilot's Hub that is situated within a 3 km radius of the Kimberley Airport, height restrictions are taken into consideration to ensure that the proposed building does not exceed a vertical height of 12m (City of Kimberley, 1994: 82).

Furthermore, figures 2.3.K to 2.3.N show the existing residential and commercial facilities in the surrounding landscape.

Fig 2.3.K: View over Kimberley Airfield (GoogleEarth, 2021: online)

Fig 2.3.L: Road on south side of Alexanderdontein Game Farm (GoogleEarth, 2021: online)

Fig 2.3.M: Turn-off from N8 toward Museum (GoogleEarth, 2021: online)

Fig 2.3.N: Residential (GoogleEarth, 2021: online)

Within the Kimberley district, wind and rain conditions play an important role in the construction of the proposed Flight Training Centre (The Pilot's Hub). This section of Chapter 2 gives information on the yearly wind conditions and rainfall. The analysis of these environmental conditions will further form an integral part of the technical approach (Chapter 4.3) toward designing the Pilot's Hub.

According to Windfinder (2021: online), Kimberley Airport experience little wind blowing throughout the year and has an average of 6 to 7 months of wind occurrences. Figure 2.3.Q shows the wind rose that proves most of the wind to come from the northern direction. In terms of climate control, summer make its appearance with 6 to 6 and half months of the dry season. Average temperatures are shown in Figures 2.3.O and 2.3.P (Alexander, 2021: online). Along with warm summers and cold winters, the rainfall lasts an average of 7 months where most rains occur from November to March (Gateway, 2021: online).

Based on the analysis done, the Pilot's Hub will consider the following architectural aspects that will help to solve any problems related to wind and weather conditions:

- The construction of pergolas
- The use of rainwater harvesting systems
- Roof pitch used to the advantage of catching rainwater
- The use of roof and wall materials to prevent overheating
- The use of a cooling system to regulate indoor temperature

Chapter 4.3 will discuss these aspects in more detail.

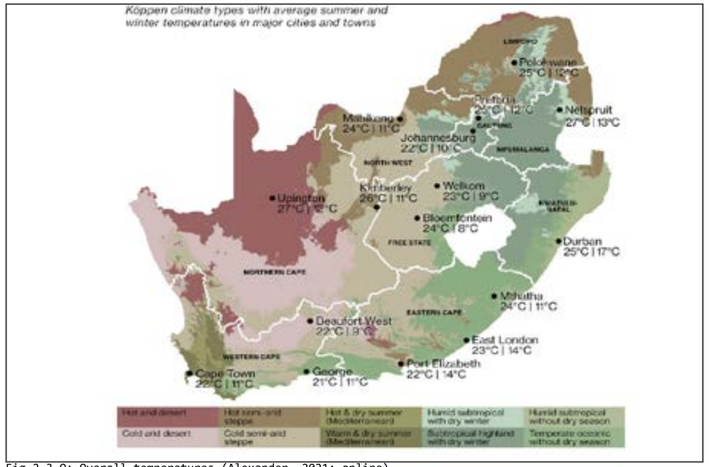


Fig 2.3.O: Overall temperatures (Alexander, 2021: online)

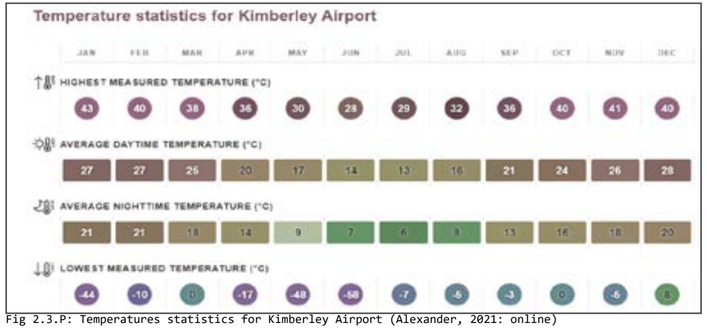


Fig 2.3.P: Temperatures statistics for Kimberley Airport (Alexander, 2021: online)

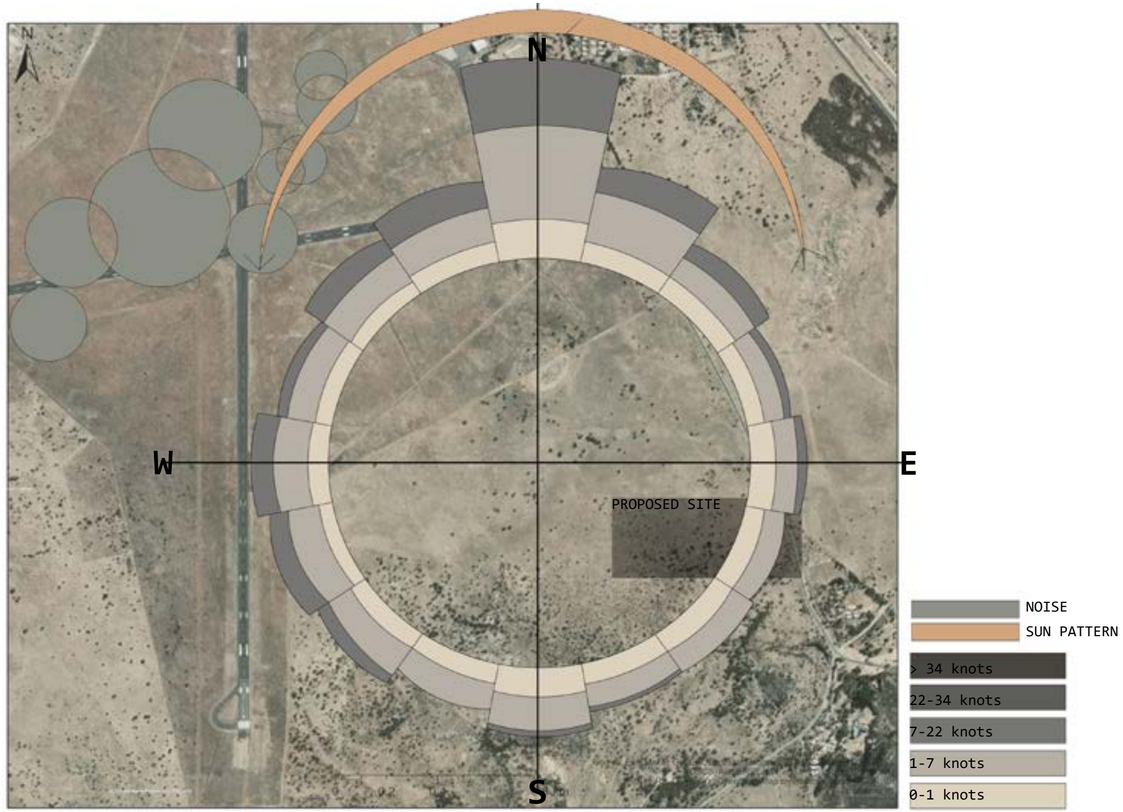


Fig 2.3.Q: Climate in the meso context (Windfinder, 2021: online)

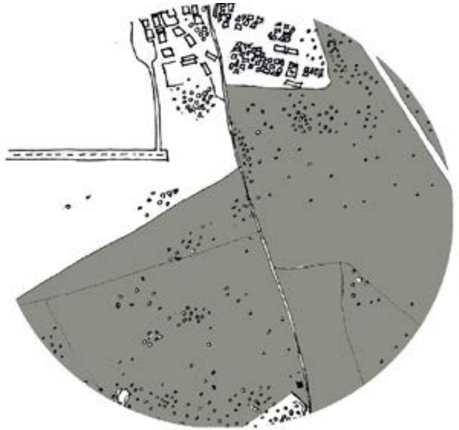


Fig 2.3.R: Vegetation (Author, 2021)

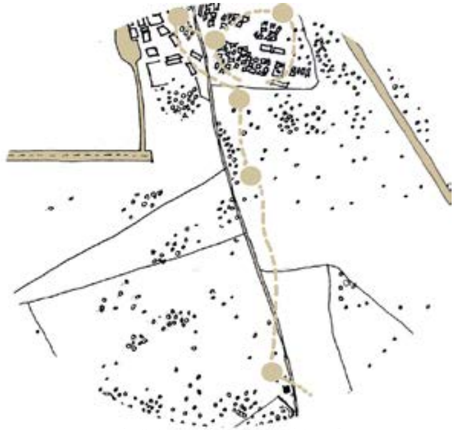


Fig 2.3.T: Pubic spaces and travel routes (Author, 2021)

In terms of the landscape, different circulation routes, existing parking and built places, and vegetation are shown in figures 2.3.R to 2.3.T.

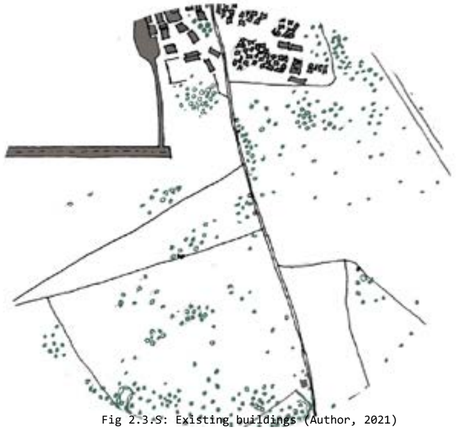


Fig 2.3.S: Existing buildings (Author, 2021)

The micro context

Presented in figure 2.3.U. and 2.3.V.

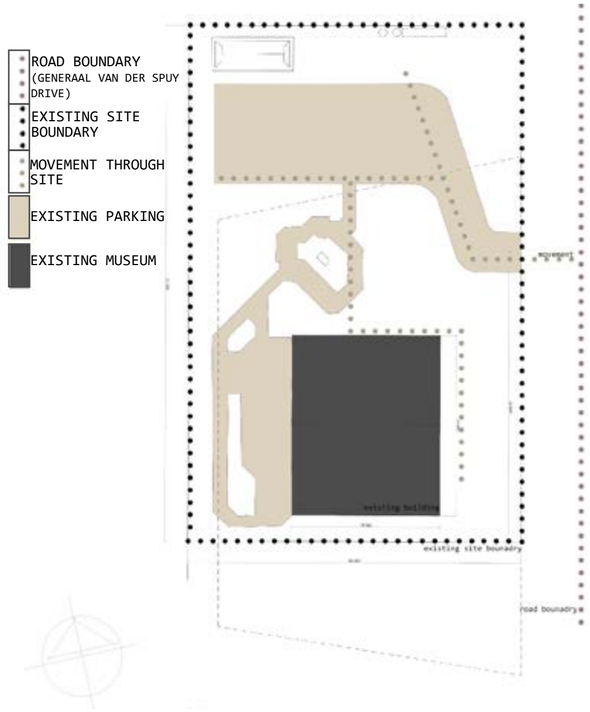


Fig 2.3.U: Development rights in the micro context [scale 1:200] (Author, 2021)

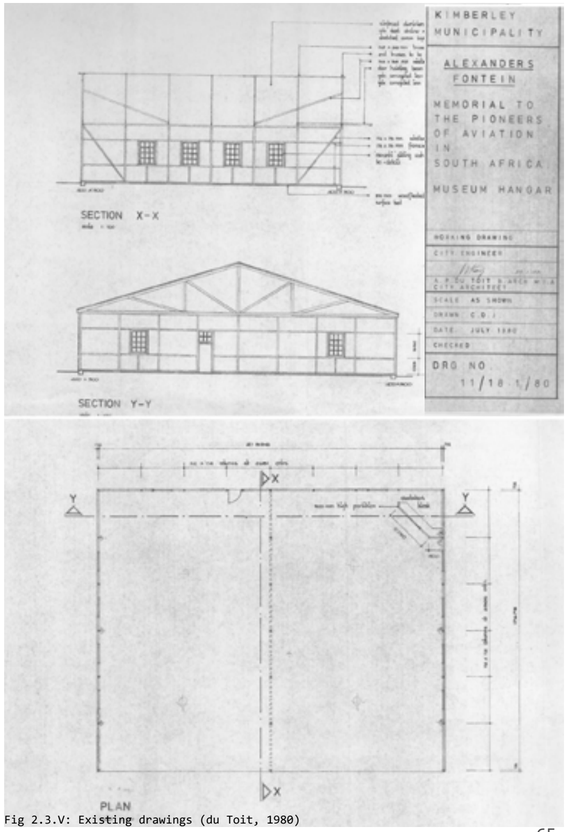


Fig 2.3.V: Existing drawings (du Toit, 1980)

The main circulation route currently takes place between Generaal van der Spuy Drive (the secondary road) and the parking provided on the existing site (located next to the existing Museum) (seen in figure 2.3.W). The Pilot's Hub aims to remove the existing parking and further aim to create a new circulation route that will invite more people into the landscape and give access to the newly proposed building site (located 100m west from the existing Museum) (seen in figure 2.3.X.). The new circulation route allows for easy access, for both vehicles and pedestrians. The Pilot's Hub will help to increase the flow of vehicles and pedestrians as it will become a large attraction point within this area.

Fig 2.3.W: Current circulation condition (Author, 2021)

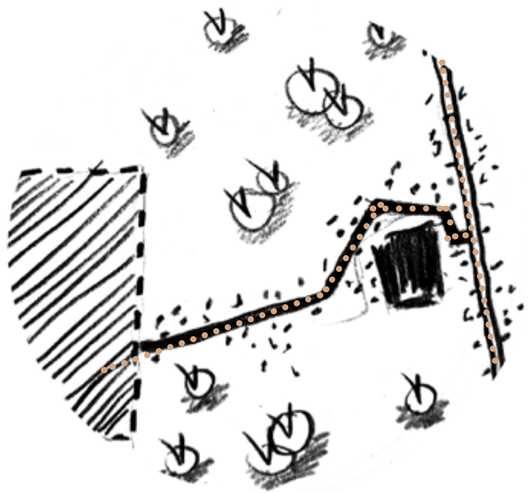


Fig 2.3.X: New proposed circulation (Author, 2021)

Qualitative aspects of the site in its micro context

The qualitative aspects of the site are exposed through section drawings that reflect the feeling and personal understanding of the site. Figure 2.3.Y is a conceptual reflection of the relationship that exists between the existing Museum, the proposed Pilot's Hub, and the implementation of aviation thereon. It reflects the hierarchy that the design brings to the existing site.

Figure 2.3.Z. show a section through the site that emphasises the connection between the existing Pioneers of Aviation Museum, the proposed building site, and the Kimberley Airport Airfields. The section further indicates the flat landscape that has a slight fall of 11 meters over a 1.62 kilometres span (from Generaal van der Spuy Drive to the edge of Kimberley Airport airfield runway 02).

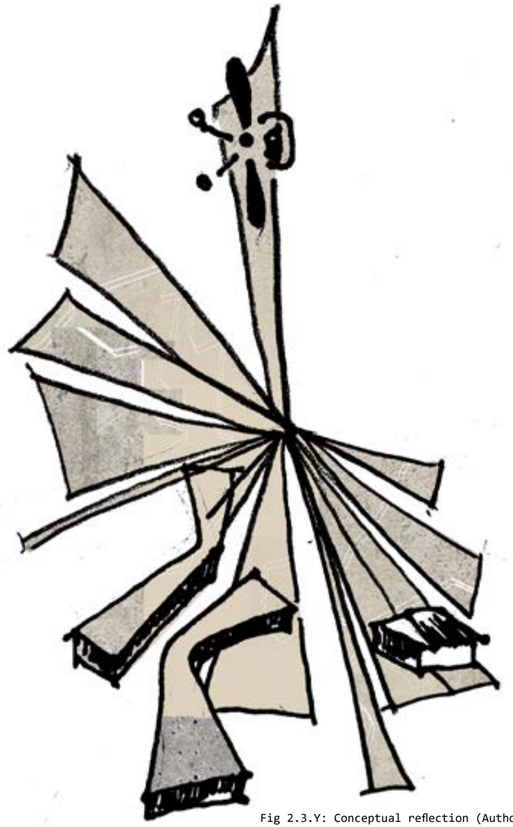


Fig 2.3.Y: Conceptual reflection (Author, 2021)

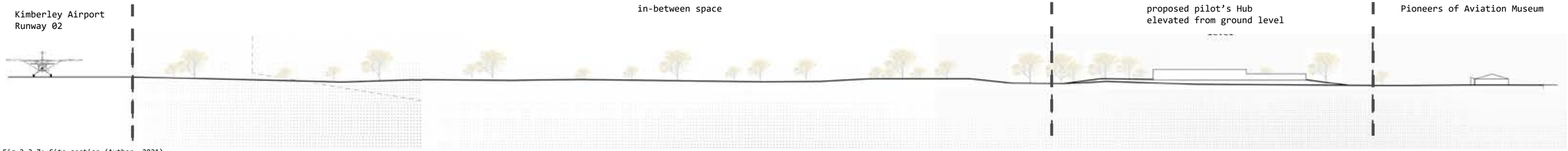


Fig 2.3.Z: Site section (Author, 2021)

The in-between space gives a clear understanding of the cosmic landscape decorated with trees and open veld patches. This landscape makes way for vegetation to grow and wildlife to flourish. Figure 2.3.AA interprets the sky as a dome-like structure that covers the landscape and gives way to that 360-degree view (seen in figure 2.3.AB) previously mentioned.

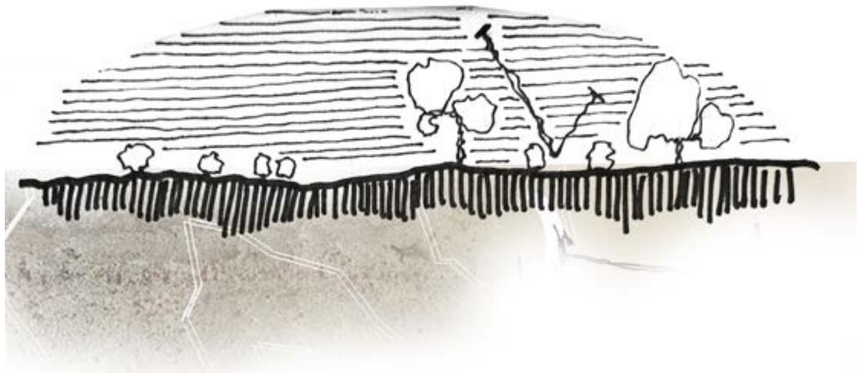


Fig 2.3.AA: Cosmic landscape and the sky (Author, 2021)

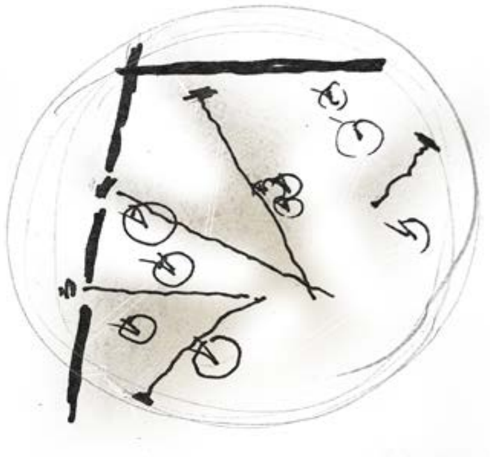


Fig 2.3.AB: 360-degree view (Author, 2021)

The Pilot's Hub becomes part of this "exposed" landscape by building it into the earth. By doing this, the design adds to the horizontal hierarchy that is created by the 360-degree view. Figures 2.3.AC to 2.3.AE show the way the design places itself into the landscape which forces the earth to "break" open and transform into a new form.

Fig 2.3.AC: The site fall before construction (Author, 2021)

Fig 2.3.AD: The break in the site (Author, 2021)

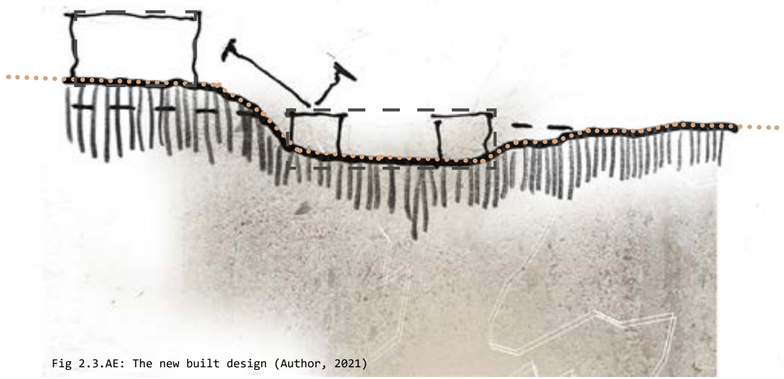


Fig 2.3.AE: The new built design (Author, 2021)

Vegetation and wildlife on site

The vegetation found within this cosmic landscape is what makes the site unique. The vegetation help to make up the characteristics of the Northern Cape and forms part of the identity of the warm climate. The following (figures 2.3.F to 2.3.K) show the types of plants and trees found within the environment:

The Alexanderfontein Game Farm have a wide range of game. Figures 2.3.L to 2.3.P show only a few of the game that will dwell around the Pilot's Hub:

Fig 2.3.AF: Low shrublands (Author, 2021)

Fig 2.3.AH: The warm environment refelcting on the trees (Author, 2021)

Fig 2.3.AJ: Flowers blooming when rain falls (Author, 2021)

Fig 2.3.AG: Grasslands and thorn trees (Author, 2021)

Fig 2.3.AI: Karee trees (Author, 2021)

Fig 2.3.AK: Thorn tree grwoing from the occasional heavy rains (Author, 2021)

Fig 2.3.AL: Sable (Schafer, 2018: online)

Fig 2.3.AN: Buffalo (Schafer, 2018: online)

Fig 2.3.AP: Giraffe(Schafer, 2018: online)

Fig 2.3.AM: Butterflies (Author, 2021)

Fig 2.3.AO: Eland (Author, 2021)

2.4 CONCLUSION

Concluding this chapter on the site and its elements it contains.

The existing Museum shows its strong connection with historical events that took place and further contributes toward the significance of this chosen site. After reading through the timeline, one truly understand the importance of the site and that it needs to be protected and preserved through the proposal of the Pilot's Hub.

The site analysis goes further by taking the macro, mezzo, and micro-framework into consideration. In terms of the macro context, important landmarks and nodes show their appearance in the landscape. Further giving the viewer a clearer understanding of the site's orientation in relation to the broader context. The mezzo context focuses on legal requirements, boundaries, access points, location, and surrounding buildings. Lastly, the section on the site, on a micro-scale, explores personal findings of the site.

In conclusion, a good visual presentation of the site and its context help increase the broader understanding of reasoning and decision making of the proposed Pilot's Hub.

3.1 INTRODUCTION

This chapter will deepen the theoretical discourse and explain how my interpretation of various theorists' work contribute toward the first conceptual ideas in the process of the design development.

The process of developing the personal theoretical understanding was initially inspired by the theories of French architect Le Corbusier (1923) (figure 3.1.A) and, thereafter, other theorists. The proposed process touches on the incorporation of aerodynamics via analysis of the structure of an aeroplane, through the lens of Le Corbusier's theory of **"standardisation"** (ibid) **and its relation to the metaphoric interpretation of an** aeroplane.

There was a personal connection made between Le Corbusier, that speak of the use of standardised "tools" in architecture (ibid), and its poetical implementation into architecture, where I believe that Le Corbusier's work proves that poetics can exist in the design of standardised architecture.

Maria Lorena Lehman (2011), a visionary artist, designer, and author, describes 'poetics' as being:

> ***"[T]he way architecture is able to "touch" its occupants on deeper emotional or spiritual levels … [and] the way architecture can convey beauty together with meaning that leaves one feeling more fulfilled."***

Therefore, interpreting Lehman's understanding of poetics in architecture as a design **process** of **engaging with the architectural features from which the building is made up, (**Lehman, 2011: 46-54) to lift the users quality of experience. In this case, these architectural features are the standardised "tools" that are used within Le Corbusier's architecture

Lehman goes on to say that this meaning of engaging with the architectural features, within the building, can be achieved through the use of a metaphor or of symbolism (Lehman, 2011: 46-54). This, personally argued, is the exact representation of the work of Le Corbusier (to be further discussed in 3.9).

Fig 3.1.A: Le Corbusier (Craven, 2020: online)

3.2 WORKING WITH THE THEORIES OF LE CORBUSIER

Standardisation, machine-like elements, and poetics in architecture

It is argued here that Le Corbusier's implementation of standardised "tools" in architecture is closely linked to, the previously discussed, poetical process.

This discourse is embedded in the theory of Le Corbusier as outlined in his book "Towards a new architecture" (Le Corbusier, Etchells, 1986). The following words by this author: *"architecture is a machine for living"* (ibid) form the axis of this presentation, thus connecting the word "machine" with architecture in a metaphoric way.

A combination of standardised elements or "tools" forms the basis of both an aeroplane and the concept of architecture, therefore one could argue that the machine becomes an element of standardisation, in other words, the machine becomes a metaphor for standardised architecture.

> ***"The Architect, by his [sic] arrangement of forms, realizes an order which is a pure creation of his spirit; by forms and shapes he affect our sense to an acute degree and provokes plastic emotions; by the relationship which he creates he wakes profound echoes in us, he gives us the measure of an order which we feel to be accordance with that of our world, he determines the various movements of our heart and of our understanding; it is then we experience the sense of beauty."*** (Le Corbusier, 1986: 1)

These words imply that the architect and the dweller both experience a "sense of beauty" when they encounter such orderly designed and "spiritually" connected architecture. This way of designing architecture depicts an emotional connection with space that help to uncover a deeper meaning and therefore, aligns the process of constructing a building with the process of poetics (explained in 3.1).

Le Corbusier's entire design process revolves around a series of experimentations that he documented throughout the course of his life. He outlines five standardised "tools", listed below, that are interpreted into built form.

Le Corbusier's "Five points of the new architecture" are (figures 3.2.B to 3.2.F):

1. Pilotis: elevating the mass of the ground and exposing the frame structure,
2. roof garden: acting as private space for gathering ,
3. free ground plan: achieved through the separation of the load-bearing columns from the walls that segment the space,
4. horizontal windows: placing emphasis on horizontality,
5. and free façade: enhancing flexibility (Oechslin & Wang, 1987: 82-93); (WordPress, 2018:pdf).

These five aspects will be illustrated and further discussed in 3.9.

It could be argued that Le Corbusier's work is contentious due to the idea that standardised architecture is cold and unconventional. But I believe that his life story and architectural encounters express his deeply manifested passion towards the architectural process. Le Corbusier's dedication can be perceived as an answer to speculation around the connection between poetics and standardised architecture.

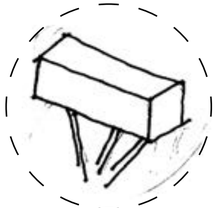


Fig 3.2.B: Pilotus
(Author, 2021)

Fig 3.2.C: Roof garden
(Author, 2021)

Fig 3.2.D: Free ground plan
(Author, 2021)

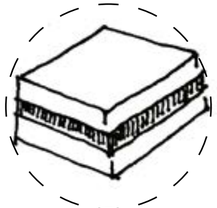


Fig 3.2.E: Horizontal windows
(Author, 2021)

Fig 3.2.F: Free facade
(Author, 2021)

Looking at new ways of designing architecture

It is argued here that Le Corbusier approach toward designing a building is unique to solving a living problem. This is done by experimenting with the use of standardised “tools” (like Le Corbusier’s “Five points of the new architecture”) needed in compliance with basic human needs and integrating these “tools” into architecture against the backdrop of poetics. Thus, designing for the good of man (Le Corbuser, 1954: 9)

In his book, “Towards a new architecture” (Le Corbusier, 1923) the author also states that:

> **“Man feels to-day that he** [sic] **must have intellectual diversion, relaxation for his body, and the physical culture needed to recuperate him after the tension of muscle or brain which his labour: “hard labour”: brings. This mass of desires constitutes in fact a mass of demands.”** (Le Corbusier, 1986: 278)

This statement pertains to the need all people have for their houses to fulfil and make provision for their basic needs (bathroom, living room, ect.) in order to live comfortably. Furthermore, Le Corbusier states that:

> ***“Industry has created its tools.***
> ***Business has modified its habits and customs.***
> ***Construction has found new means.***
> ***Architecture finds itself confronted with new laws.***
> ***Industry has created new tools: the illustrations in this book provide a telling proof of this. Such tools are capable of adding to human welfare and of lightening human toil”*** (Le Corbusier, Etchells, 1986: 284).

This statement could be recognised as means to capturing Le Corbusier’s architectural advice to people in virtue of achieving the best living conditions. In other words, this statement highlights the author’s discourse of creating a place that contributes toward optimal fulfilment of basic living conditions.

The first approach to experimenting with standardised “tools” and its poetical implication is the creation of a conceptual touchstone.

Fig 3.3.A: Standard elements used to build the touchstone (Author, 2021)

3.3 TOUCHSTONE

Architecture has always been a way of reflecting certain theories and ideas that one wish to convey (Raman, 2009: 100-102).

The design of a conceptual touchstone form an integral part of the design process of the Pilot’s Hub in order to capture the essence of what the project is about and stems from an integrated approach on the theoretical discourse thus far. Pattabi Raman, a Research Professor, encourage his readers to speak of such structure/model as being a “device” that’s tests the possible implications that one’s ideas/ discourse can have on architecture (ibid).

The notion behind the touchstone is to reveal a standardised system that is used in a way to create a form of poetics. Emphasis is placed on standardised elements that are taken out of their original context and placed together to form a new standardised system where one gear influences the movement of the next gear and the next. These gears, once used for other purposes, are now ordered to depict a new system that leads to a new or different outcome and portrays the telling of a new story based on standardised elements.

Evidence of the outcome could be illustrated by black paint on a white canvas (figure 3.3.B). As the gear system turns, the ink falls out of the cups (figure 3.3.C) and splashes onto the canvas (figure 3.3.D). The splash on the canvas is only made possible once a person turns the gears and the gears cause the cups of paint to tilt. Thus, it is argued, that the artist becomes part of the process, achieving a form of poetics. The poetics remains in place, as the paint keeps on dripping from the cup. This process foregrounds the essence of human participation to enhance a form of poetics in the realms of architecture.

The touchstone aims to prove that standardised “tools” can be used to create a form of poetry and furthermore brings the poetics, already present in architecture, to light. The touchstone could be perceived as providing an idea for the entire design process; it also serves as a reminder to appreciate the tectonics and tools encompassed by an architectural language.

Fig 3.3.B: Paint on white canvas (Author, 2021)

Fig 3.3.C: The cups (Author, 2021)

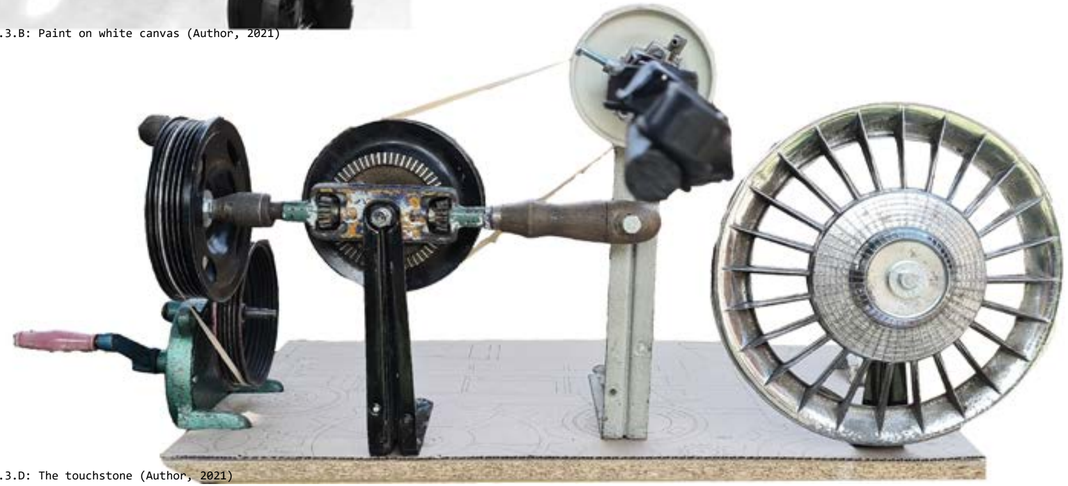
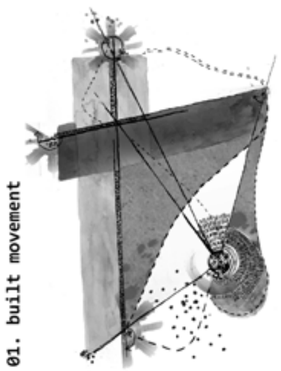
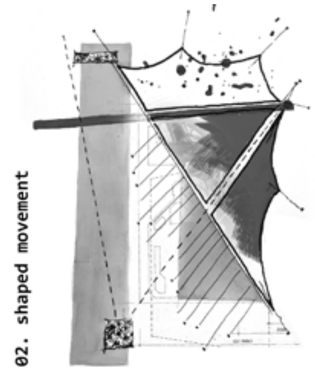


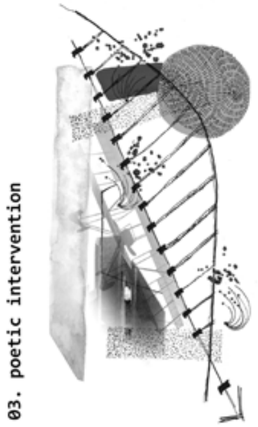
Fig 3.3.D: The touchstone (Author, 2021)

3.4 EXPLORING THE INTERGRATION OF THE THREE CONCPETS

From the conceptual touchstone, stems the next part of the design process that describe the development of three concepts. The three concepts (figures 3.4.A to 3.4.C), used as a brainstorming tool, forms a guiding golden thread that runs through the entire project in order to keep all the proposed ideas, relating to the theoretical discourse, together. The three concepts contributes toward the argument relating to standardisation and poetics in architecture.







Shaped movement

This first concept (figure 3.4.A) focuses on the pilot's view from the sky. When moving through the airspace, the pilot experiences a unique view which differs from the view observed from the ground. The pilot views a different arrangement of landscape patterns such as patches of open veld, dense spaces with soft and hard edges, simultaneously to movement in the air. This unique observation by the pilot often cultivates inspiration toward new opportunities.

It could thus be argued that **the landscape plays an important role in directing the pilot**, in other words, shaping his decision-making process.

Interpretation of the first concept into the design planning

This concept does not contribute to the further theory and conceptual development of the design, but it reflects the original train of thought that inspired the composure of this study.

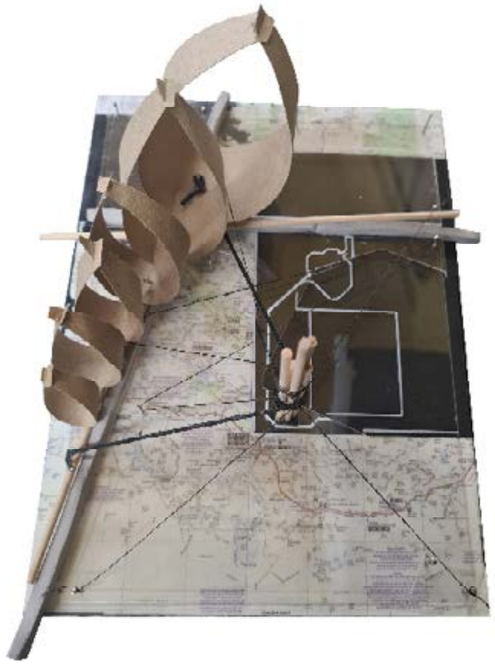


Fig 3.4.A: Model representing the first concept (Author, 2021)

first concept

Built movement

With further reference to the narrative of the pilot and the way in which the site is experienced from above, it could be argued that, as the pilot approaches for landing, they come closer to the ground and notices more elements which encompass the journey of both pilots and people on the ground. The pilot senses an interconnection between the earth and sky where 'earth' is embodied by the site and the existing structure, while the 'sky' is embodied by the general flying area (explored in figure 3.4.B).

Interpretation of the second concept into the design planning

Since this study revolves mainly around theoretical development, as mentioned above, this concept will also not be integrated further into the proposed design.

Fig 3.4.B: Model representing the second concept (Author, 2021)

second concept

The third concept is the most important and it depicts a close connection to the previous discussions of Le Corbusier (1923). The third concept will thus be explored further and presented as an integral element of this discourse.

Up to this point in the theoretical discourse, this study has outlined an interpretation of the theories of Le Corbusier showing the summary by means of a diagram (3.4.C):

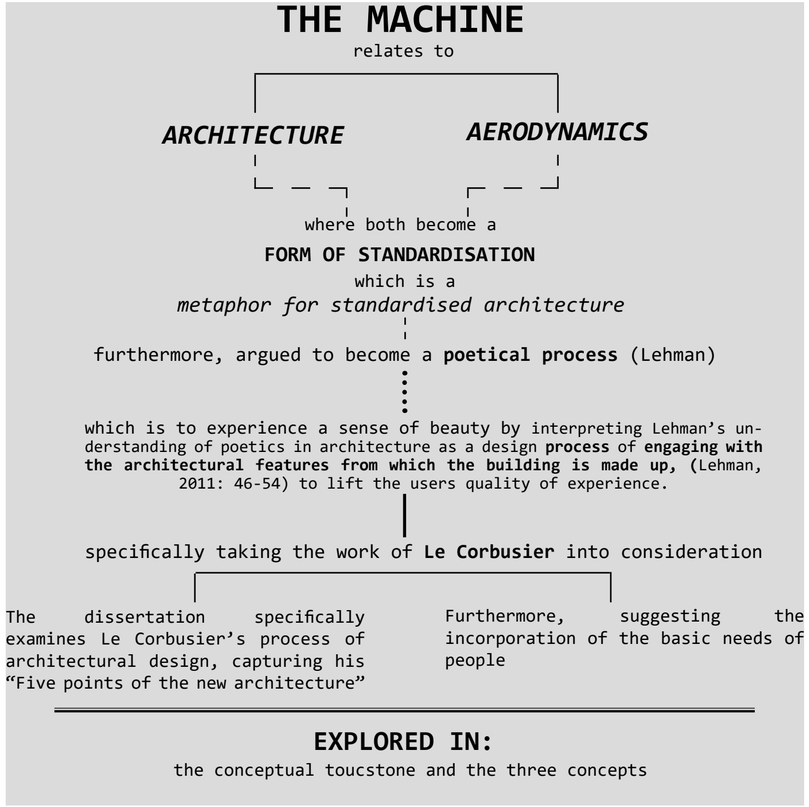


Diagram 3.4.C: Summary of theoretical discource so far (Author, 2021)

The third concept (figure 3.4.D) merges architecture and poetry by means of a metaphorical interpretation of an aeroplane.

For architecture to translate into a language of standardisation and poetics, necessitates the site, the standard tools used in architecture and the various components of an aeroplane to function in synchronised unison.

THE FOLLOWING TABLE (3.4.E) ILLUSTRATES THIS NOTION:

SITE	STANDARD TOOLS IN ARCHIECTURE	COMPONENTS OUT OF WHICH A PLANE IS BUILT
The existing structure holds a rich history and should be considered during the design and development processes of the Pilot's Hub. The site analysis also entails a detailed understanding of the site and its most essential aspects (such as climate, landscape, influences, etc.) that need to be considered.	Le Corbusier incorporated his "Five points of the new architecture" into the design of various buildings. He applied standardised elements in different ways.	Any aeroplane, old or new, is designed and built according to standardised elements that constitutes a working system/ machine. The different "tools" and components are imperative to ensure that an aeroplane functions in adherence to certain criteria of standardisation. Thus, implying that it is a set of standardised components/ a kit of parts.

Fig 3.4.D: Model representing the third concept (Author, 2021)

3.5 THE ESSENCE OF THE THIRD CONCEPT

The following aspects have been identified as relevant to my third and final concept:

A functioning system

Each element of a plane (figure 3.5.A) characterises a different function and contributes in a different way:

- The wheels of an aeroplane help for safe landing and allow for movement to take place on the ground.
- The propeller creates a forward movement when air is pushed behind the propeller and forward propulsion is generated **(Christie, 2020: online).**
- The tail of the aeroplane is the stabilizing and balancing component. **(NASM Explainer, 2014: online).**

Hence, it is noted that each component is of paramount importance, and accurate functioning of every component is essential for stability and successful movement of the aircraft on the ground and in the air.

Kit of parts

The standardised “tools” form a ‘kit of parts’, as depicted by Daniel Libeskind, (2000). According to Libeskind, the kit of parts is related to the study of pre-designed components that slot into one another through the use of joints and solid elements to achieve flexibility and variation in their use.

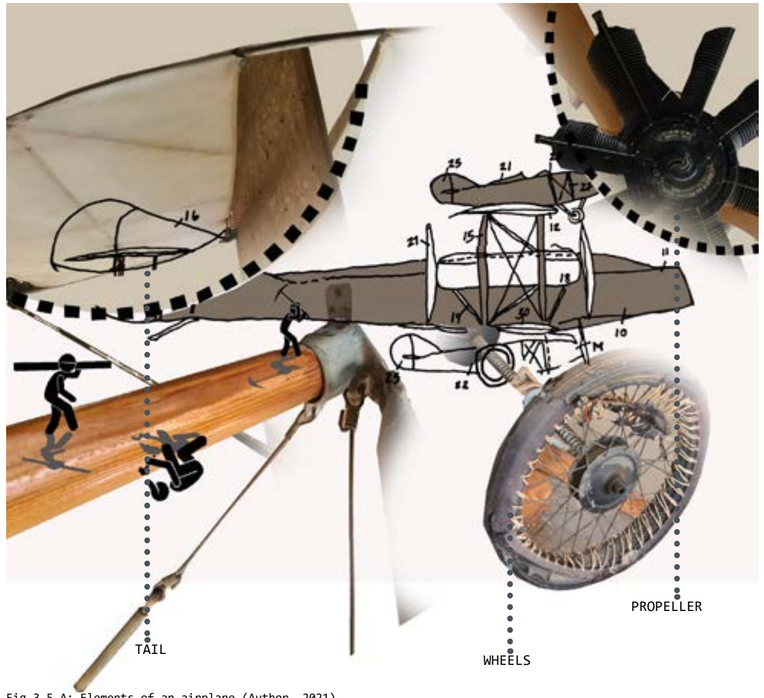


Fig 3.5.A: Elements of an airplane (Author, 2021)

3.6 DANIEL LIBESKIND’S IMPLICATION OF A KIT OF PARTS CONTRIBUTES TOWARDS TURNING THE CONCEPT INTO A THREE- DIMENSIONAL APPROACH

Amarican architect and theorist Daniel Libeskind’s (2000) theory of ‘three machines’ entails a “structuralist’ theory which focuses on the construction process of a specific design. It is argued here that his theory frontstages the idea of synchronising the poetical or ”spiritual” use of materials, the composition of joints, and the nostalgic essence of historical elements into the design of the Pilot’s Hub. In other words, these ‘three machines’ theory depicts the notion that exploration of, and experimentation with the structuring process is fundamental to architecture.

For more than twenty years, Libeskind has been regarded as one of the world’s leading theorists and educators who teach people of the importance of designing something Avant Garde **(Libeskind, 2000).** Throughout his career he has influenced others to test and explore by means of his boundary-breaking ideas (ibid).

Libeskind’s built models and explorative drawings are embedded in a process of experimentation and deeper interaction with the cultural, historical, and social contexts of a site. Pastor argues that this process also resonates in a narrative, telling the story behind each design **(Pastor, 2014: 126).**

Daniel Libeskind exhibited an installation of structures, “Three Lessons in Architecture”, at the Venice Biennale 1985. The installation consisted of three large machines, namely: The Reading Machine, the Memory Machine, and the Writing Machine. According to Loannidou (2010), each of these machines represented a way of thinking about architecture. Loannidou states that Libeskind re-articulated the importance of humanism in design through his theory of “making.

Libeskind’s “Three Machines” Theory: reading, memory, and writing

The Reading Machine places emphasis on the formulation of a kit of parts through the deconstruction, analysis, and reconstruction of a machine.

The Memory Machine then uses that formulated kit of parts to construct a creative (building) appearance by placing focus on detail and the building process. This machine implies that one can make use of the knowledge, that is gained in the build of the first machine, to create an arrangement of spaces.

The Writing Machine takes the concept of both the first and second machine to become a machine of its own. This is where I translated the metaphorical interpretations of the three machines into my own architectural approach.

"[T]he method of construction and the technique of understanding bring about a revolution of architecture's techne." (Libeskind cited in Maden, 2008: 91)

This quote was illustrated by building a model that represent the first machine.

Libeskind's model of The Reading Machine (figure 3.6.A) comprised of a large, scaled wheel that could turn. Once the wheel turned, it gave the reader access to seven books without having to move or re-open each book when needed. Maden holds that, the power of turning the machine and the energy needed, therefore, comes from the "power of the word" (Maden 2008: 93) found on the pages of the book. In a similar manner, the design of the Pilot's Hub will aim to engender its "energy" (metaphorically spoken) from the construction of the machine, demonstrating a method of "architectural text" (Maden, 2008: 94).

The process of deconstructing the overall into standardised components and re-analysing them to be used for a new purpose, places focus on the "making" of the design. Thus, resulting in poetic interpretation. These components still remain standardised "tools" that constitute a **kit of parts** but used and positioned in a new way. Hence, the architectural interpretation of the first Machine refers to the initial research with respect to technique (formation of a kit of parts).

The Reading Machine allowed Libeskind to make use of design as a process in order to recreate an experience by placing focus on the **craft of making**. He makes use of this machine to place emphasis on the process of building (Allen, 2010: online). This process of building becomes a step-by-step compilation of "tools" that helps to make up a machine as an entity.

With the construction of this model, built by hand, Libeskind places emphasis on his aim to contrast with the general approach about "modern architecture", which often fosters a non-interactive and unpoetical perception (Libeskind cite in Maden, 2008: 91). In other words, Libeskind's argument development becomes complimentary when taking into consideration that he indeed utilised standardised "tools" to develop a working system, thereby attaching poetical (figurative) meaning to the (literal) structuring of a machine. Similarly, the proposed design of the Pilot's Hub

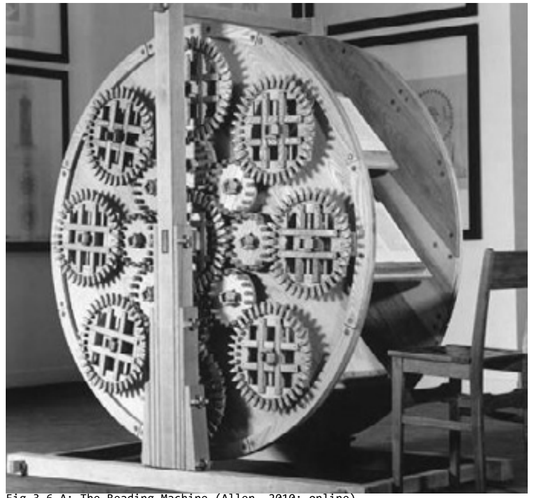


Fig 3.6.A: The Reading Machine (Allen, 2010: online)

will aim to focus on adding poetical meaning ("architectural text") to the construction process.

In a research project by Weak (2016: 2), a replica of Libeskind's Reading Machine model was built, taken apart and re-interpreted to portray a new meaning. The intention of Weak's project was to highlight the components of Libeskind's model (figure 3.6.B). by making use of a disassembly process that is divided into three steps:

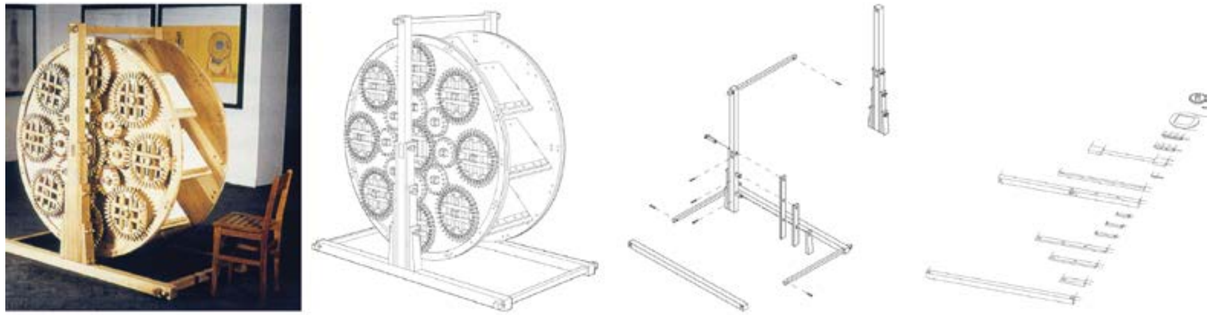


Fig 3.6.B: Weak's model (Weak, 2016: pdf)

Step 1: Deconstructing the model into individual components
Step 2: Re-analysing these individual components
Step 3: Exposing new information by exploring the potential of these component. In architectural sense, reconstructing the components to form new possibilities/ a new meaning.

The approach toward designing the Pilot's Hub is therefore inspired by the original model (built by Libeskind) and Weak's (2016) interpretation thereof.

Placing the primary focus on the making and crafting processes, necessitates the individual positioning of the standardised "tools"/components in order to understand the concept "order of making". Thus, this study will propose an interpretation of the aeroplane as 'machine', which is closely related to a process of **reconstruction**.

The Memory Machine 02

Libeskind argues (as confirmed by Maden) that this machine *"represents the stage of Architecture's appearance and is a testament to its own manifestation"* (Libeskind, 1992: 51; Maden, 2008: 96).

The Memory Machine's incorporation into architecture is through craftmanship and built form. Here, Libeskind's process turn out to be more of a spiritual experience as the elements, from which The Memory Machine is made of, (figure 3.6.C) become more exposed. Therefore, giving attention to detail. In alignment with Libeskind's theory, this study will foster the idea that appearance forms an essential element of architecture (Cranbrook Academy of Art, 2021: online).

Maden (2008: 94) pinpoints that this Machine expanded on the idea of "Remembering architecture" by portraying the icons of memory, change, and movement. To explain this idea behind the machine, Maden claims that Libeskind had been inspired by a Renaissance backstage theatre mechanism. The 'Memory machine' revealed the internal equipment and their different arrangements and embodied the mind that is filled with a myriad of ideas, in the form of "crowded images" (Maden, 2008: 95).

Libeskind proposed that once the making and gathering of information has been achieved, one enters into the architecture with a mind filled with ideas and knowledge that can now be interpreted in any way possible, leading to an arrangement of spaces that constitutes a spiritual experience.

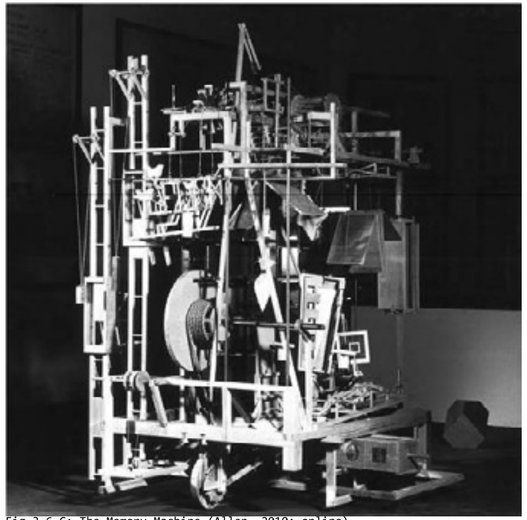


Fig 3.6.C: The Memory Machine (Allen, 2010: online)

The Writing Machine 03

The Writing Machine commemorates the essence of both The Reading- and Memory Machines and, according to Maden, demonstrates the unique process of how Libeskind *"dealt with organised chaos"* (Maden, 2008: 100).

The Writing Machine model (figure 3.6.D) consisted of a square formation of complex gears, each with their corresponding handles (Maden, 2008: 100). The message of the Writing Machine lies within the handles; after one gear had been turned, the gear on the opposite side of the square formation moved.

It is argued here that this Machine becomes a metaphoric representation of the total outcome of architecture by implementing new forms and ideas. This process of implementing new forms and ideas, emphasises and connects specific architectural elements, such as historical value and the making that *"interweave and support each other for a technically and aesthetically enhanced work"* (Charleson, 2014).

Both Maden and Libeskind emphasise that this condensed constructed machine *"processe[d] both memory and reading material"* (Libeskind, 1994: 68; Maden, 2008: 99) and, according to Sir Greg Allen, projected the findings of gathering and making (Allen, 2010: online).

In essence, Libeskind desired for his three machines to be recaptured and integrated into the design process of future architecture (Cranbrook Academy of Art, 2021: online). Maden stated that the reason why Libeskind placed emphasis on the making **was to prevent de-humanisation from becoming a reality in architecture** (Maden, 2008: 90).

In terms of the Pilot's Hub, the design process will be based on reconstructing the following proposed standardised "tools" (to be discussed in 3.7) and reflecting the process of "making". Therefore, achieving exactly that what Libeskind desired for.

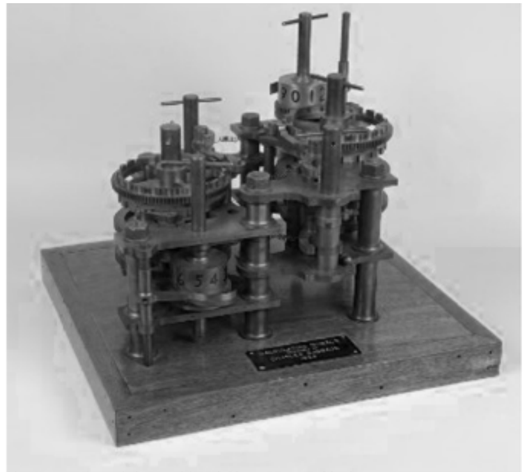


Fig 3.6.D: The Writing Machine (Allen, 2010: online)

Embracing the “Five points/ standardised tools”, supported by Le Corbusier (1923); (Oechslin, Wang, 1987: 82-93) as a point of departure, this study will depict personal chosen four points that will be implemented as standardised “tools” for the design of the proposed Pilot’s Hub. These four points are embedded in the different components of an aeroplane; hence it could be argued that the standardised “tools” engender a metaphoric interpretation of an aeroplane. Furthermore, with respect to Libeskind (2000), referred to by Maden (2008), my personal set of four points will be proposed as the chosen “kit of parts” (to further be referred as **my “design tools”**) thereby, placing emphasis on the construction/ making of the Pilot’s Hub. **Thus, this dissertation aims toward bringing the notion of standardisation together with poetry by means of experimentation.**

The aeroplane chosen to be analysed is the Compton Paterson Biplane (figure 3.7.A). This aeroplane is highly valued as a historical structure in the Museum. The analysis process takes place as follows:

Fig 3.7.A: The Compton Paterson Biplane (Goodall, [n.d.]: online)

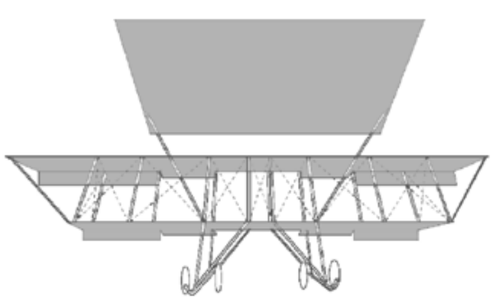


Fig 3.7.B: Drawing out the Compton Paterson Biplane (Author, 2021)

1. deconstructing the Compton Paterson Biplane

Step 1: *“Cross-reference”* (Weak, 2016: 2): A full view of the Biplane is given (figure 3.7.B) where each element, from which it is built out of, are presented separately and now given the chance to be deconstructed.

2. re-analysing the different components of the Biplane

Step 2: *“Scalar systems”* (Weak, 2016: 2): These individual elements (figure 3.7.C) are placed according to correct scale in order to get a clear understanding about the various proportions of the elements.

3. and finally, reconstructing and integrating the important components of the Biplane into my “five points”/ “design tools”.

Step 3: *“Gathering the information”* (Weak, 2016: 2): After all the elements have been set out to proportion and in relation with one another, a decision will be made as to which elements will be incorporated into the process of design (figure 3.7.D):

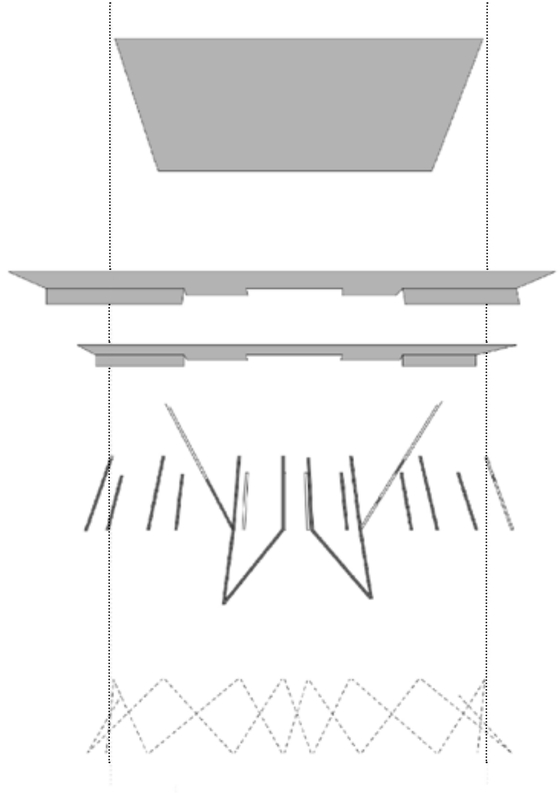
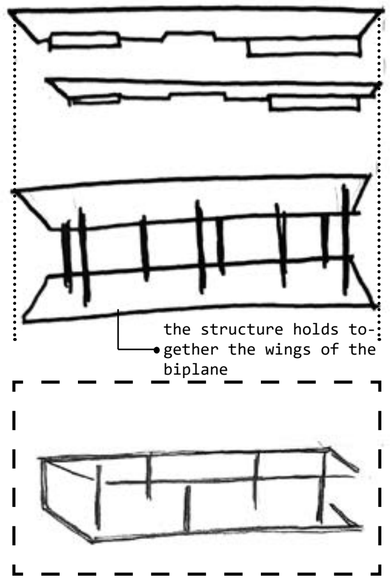
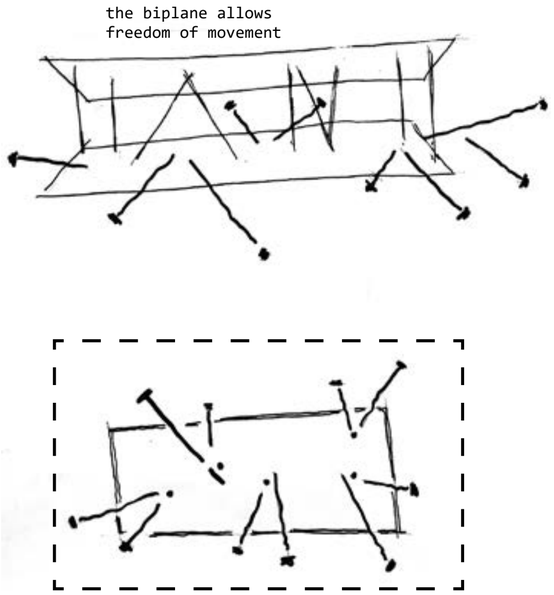


Fig 3.7.C: Re-analysing the individual components (Author, 2021)

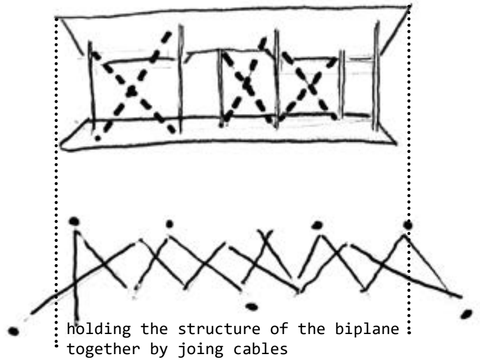


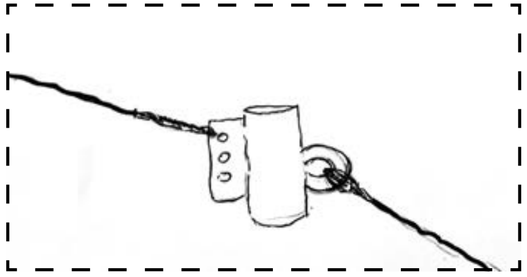
01 exposed frame structure



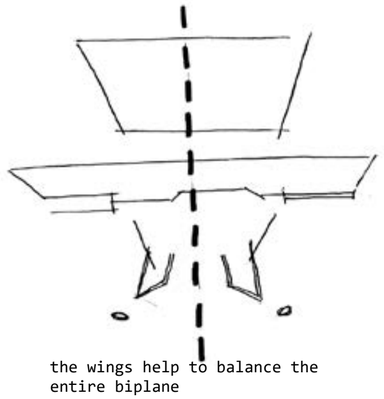
02 open plan

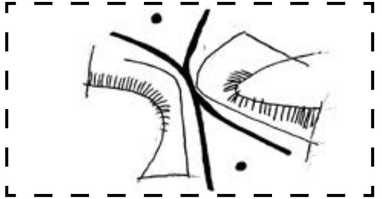
elements taken from the re-construction of the Biplane: this become my kit of parts "design tools"





03 joints





04 volumetric balance

These design tools will be discussed in more detail in Chapter 4

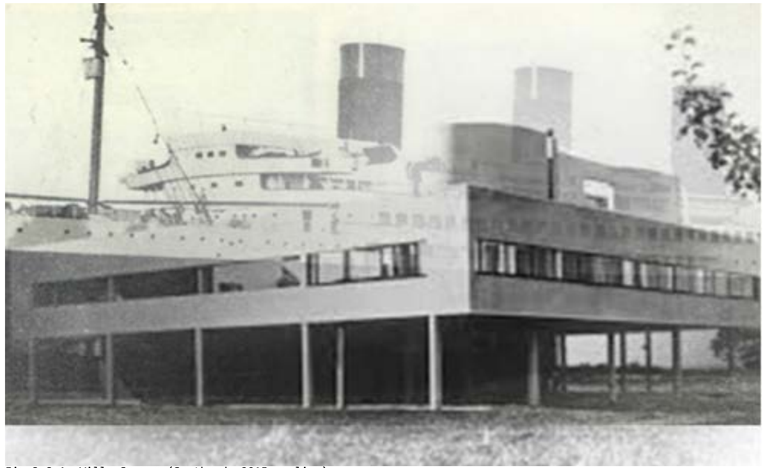


Fig 3.8.A: Villa Savoye (Southard, 2015: online)

Villa Savoye

ARCHITECT:

Le Corbusier

REASON:

Theoretical inderpinning

Behind the design of the Villa Savoye, there lies a deep metaphorical interpretation of a machine. This three-dimensional design reflects the structure of a boat, known as an ocean liner.

Taking the 'craft of making' (Allen, 2010: online) into consideration, the thought process of the Villa Savoye is based on the reconstruction of Le Corbusier's "five points" (WordPress, 2018:pdf) into a new three-dimensional design.

Reflecting Le Corbusier's process further into my understanding of Libeskind's theory (2000), Le Corbusier makes use of a similar thought process to that of Libeskind (2000):

First, he 'reads' into each of his "five tools", then, he 'memorises' them and, finally, he 'writes' them into becoming something new that reflects the memory of a machine (gigures 3.8.B to 3.8.D).

In conclusion, a similar approach is to be followed in the design process of the Pilot's Hub.

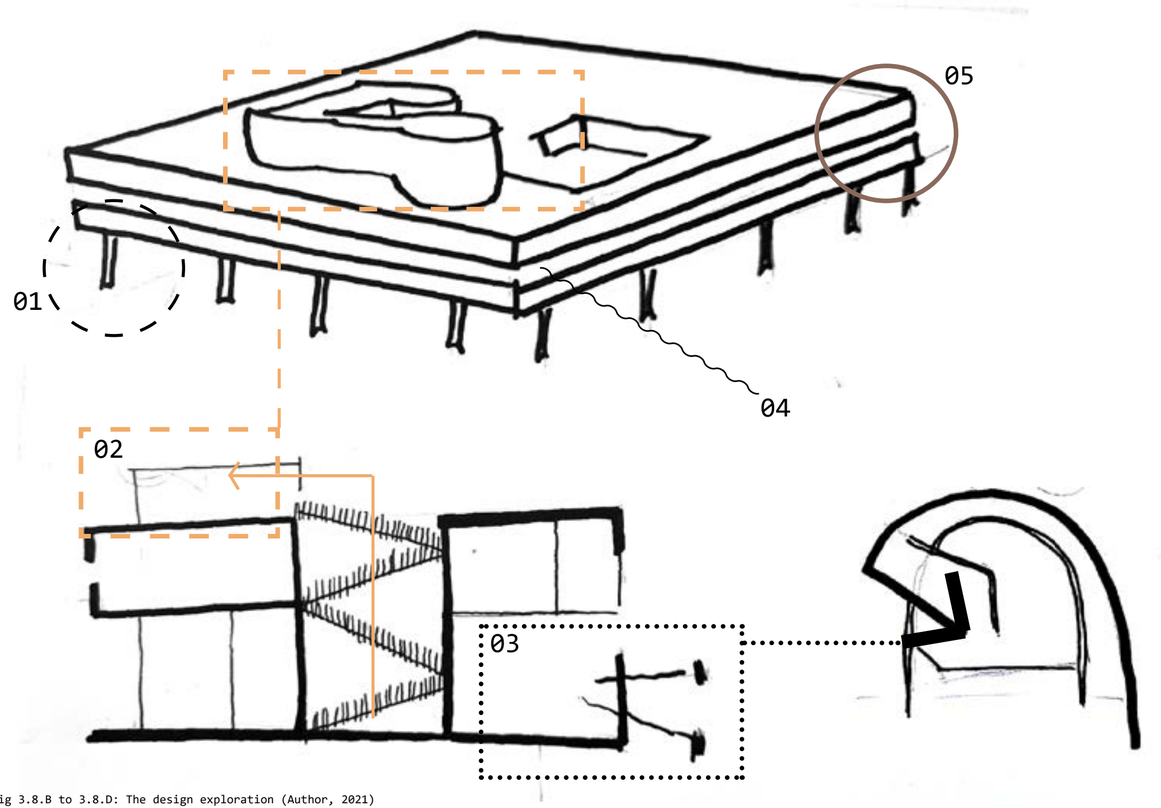


Fig 3.8.B to 3.8.D: The design exploration (Author, 2021)

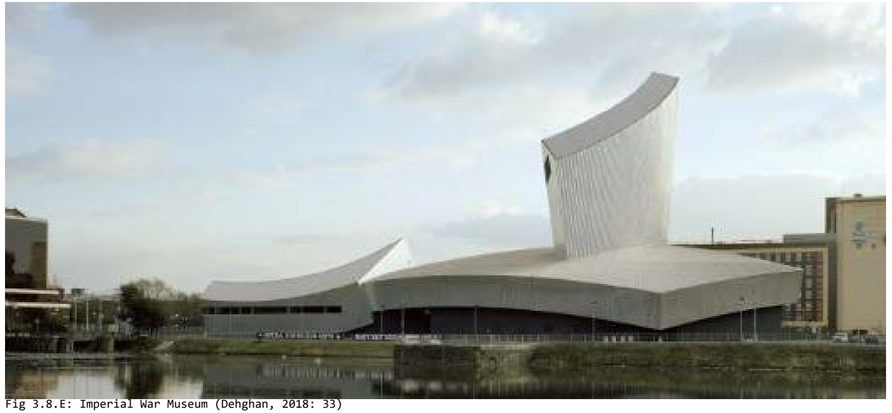


Fig 3.8.E: Imperial War Museum (Dehghan, 2018: 33)

The Imperial War Museum is located in Manchester, United Kingdom and tells the story of how the war affected the British and Commonwealth citizens since the early 1014's. The design is rooted deep into the historical aspect of the event and becomes a metaphoric representation of a globe that was broken apart and reassembled. Located close to a canal, the design exemplifies the conflict fought by men and women (Dehghan, 2018: 33).

Imprial War Museum

ARCHITECT:

Daniel Libeskind

REASON:

Theoretical inderpinning

In terms of the metaphorical representation of a globe, the three reassembled parts of the design represents air, earth, and water (figures 3.8.F and 3.8.G). The first being the Air shard that serves as a dramatic entry into the museum. Within this large vertical span, window openings allow the climate to be integrated into the design where the visitors can feel the air and wind and rain. This makes them part of the climatic experience. In terms of the aspects of "making", the Air shard is like a three-dimensional structured map of the warplanes (Dehghan, 2018: 34).

Once entering, the visitor goes into the museum that is the representation of the Earth shard. This shard signifies the open, earthly realm of conflict and war and forms a more enclosed space that comprises of a 'heavy' roof structure where light is controlled. This aspect of the design makes the work of Libeskind unique and portrays the use of windows in a non-traditional way. In this case, the windows are not used to allow light to enter in but is rather used to emphasise the darkness that fills the museum. Therefore, these fragmented windows become symbolic of the dark times that were experienced throughout the war. The layout of this Earth shard is similar to the layout of a British warship, therefore, making the design approach more direct (similar to the Villa Savoye).

Finally, the Water shard becomes the platform for viewing the canal. This is a public space that comprises a restaurant, deck, café, and performance space.

In terms of the circulation of the building, the dwellers first experience the dramatic entrance and museum before being able to reach the public space where the emphasis is placed on the full view of the sunset over the water (Dehghan, 2018: 35).

In conclusion, the design portrays Libeskind's approach toward the decomposition and reconstruction of elements where each part has its meaning. Furthermore, his way of circulation will contribute toward the design process where the Pilots Hub will also be divided into three possible parts. These parts being the place for pilots, the part for dwellers/public and the last part where they come together in a shared space.

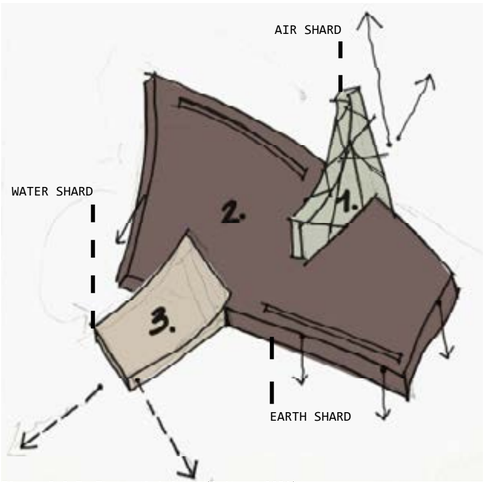


Figure 3.8.F: Three divisions (Author, 2021)

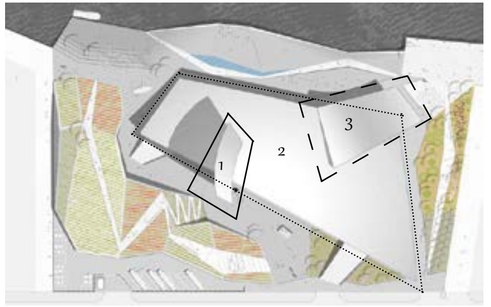


Figure 3.8.G: Three divisions (Studio Libeskind, [n.d.]: online, 2021)

3.9 CONCLUSION

In conclusion, the goal is to make use of all possibilities and exciting experiences of flight as a metaphor to create architecture. The design should be a functional and “poetical” contribution to the context and should further contribute toward standardisation in architecture.

Chapter 3 helped to achieve this goal by integrating concepts and ideas into a theoretical discourse that gives a deeper routed meaning to the design of the Pilot’s Hub. Based on the precedent analysis the following lessons were noted:

- Le Corbusier’s approach to experimentation,
- his further approach toward the metaphorical interpretation of a machine into an architectural design.
- Libeskind’s play with materials and structural elements in a non-traditional way to reflect something of the direct world,
- furthermore, his form giving that is dependent on the theme of the building.

The skills learnt and the theories implied from this chapter will be carried over into the next process where planning and spatial layout will be experimented with.

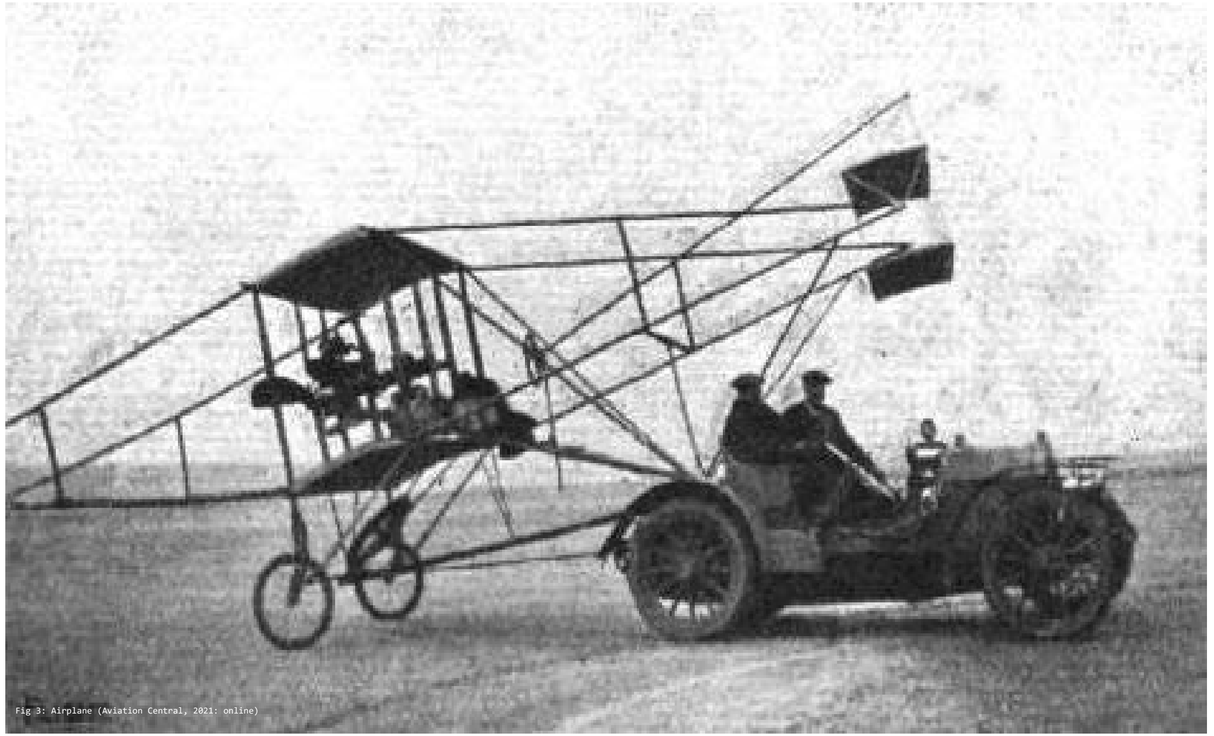


Fig 3: Airplane (Aviation Central, 2021: online)

04

the development process: design and technical exploration

4.1 INTRODUCTION

From the deconstruction of the Paterson Biplane to the reconstruction of the relevant parts, I aim to create new possibilities. These possibilities are explored by means of an entire development process from which the three-dimensional design stems (figure 4.1.A). Chapter 3 explained the personal understanding of standardised tools in architecture and my application thereof to the theoretical underpinning of the Pilot's Hub. By *"gathering the information"* (referred to in chapter 3.7), chapter 4 will become the next step within the design development process that will focus on exploring with a personal set of **"design tools".** These "design tools" become a kit of parts that contributes to the entire design process starting from the first rough draft, evolving into a final plan.

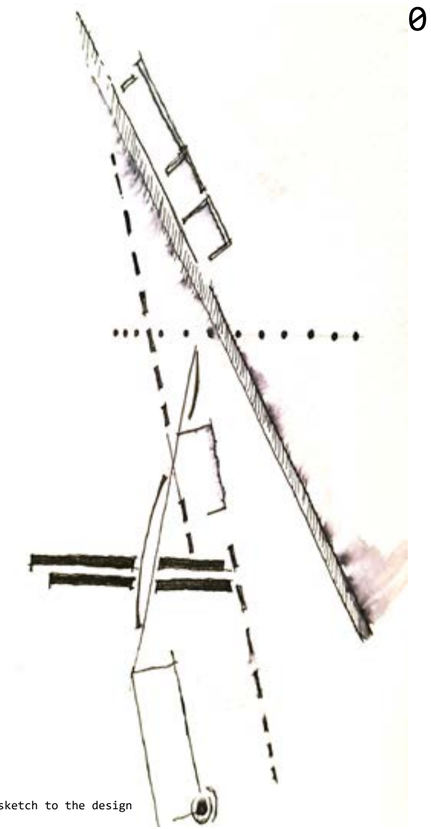


Fig 4.1.A: Introduction sketch to the design approach (Author, 2021)

The first "design tool": Exposed frame structure

The exposed frame structure is used for more than just its structural purposes it also communicates a much deeper form of poetry within the architecture by exposing the "making" of the Pilot's Hub through the eyes of the dweller. This exposed frame structure is embedded in the build of the Paterson Biplane (figure 4.2.A) and holds together the entire body of the aeroplane.

In terms of the building construction of the Pilot's Hub, this exposed frame structure is translated into a column and beam structure that holds together the entire "body" of the building (floor, wall, and roof) (figure 4.2.B) which thereby, connects to the exploration of the existing (Paterson Biplane).

Fig 4.2.A: Paterson Biplane frame structure (Author, 2021)

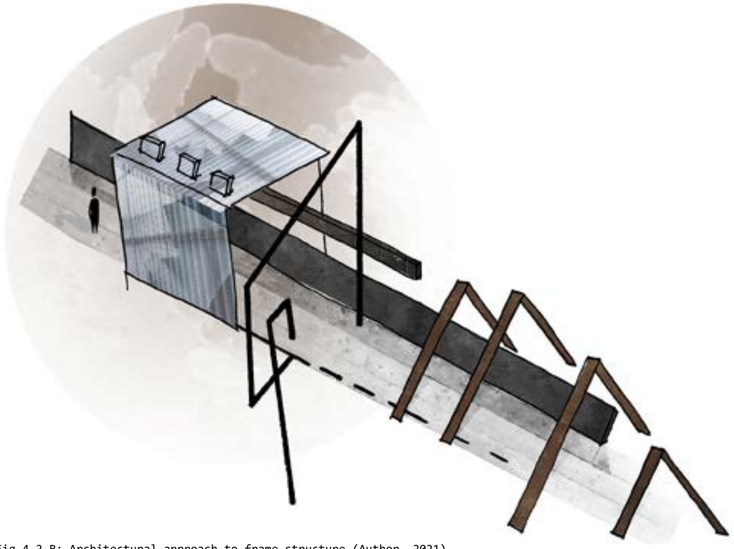


Fig 4.2.B: Architectural approach to frame structure (Author, 2021)

The second "design tool": Open plan

The use of an open plan refers to the pilot's experience during flight. The exposed frame structure of the Paterson Biplane causes the seat of the pilot to be exposed and therefore, allow the pilot to physically experience the wind and the air, first-hand (figure 4.2.C).

In terms of the building construction of the Pilot's Hub, the user must also be able to experience a sense of freedom. Thus, creating the idea of relating to an open plan that gives freedom of movement inside the realms of the frame structure (figure 4.2.D).

Fig 4.2.C: Exposed elements of the Biplane(Author, 2021)

Fig 4.2.D: Architectural approach to open plan (Author, 2021)

The third "design tool": Joints

During close examination of the Paterson Biplane, the entire structure is supported and held together through joint connections. These joint connections are viewed in the way the cables attach to the aeroplane and also the way the wooden beams are joint together to form one structure (figure 4.2.E).

With respect to the building construction of the Pilot's Hub, the joint connections expose themselves in the section development of the building. Similar to the Paterson Biplane, cable joints are used and further explored by looking at ways in which different materials can connect with one another (figure 4.2.E).

Fig 4.2.E: Joining of elements(Author, 2021)

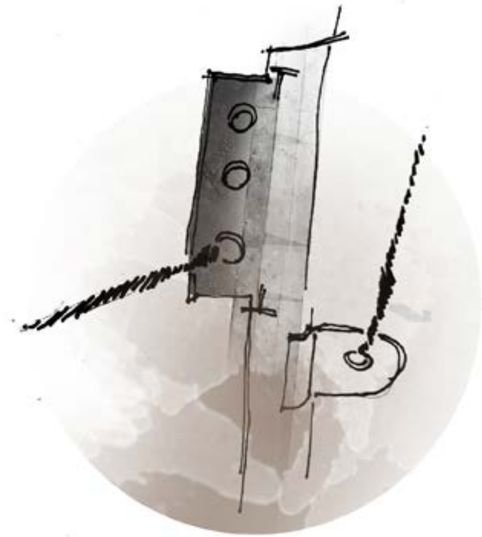


Fig 4.2.F: Architectural approach to joints (Author, 2021)

The fourth "design tool": Volumetric balance

Volumetric balance forms part of the "design tools" to create order within the floor layout of the Pilot's Hub. The layout of the Paterson Biplane comprises of a body that carries the large-spanned wings. These wings (figure 4.2.G) are the most important aspects of the aeroplane which differentiate it from any other standardised system. These wings allow controlled movement of the plane and also balance the entire body of the plane.

In terms of the building construction of the Pilot's Hub, the plan layout also aims to achieve volumetric balance in the way it is laid out and orientated (figure 4.2.H). This will further contribute toward the way the users move in and around the building.

The next part of the conceptual approach is experimenting with ways in which these four "design tools" can be incorporated into a three-dimensional structure.

Fig 4.2.G: Balance in the wings of the Biplane(Author, 2021)

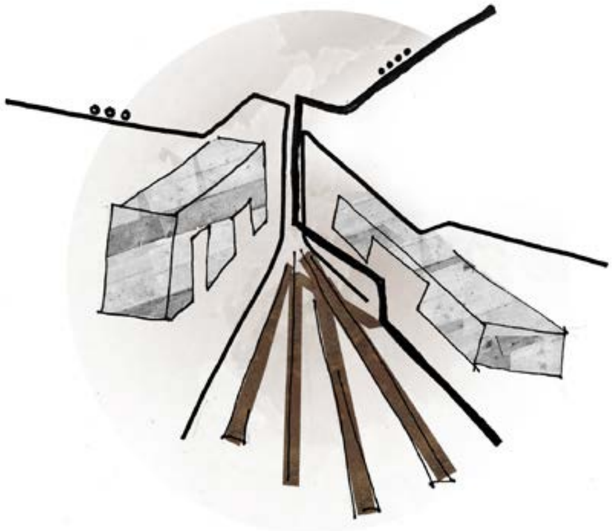


Fig 4.2.H: Architectural approach to joints (Author, 2021)

Construction touchstone: the first step toward a three-dimensional structure

Similar to the touchstone (discussed in 3.3), the construction touchstone help to uncover the essence of the Pilot's Hub built structure and the way it fits into the theoretical discourse on standardisation and the "making" thereof (Raman, 2009: 100-102).

This structural model tests possible structural ideas.

What is the touchstone about?

The aim of the touchstone is taking the proposed "Kit of Parts" (explained in 4.1) and converting it into architectural elements that portray structural possibilities and materiality. Therefore, the goal was to use all possibilities and exciting experiences of flight as a metaphor to create architecture. The touchstone is the first approach toward three-dimensional thinking (seen in figure 4.3.A).

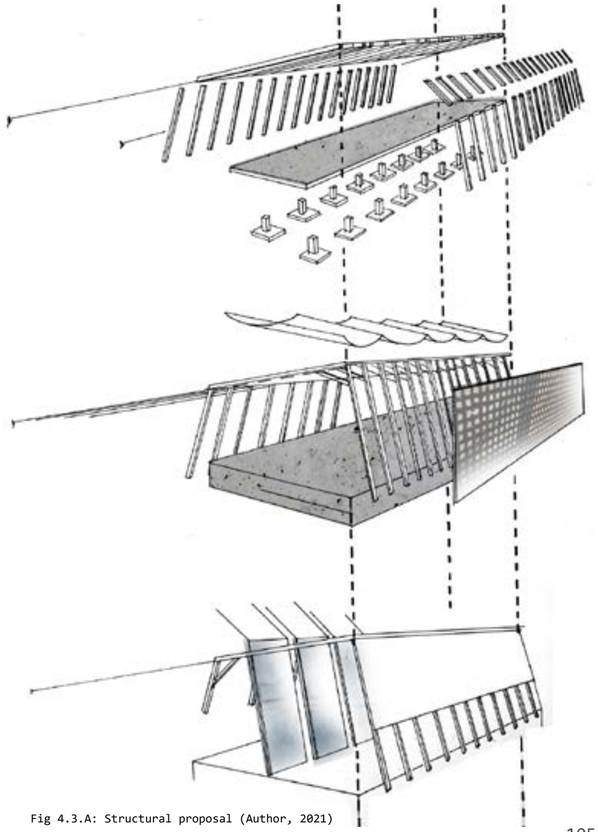
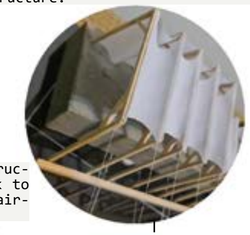


Fig 4.3.A: Structural proposal (Author, 2021)

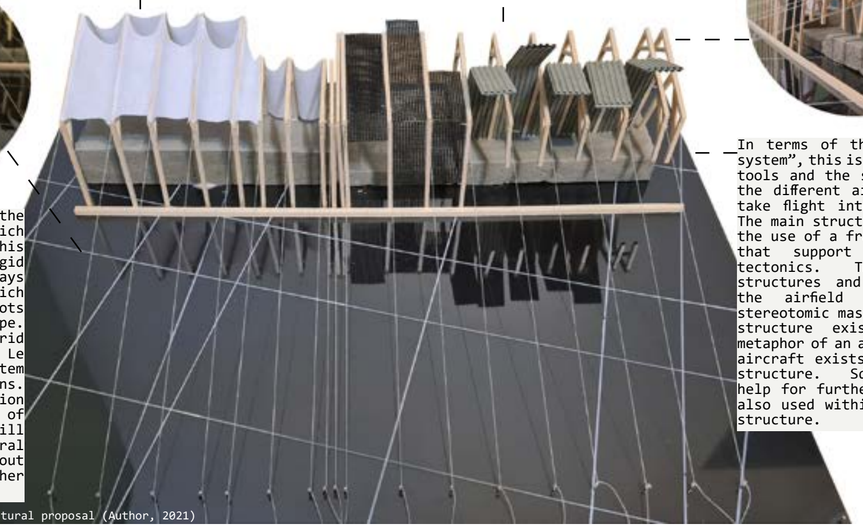
The first phase portrays traditional material used in the first airplanes. This soft cotton lightly holds onto the structure.

From there on, the development in material is portrayed by making use of stronger material that is braded into the structural layout.

In term of more modern planes, steel is used (just like in aircrafts), where the architecture aims to portray how the use of new/ standard materials can be used in interesting ways in terms of construction techniques which is seen in the last phase of the model. This allows opening up more spaces through cable supported structures, therefore, emphasising the relationship between body, machine, and movement.



Cable supported structures which also link to the metaphor of an airplane.



The base becomes the foundation from which all elements exist. This base is placed on a rigid grid layout that portrays “imaginative” lines which are drawn down from pilots view onto the landscape. Furthermore, these grid lines exist from Le Corbusier’s grid system used within his designs. This gives implication toward the idea of standardisation and will be used for structural purposes and layout of columns and other structural functions.

In terms of the “functional system”, this is where standard tools and the significance of the different aircraft system take flight into the design. The main structural system is the use of a framed structure that support the design-tectonics. The existing structures and the mass of the airfield becoming the stereotomic mass. This framed structure exists from the metaphor of an aeroplane as an aircraft exists from a frame structure. Square joints help for further support and also used within an aircraft structure.

Fig 4.3.B; Structural proposal (Author, 2021)

01. FIRST CONCEPT MODEL

Figure 4.3.C shows the first concept model for an approach to the site. The idea that the building should become part of the landscape, was conceptualised by laying it flat onto the site with a strong emphasis on **horizontal view** rather than vertical hierarchy. The first conceptual floor plan (figure 4.3.D) shows the development of building the "new", around the existing Museum and thus, creating a circulation route that starts and ends at the same point. During these early stages, there was still little consideration given to material choice and more consideration given to the building outline.

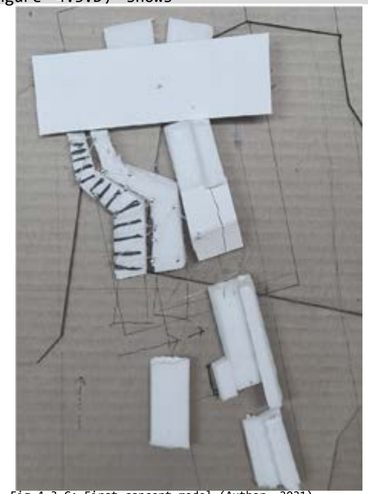


Fig 4.3.C: First concept model (Author, 2021)

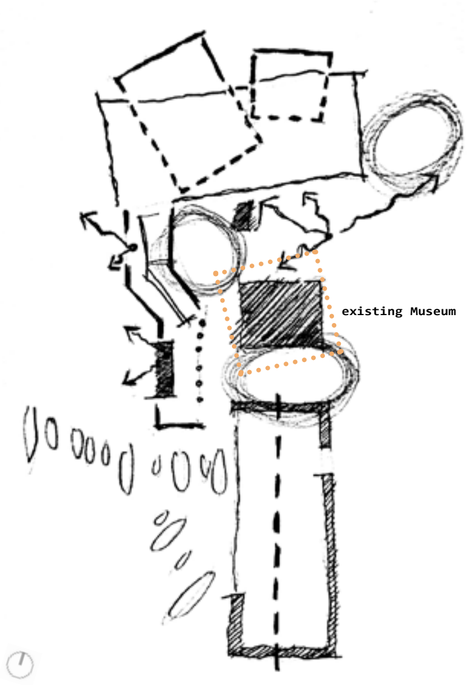


Fig 4.3.D: Concept plan layout (Author, 2021)

02. EXTERNAL REVIEW 01

Figure 4.3.E shows the model along with the floor plan (in figure 4.3.F). This design approach aimed to invite both public users and pilots to dwell together in one space and was further orientated to have a **360-degree view** of the surrounding landscape which includes a view of the Kimberley Airport Airfields. The massing of the building portrayed rough edges and long walkways with a few in-between spaces for people to gather.

Concerning the theoretical underpinning, this model (figures 4.3. G and 4.3.H) experimented with **cable joints** ("design tool" number 3) and the implementation of cable-supported structures that could link the "old" and the "new" with one another.

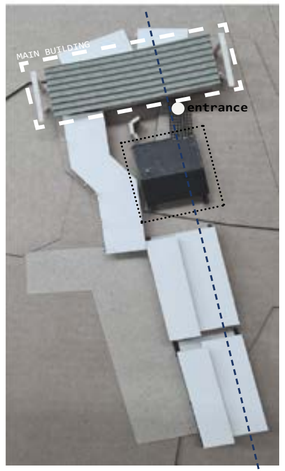


Fig 4.3.E: External model (Author, 2021)

Fig 4.3.F: Plan (Author, 2021)

Fig 4.3.G: Cable exploration (Author, 2021)

Fig 4.3.H: Cable exploration (Author, 2021)

The section development was achieved through a precedent study:

Fig 4.3.I: Roof structure (Ott, 2021: online)

Fig 4.3.J: Roof structure (Author, 2021)

Nordeste Curuguaty Offices (figure 4.3.I, J & K)

Architects: Mínimo Común Arquitectura

Location: Paraguay (Ott, 2021: online)

This cable-stayed roof structure opens possibilities (explored in figures 4.3.K to 4.3.O) of ways in which forces can be acted out onto the cable to support a roof structure in different ways. With the support of the cables, the load of the roof does not fall on the walls anymore, therefore, making provision for non-load bearing walls and further contributing toward the “design tool” of having an **open plan** (number 2).

After external feedback, the design was understood as being too formalistic with little consideration given to the importance of the pilots and their accommodation needs. After the first layout approach, a total shift in emphasis took place.

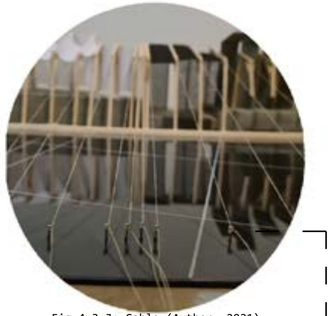


Fig 4.3.J: Cable (Author, 2021)

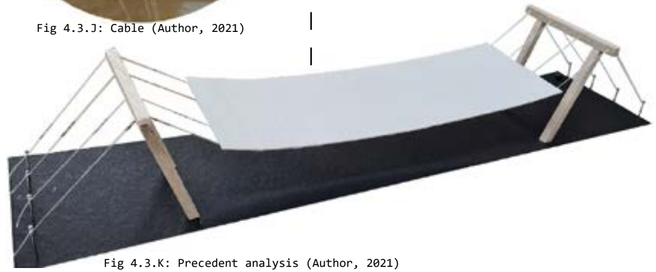


Fig 4.3.K: Precedent analysis (Author, 2021)

Fig 4.3.L: Experimenting ith a cable supported pergola (Author, 2021)

Fig 4.3.M: Experimenting with a cable system incorporated into the existing Museum structure (Author, 2021)

Fig 4.3.N: Experimenting ith a cable supported pergola (Author, 2021)

03. DEVELOPMENT BASED ON FEEDBACK

Reflecting back on my 4 “design tools”, volumetric balance (“design tool” number 4), becomes my new point of departure (figure 4.3.O). The proposed floor plan (figure 4.3.P) advances into two “wing”-like spaces, held together by means of a circulation route, that gives way to freedom of movement, placing emphasis on the 360-degree view, and invites the users by pulling them into the in-between space that exists between the two building “wings”. Figures 4.3.Q to 4.3.T show a series of concept models.

The **two building “wings”** each represents a different user. The main endeavour of the Pilot’s Hub is to teach students the necessary skills of flight training and therefore, the planning layout should emphasize the main function of the Pilot’s Hub. Thus, the bottom building “wing” is set to accommodate the programme for the student pilots and instructors. The top building “wing” then starts to open up for public users and providing opportunity to both public and the students/pilots to interact with one another. Thus, re-establishing the aviation community that once existed on this specific site.

Fig 4.3.O: New proposal(Author, 2021)

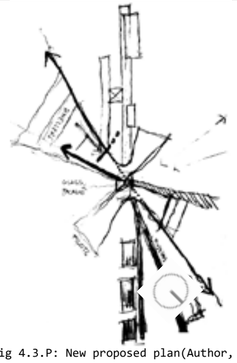


Fig 4.3.P: New proposed plan(Author, 2021)

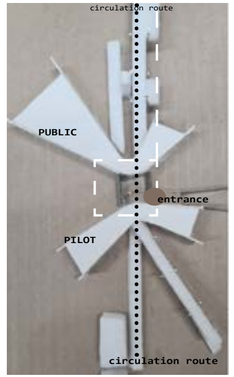


Fig 4.3.Q: Development (Author, 2021)

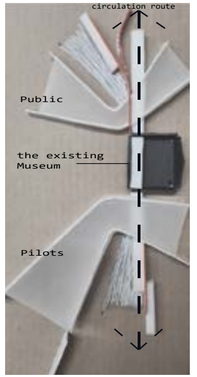


Fig 4.3.R: Development (Author, 2021)

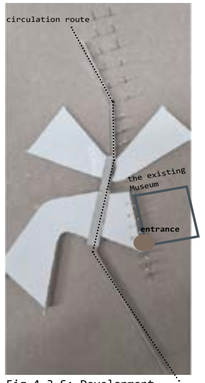


Fig 4.3.S: Development (Author, 2021)

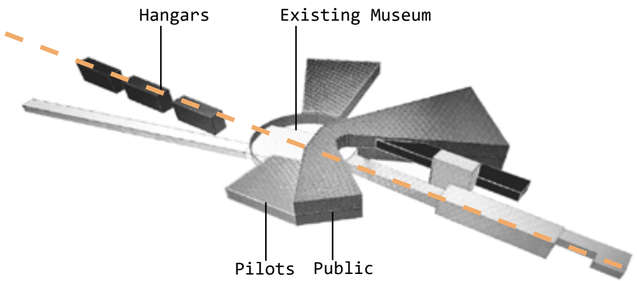


Fig 4.3.T: Development (Author, 2021)

Figures 4.3.U to 4.3.W show consideration given to the morphological development of the Pilot's Hub. This morphological development explores the Pilot's Hub linkage with the existing Pioneers of Aviation Museum (figure 4.3.U) where the placing of the Museum has undergone its own layout and three-dimensional development. In this figure (4.3.U) the Museum was stripped from its cladding and given a new function to allow parties to interact with the existing/ "old" structure. The rest of the figures show exploration of materials and its connection to the landscape within different spaces of the Pilot's Hub.

During the development of the floor plan layout, the two building "wings" created balance between top and bottom. Therefore, in order to create further balance between the left and right parts of the layout, a circulation route cut through the two building "wings" to allow for this balance between left and right (shown in figure 4.3.X).

Figure 4.3.Y shows consideration given to the design of that circulation route: Exposed frame structure ("design tool" number 1) with services attached.

The structural approach toward designing the two building "wings" is shown through a series of section sketches (figures 4.3.Z to 4.3.AB) that start to interact with the cosmic landscape by pushing certain spaces into the earth and elevating other spaces into the air. Thus, linking with the notion of an aeroplane that ascends from the ground into the air ("taking flight"). As far as the main structural system is concerned, the initial idea was to explore with exposed columns that supports a cable system that holds the roof. The following precedent analysis expands on possible ways of designing such roof structure:

Fig 4.3.U: Existing Museum proposal(Author, 2021)

Fig 4.3.V: Circulation route (Author, 2021)

Fig 4.3.W: New Museum space (Author, 2021)

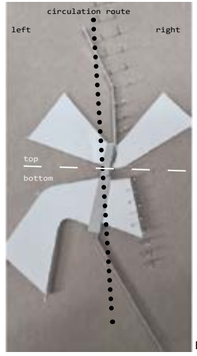


Fig 4.3.X: Balance(Author, 2021)

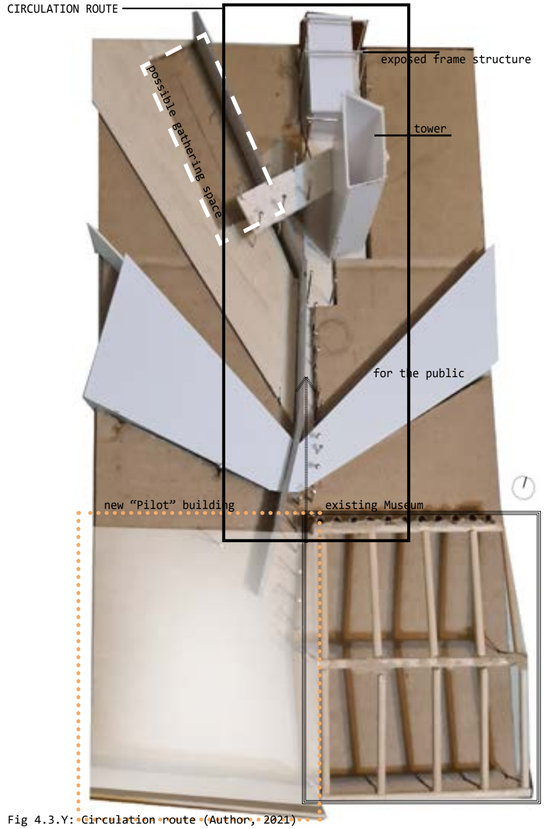


Fig 4.3.Y: Circulation route (Author, 2021)

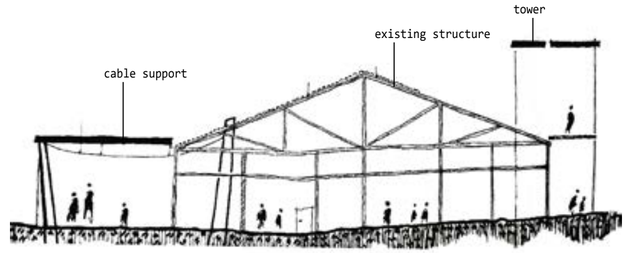


Fig 4.3.Z: Section sketch (Author, 2021)

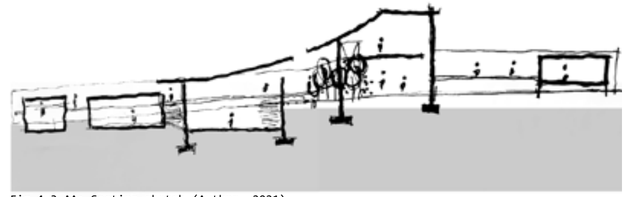


Fig 4.3.AA: Section sketch (Author, 2021)

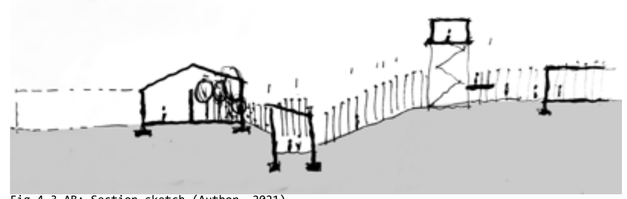


Fig 4.3.AB: Section sketch (Author, 2021)

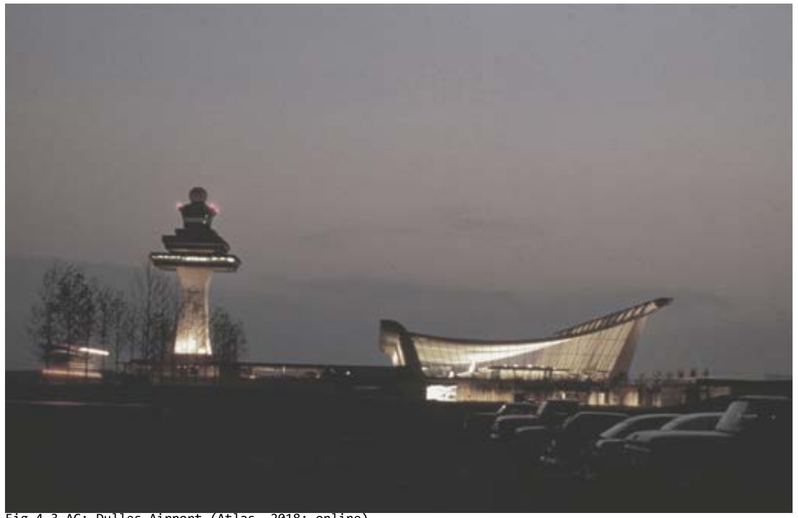


Fig 4.3.AC: Dulles Airport (Atlas, 2018: online)

precedent study

Client:
Metropolitan Washington Airports Authority

Architect:
Eero Saarinen

Function:
Airport Terminal, Infrastructure

Location:
Dulles, VA, USA

Year
1958-1962

This beautiful designed Airport (figure 4.3.AD) was requested due to the increased growth of aviation after the Second World War and occupies over 11, 000 acres of land (Sveiven, [n.d.]: online) as it stretches itself over the site. The architect, Saarinen, was faced with this challenge where a series of questions were asked as to what an airport should look like and whether a good design can contribute toward the experience of the traveller (wtww, [n.d.]: online). Based on my personal opinion, both these questions were well addressed. Saarinen did not just achieve the build-up of a breath-taking design but challenged the architects of today to design in such exquisite language.

Taking the overall design into consideration, the architect aimed to design a space that can provide graceful beauty toward the eye of the dweller which is similar to the beauty found in the nature of flight (Jen, 2011: online). Therefore, this monumental scaled (Jen, 2011: online) design represent an innovative implementation of sculptural form that is exposed to the human's eye.

Fig 4.3.AD: Exposed beauty (Atlas, 2018: online)

Driving across the Virginia countryside (Atlas, 2018: online), lies the Airport in its classic lucidity with the exposed structure and columns that hold up the building like large arms. Driving toward the Airport, one realises how the building represents a combination of the "curviness" of a jet and the classicism of Washington (wtww, [n.d.]: online).

The structure of the Airport help to make up more than just support but rather add value toward the aesthetics of the building and everything it entails. The structure speaks of modernism when taking the materials into account and speaks of repetition that is seen in the exposed columns (Sveiven, [n.d.]: online).
The site is accessed from the north side (figure 4.3.AE to 4.3.AI) where there exists an articulated series of entrances that guide the dwellers into the design. Once entering the parking via the Dulles Access Road, the traveller is faced with the Northern façade of the airport and immediately experience the wide span roof that was built to allow maximum use of interior space. For Saarinen to construct such large space of movement, various elements of circulation and spatial layout needed to be taken into consideration (Atlas, 2018: online). Also, the link between outside and inside space. The circulation start of on the outside where the travellers unpack their luggage from the car and make their way toward the entrance of the Airport. Once entering the building, a ramp takes them to the ticket compartments and from there on they can make their way to the runway side (South) where they will find gates that will guide their way toward the airplane (Atlas, 2018: online). In between circulation takes place between arrivals and departures where the travellers can sit, relax, and shop.

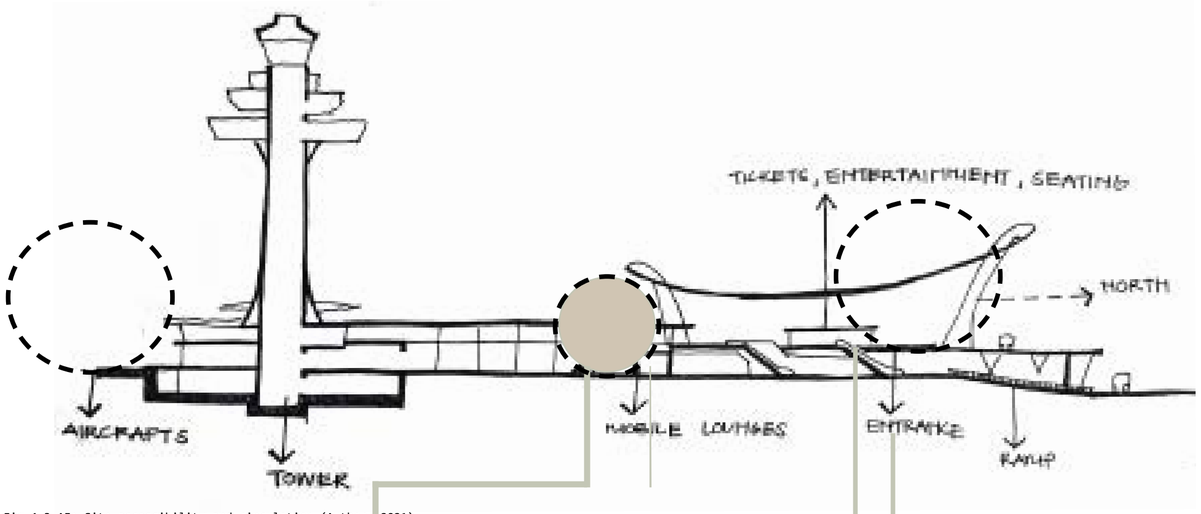


Fig 4.3.AE: Site accessibility and circulation (Author, 2021)

Fig 4.3.AF: Mobile lounge (Atlas, 2018: online)

Fig 4.3.AG: Direction to the planes (Atlas, 2018: online)

Fig 4.3.AH: Entrance (Atlas, 2018: online)

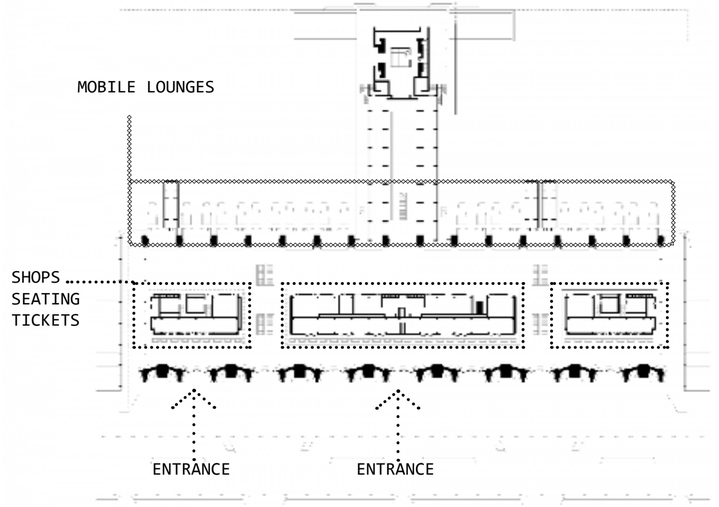


Fig 4.3.AI: Service and user requirements (Atlas, 2018: online, adapted by author)

In terms of airport movement (figure 4.3.AJ), a system known as “mobile lounges” (figure 4.3.AF) were developed by Saarinen (Jen, 2011: online). During the design of the Airport, Saarinen studied the movement of passengers and the way they make their way toward a terminal. As well as the time it takes them to get there. The design of these mobile lounges allowed travellers to travel in style. This lounge-on-wheels gave the passengers the chance to travel without having to walk too far. This design emphasized the integration of technology and adding to the modernity of the design. During the design process, the interior was done in such a way as to adapt to the new technology. These mobile lounges are seldom used today and replaced with a more developed underground system known as the aerotrain (Wikipedia, 2020: online).

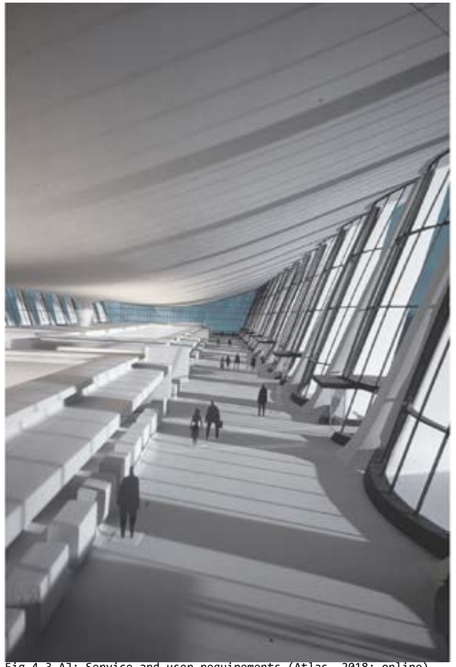


Fig 4.3.AJ: Service and user requirements (Atlas, 2018: online)

The outside of the Airport reveals more of the landscaping and site planning. The airfield plays a large role in terms of the airplane circulation and the way it first into the landscape. Currently, there are four long runways (figure 4.3.AK) that are integrated through taxiways and connection roads. All four of these runways have pathways that link to the terminal building. Therefore, bringing the aircrafts to gather in one space.
Furthermore, the design is surrounded by a man-made lake to collect rainwater, a low-rise hotel, and a row of office buildings along the north side of the main parking lot. In addition, having a two-level road that improves circulation by separating the arrival and departure traffic (Wikipedia, 2020: online).

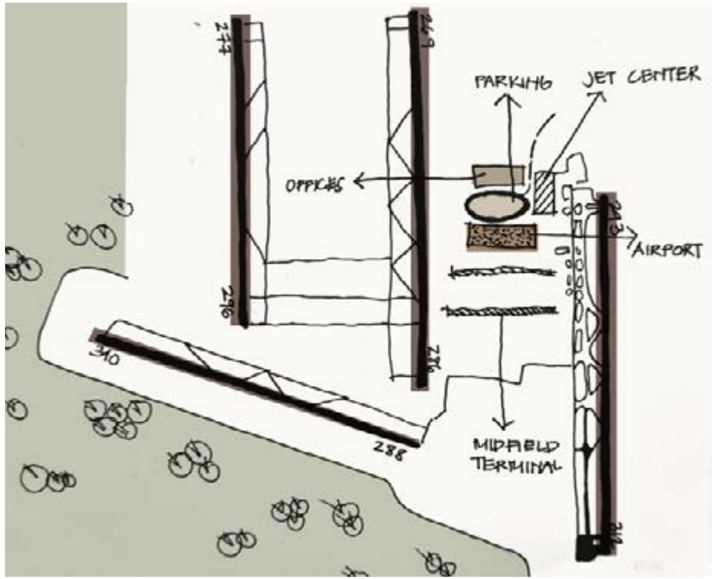


Fig 4.3.AK: Landscaping and site planning (Atlas, 2018: online)

The roof and wall construction of the Airport is quite spectacular-
The design comprises a suspended roof structure supported by hook-like columns with unique heights that give the building its shape. These columns are reinforced concrete structures specially designed for the Airport. What makes the roof structure interesting is that it is supported by lightweight steel suspension bridge cables (figure 4.3.AL) that are placed between concrete roof panels and cladded with large glass facades, creating the illusion of a “weightless” form (Jen, 2011: online).
The cables are suspended on each end by the leaning cantilevered concrete piers. The outward lean of the columns (figure 4.3.AM)allows the piers to resist the tension in the cable so holding up the roof. The system of cantilevers and catenaries results in an interior space that is completely free of columns or any other forms of barriers giving it an open plan layout (Sveiven, [n.d.]: online).
This cable system refers to a suspended cable structure that holds up the roof instead of the roof resting on the columns. This suspended structure transmits the load from the cables into the anchored columns and down into the ground (edu, 2021: online).

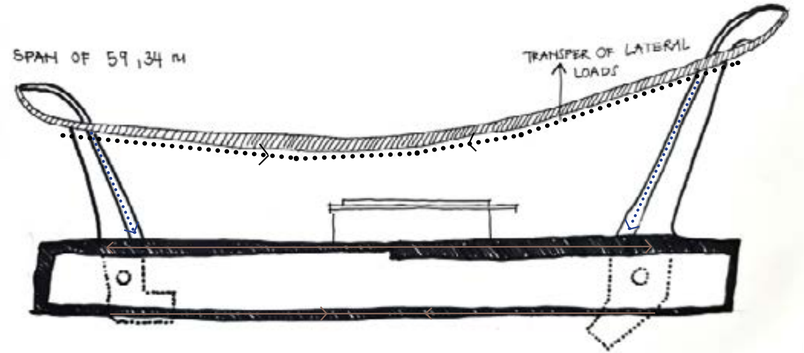


Fig 4.3.AL: Structural analysis (Author, 2021)

Fig 4.3.AM: Structural columns (Atlas, 2018: online)

Along with the columns, there is a horizontal concrete beam (figure 4.3.AN and 4.3.AO) that not just help to resists the lateral loads but also provides a place for the roof to bear in between the piers. With them all anchored deep into the ground, along with a concrete roof structure providing added stability, the lateral loads are compensated for sufficiently in all four directions. This makes for one stable structure that has no limits toward the movement that takes place inside the Airport. The cladding of the design is large glass facades that are structurally independent of the main system (edu, 2021: online) ,(figure 4.3.AP).

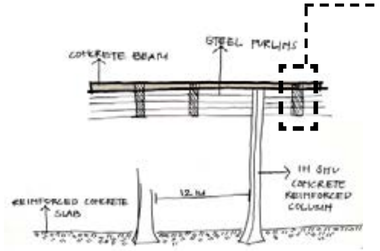


Figure 4.3.AN: Beam support (Author, 2021)

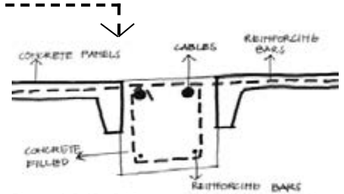


Figure 4.3.AO: Cable connection (Author, 2021)

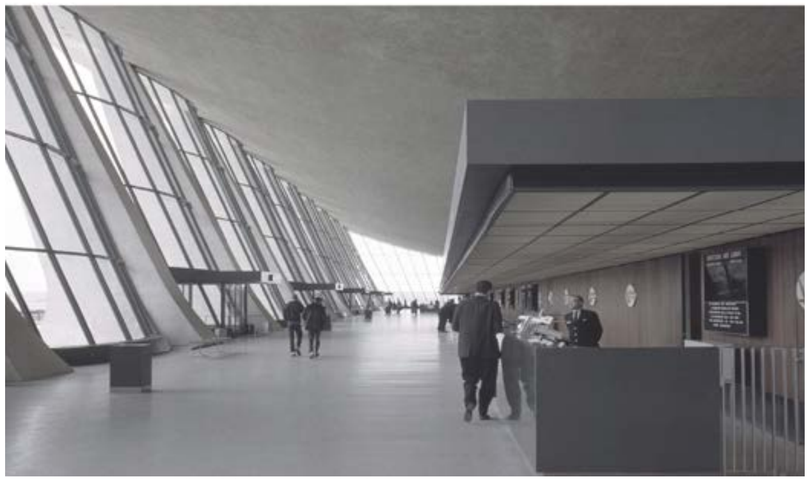


Figure 4.3.AP: The “floating” roof (Atlas, 2018: online)

Through the analysis of this structure, it seems quite obvious that space is enhanced by the open plan (figure 4.3.AQ) that the structure provides toward the inside of the design (wtww, [n.d.]: online). There is no restriction in terms of movement and due to the use of this cable system, compression and expansion is also allowed in the design.

Lastly, the materials used in the design comprise solid concrete floor and roof slab that is supported by the thick cast concrete columns. In contrast with these heavy materials, a sense of lightness is added to the design through the large glass panels that act as cladding on all sides of the design and also the use of steel cables that keep the entire system together. When looking at this structure is seeming almost impossible for such a heavy structure to float the way it does (figure 4.3.AR). And yet… it is made possible!

Figure 4.3.AQ: Open plan made possible by means of structural system (Atlas, 2018: online)

Figure 4.3.AR: Glass facades made possible (Atlas, 2018: online)

With relevancy to the Pilot's Hub, the Dulles International Airport provides more than just a space for travellers, rather, it addresses a wider range of importance. The design takes the significance and beauty of flight into consideration through the integration of structure, built form and ways of aesthetics.The design places emphasis on the expression of ideas of flight and movement in its simple, wing-like form (wtww, [n.d.]: online).

In terms of the Pilot Hub, this precedent gives way to new ideas of structure and spatial enhancement, seen in figures 4.3.AS and 4.3.AT.

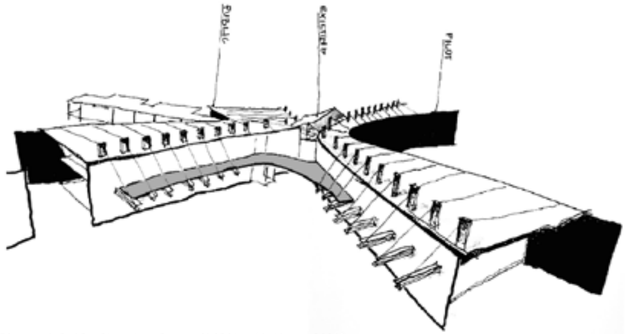


Figure 4.3.AS: Structural possibility (Author, 2021)

Figure 4.3.AT: Structural possibility (Author, 2021)

04. EXTERNAL REVIEW 02

After development of volumetric balance, the implementation of the circulation route, and the possibility of a cable supported roof structure, the design of the Pilot's Hub seems to move away from the aesthetics of simplicity.

The 2nd External Review shows the response to bringing back that aesthetics. Figure 4.3.AU shows the plan layout that emphasises the flow of circulation routes that take place between the two building "wings" and follow the given form. This layout also shows the placing of the existing Museum, kept at a distance, and left with its original function (a Museum). The plan also starts to explore with the layout of the aeroplane hangars and their connection with the main building. In-between the two building "wings" the walkway transforms into a viewing pavilion that overlooks the landscape in the direction of the Kimberley Airport Airfields.

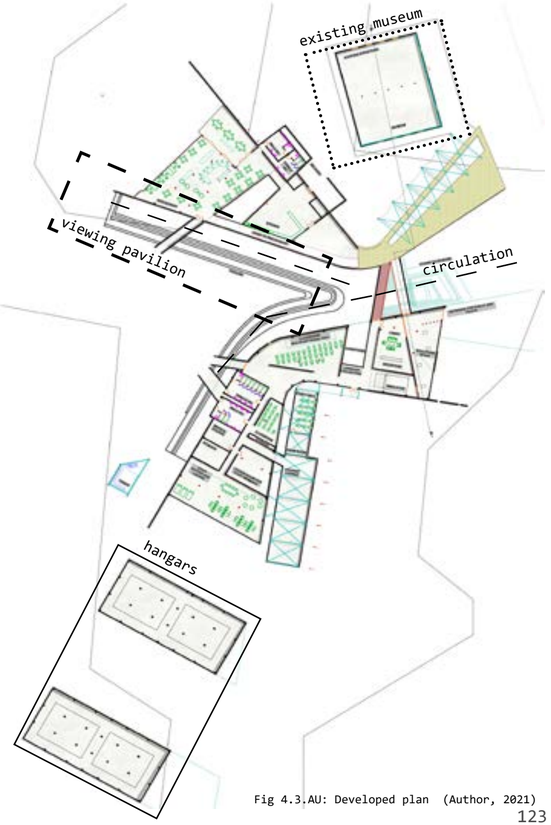


Fig 4.3.AU: Developed plan (Author, 2021)

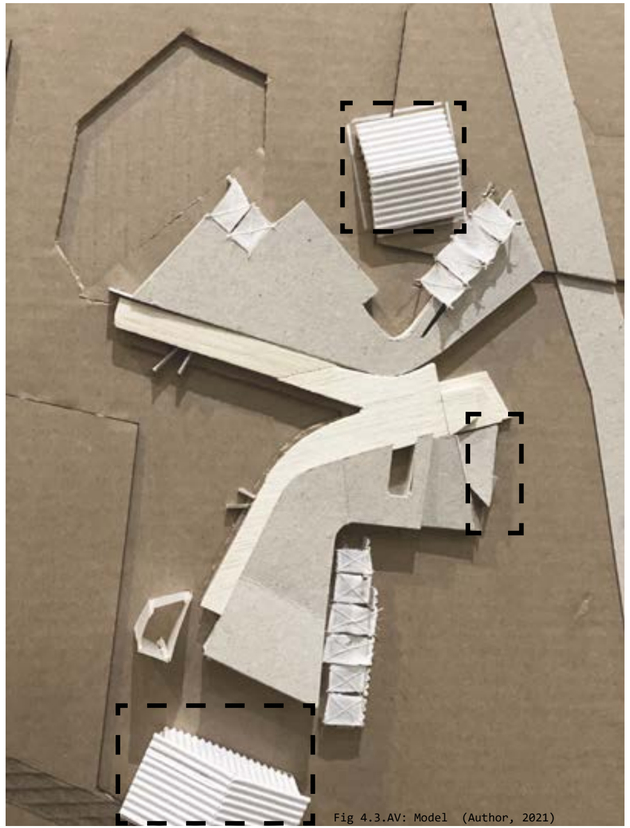


Fig 4.3.AV: Model (Author, 2021)

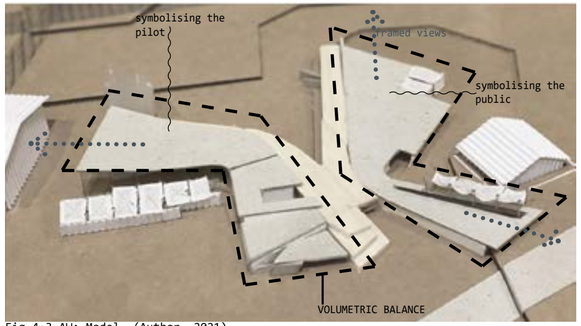
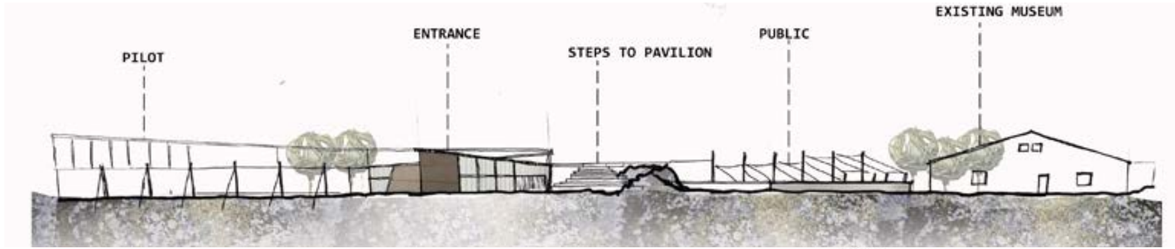


Fig 4.3.AW: Model (Author, 2021)

Figure 4.3.AV and 4.3.AW shows the model that communicates a more simplistic layout with certain spaces articulated by means of a pergola system. The elevations (figure 4.3.AX) also start to communicate façade possibilities. The overall structure (figure 4.3.AY) of the Pilot's Hub communicates an architectural language of a light steel structure that are exposed in certain spaces and enclosed in others. **The structure forms the core of the design and allow exploration of spaces further into the development process** (also explored in figures 4.3.AZ and 4.3.BA).



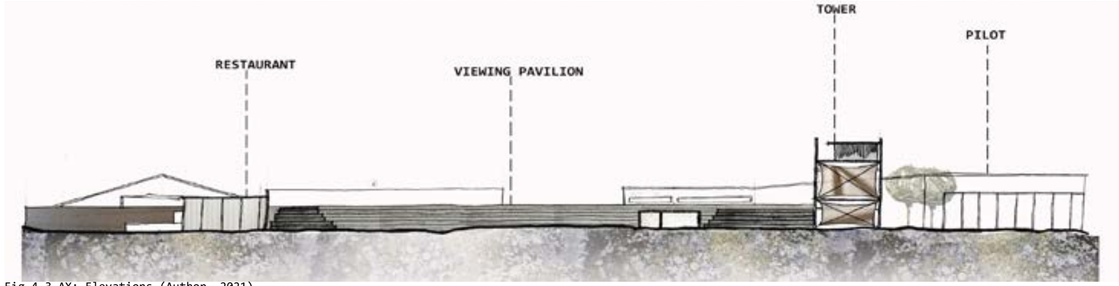


Fig 4.3.AX: Elevations (Author, 2021)

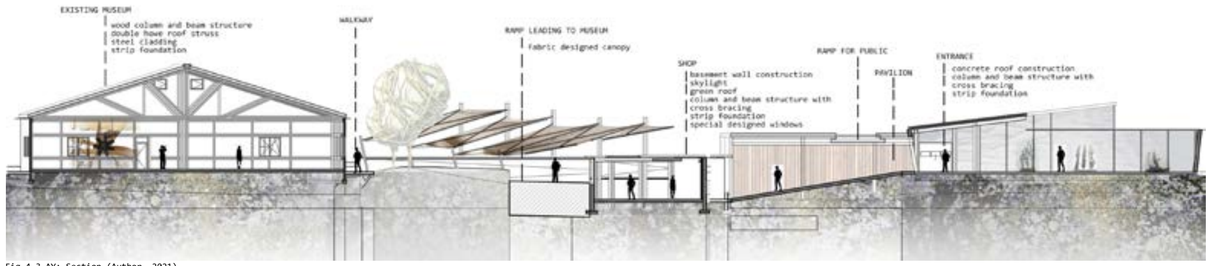


Fig 4.3.AY: Section (Author, 2021)

Fig 4.3.AZ: Perspective exploring structure (Author, 2021)

Fig 4.3.BA: Perspective exploring structure (Author, 2021)

05. DEVELOPMENT BASED ON FEEDBACK

With response to the feedback provided in the 2nd External, the design starts to incorporate more detailed elements by taking a closer look at the student programme and the important spaces needed for instruction. The design of the simulator room was also taken into consideration and addressed according to room specifications and the simulator dimensions (figure 4.3.BB), as well as previously discussed precedent studies (referred to in 1.7).

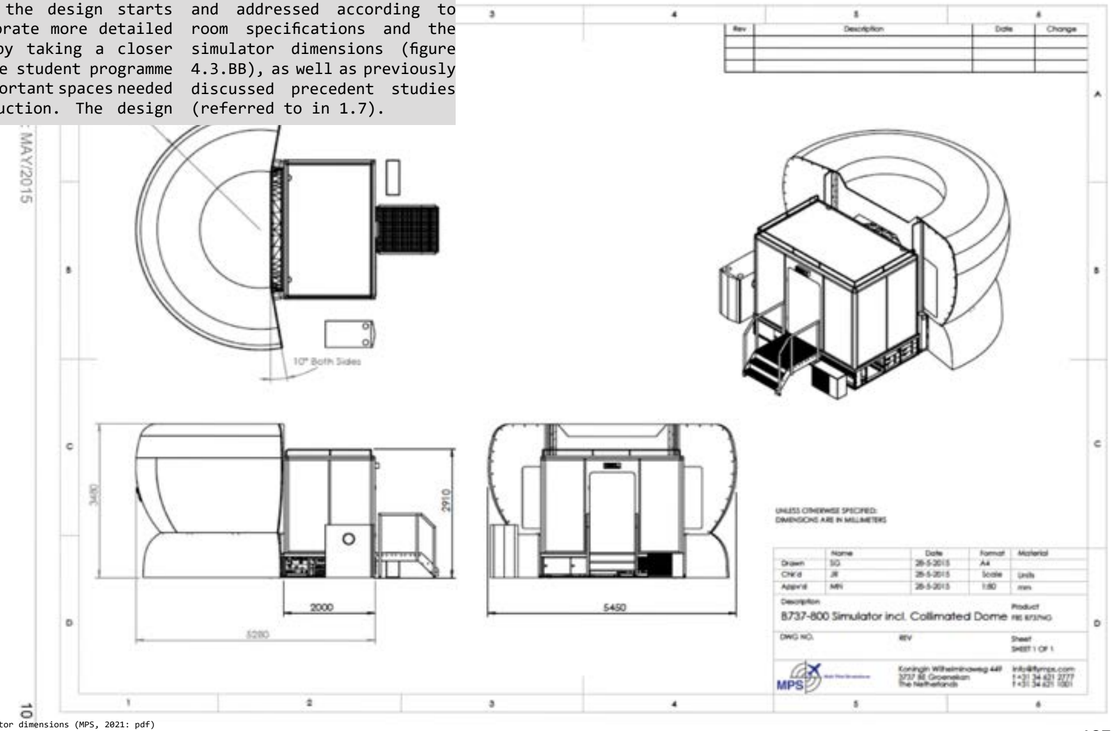


Fig 4.3.BB: Simulator dimensions (MPS, 2021: pdf)

Further important moments added to the design of the Pilot's Hub:

In order to allow daily interaction with the Pilot's Hub, the approach was to add accommodation for students and visitors. The implementation of the accommodation units broadened the scope of the Pilot's Hub to attract more visitors and students. Figures 4.3.BC to 4.3.BE show the layout development of these units.

Fig 4.3.BC: Accommodation proposals (Author, 2021)

Fig 4.3.BD: Accommodation proposals (Author, 2021)

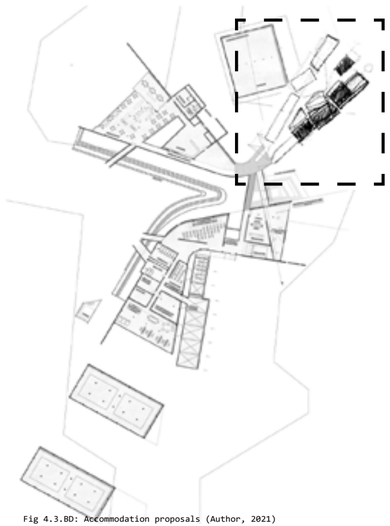


Fig 4.3.BD: Accommodation proposals (Author, 2021)

Personally, the overall experience of the Pilot's Hub lacked an element of hierarchy. Something "explosive" needed to be placed within the three-dimensional layout of the design in order to individualise the Pilot's Hub from any other design and to link the idea of "taking flight" therewith. The first step toward achieving this was by means of the following precedent analysis:

Fig 4.3.BE: San Antonio Children's DoSeum (Swimmer, 2016: online)

San Antonio Children's DoSeum

Architect
Lake/Flato

Function
Civic/ Cultural (Museum)

Location
San Antonio, TX

The San Antonio Children's Museum supports the vision of being, "a premier educational resource, developing innovative thinkers capable of meeting the challenges of the 21st century." The design of this museum is comprised of a series of three, two-story Exhibit Halls decorated with glass, open courtyard spaces and transition spaces that connect visitors to the outdoor exhibit yards. Adjacent to Brackenridge Park, it is set in a park where the landscape surrounds the building with twisting pathways, gardens, and shady places for families to relax, and school groups to unwind (Butt, 2016: online).

Approaching the entrance of the DoSeum, a century old oak tree has been specially preserved that serve as icon for the museum. Figure 4.3.BF shows the oak tree and its similar connection to the old tree that stand in front of the Pioneers of Aviation Museum. Entering into the building, the visitor can immediately experience the connection between indoor and outdoor space where large glass facades place emphasis on view toward the outside (figure 4.3.BG). The aim of the DoSeum was to design a place that can attract the public by inviting them in by means of an architectural design that consider the making of the facades and choice of material.

Fig 4.3.BF: Tree (Author, 2021)

Fig 4.3.BG: Glass facades placing emphasis on view(Author, 2021)

In terms of the site plan (figure 4.3.BH), the building is located in an area that comprise of a balance between commercialised/ public spaces and natural park-like spaces. Thus, never being to far to engage with nature. Figure 4.3.BI shows the points where the indoor spaces and natural vegetation come together to allow the visitors to experience both. By opening up toward the outside, the design becomes one large open floor plan with no restriction to movement. In a similar approach, the Pilot's Hub will make use of large glass facades that will invite the public in and open up building to achieve that similar connection that the DoSeum has with the landscape (Butt, 2016: online).

Fig 4.3.BH: Site plan (Brooke, 2014: online)

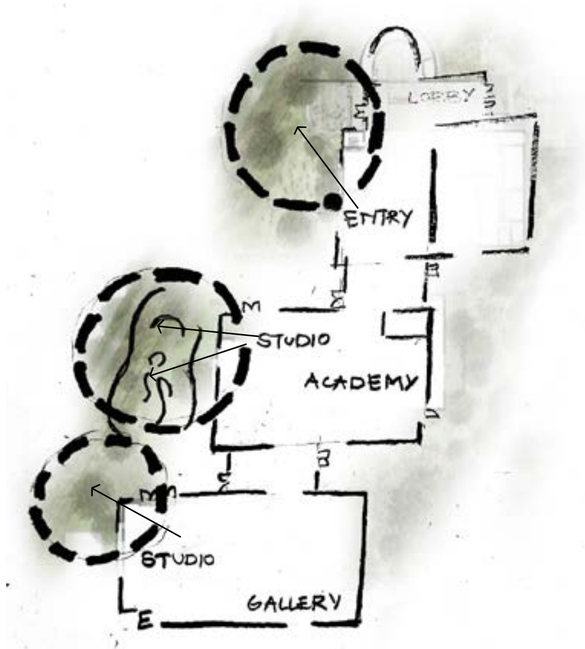


Fig 4.3.BI: Built plan and vegetation come together (Author, 2021)

Spatial enhancement: The scale of the entrance is expansive, seen in figure 4.3.BJ, which is similar to the entrance of the Pilot's Hub that hold the reception and Museum.

In terms of the conceptual approach toward designing the DoSeum, the programme is filled with various activities for both children and adults to interact and learn and be able to make use of the outside courtyards that become a place of reflection.

The programme allow for people with similar interests to come together (figures 4.3.BK to 4.3.BM) and shape a community. Similar to the way the Pilot's Hub enhances the existence of an Aviation community.

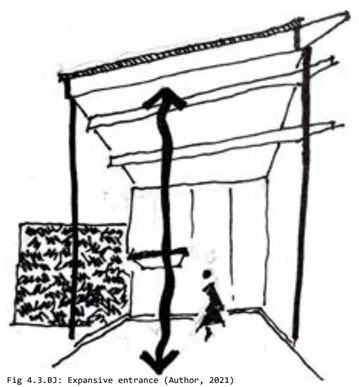


Fig 4.3.BJ: Expansive entrance (Author, 2021)

Programme:

Water works centre
Art studio
Café & kitchen
East garden
West yard
Little town (education space)
Spy academy (math classes)
Imagination station
60% fixed and 40% temporary Exhibition Halls
Sensation studio
And a first floor comprising of an: Innovation station, Powerball Arena, Social Studies

Fig 4.3.BK to 4.3.BM: Introducing the programme (Butt, 2016: online)

Design solution: A few remarkable moments are found in the construction of the DoSeum which contributes toward the "open" and explorative feeling that the design aims to create.

The first "moment" being the steel roof pergola (figure 4.3.BN), that emphasise the expansive scale of the entrance.

Secondly, the exposed beam structure (figure 4.3.BO) creates a rhythm that enhances the circulatory route toward the lobby.

Third, the ceiling of The DoSeum was specifically designed for its function by adding in noise control panels to control the acoustics (figure 4.3.BP). Lastly, solar energy panels and water harvesting systems shows the architects consideration to the environment.

Fig 4.3.BN: Pergola roof (Brooke, 2014: online)

Fig 4.3.BO: Exposed structure (Author, 2021)

Fig 4.3.BP: Acoustic roof installation (Brooke, 2014: online)

Based on the analysis of the work done by Lake/Flato, the following lessons were learnt:

- Lake/Flato's interaction with nature through the design of various courtyards that link with a specific interior space.
- Their consideration given to vegetation around the building
- Their structural approach toward designing the large-scaled facades
- And lastly, the "open" feeling that they aimed to create by means of scale and material use in order for the visitor to experience that freedom of movement

Fig 4.3.BQ: The DoSeum (Brooke, 2014: online)

The analysis of the DoSeum created major breakthrough in the design of the Pilot's Hub.

Figure 4.3.BR show the development of a large spanned pergola structure that covers both building "wings" of the Pilot's Hub and becomes a point of hierarchy when entering into the central gathering space (figure 4.3.BS). This pergola aims to create a vertical hierarchy in the horizontally focused landscape scene. The pergola is made up of individual spaced steel columns that span cables in-between. Traditional material (fabric) was used as coverage that link with the fabric used in the cladding of the Paterson biplane. In terms of concept development, this specially designed canopy acts as coverage that binds the two building "wings" together for the Pilot's Hub to be interpreted as a single, unified structure.

Fig 4.3.BR: Pergola roof (Author, 2021)

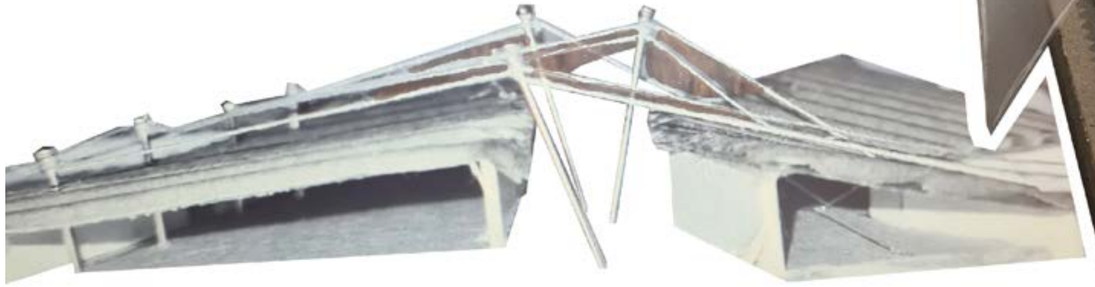


Fig 4.3.BS: Pergola roof (Author, 2021)

After the design and technical exploration of wall and roof possibilities, the choice of materials were gatherer and analysed accordingly:

Fig 4.3.BT: Metal (CWRoofing, [n.d.]: online)

Corrugated metal:

Concept linkage:
Metal are used as cladding material in the design of all aeroplanes

Function:
Corrugated metal roof sheeting with exposed roofing screws that add to the concept of making use of standardised elements in the design thereof.

Type & finish:
R Panel Steel 26-Gauge with a meshed grey finish (CWRoofing, [n.d.]: online)

Fig 4.3.BU: Concrete (Aedo, 2014: online)

In-situ concrete:

Concept linkage:
This suggest to spaces of hierarchy within the plan layout of the Pilot's Hub.

Function:
The use of concrete add to the structural stability of a special designed wall and roof systems. In the case of in-fill walls, the strength of the concrete walls allow increase in height in relation to brick in-fill walls.

Type and finish:
Board formed finish that give the idea of a rough textured finish to contribute toward the concept of "making". This board formed finish will seem as if hand made by the builders which will give it a poetical/ interactive façade for the user to experience.

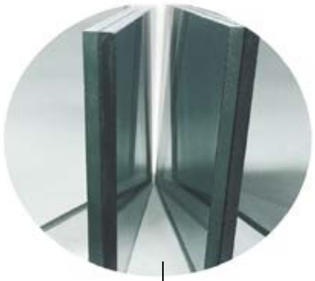


Fig 4.3.BV: Glass(Kaim, 2021: online)

Glass:

Concept linkage:
Opening the façade to allow the viewer to experience the 360-degree view of the landscape.

Function:
Open façade and allow light to filter into building

Type and finish:
Laminated glass supported with aluminium mullions

Fig 4.3.BW: Weathered steel (Derun, 2021: online)

Weathered steel panels:

Concept linkage:
Weathered steel links back to the concepts of "old". Therefore, linking with the historical background of the first steel designed hangar that still stand today. Suggesting a transformation that take place from "old" to "new".

Function:
Cladding device that contribute toward the morphological "feeling" of the design

Type and finish:
A588 Corten steel with a customised pattern, ODM design

Fig 4.3.BX: Wood (DIY, 2021: online)

Wood:

Concept linkage:
This is a direct reference to the wooden beams used in the structural design of the Paterson Biplane.
Function: Used as floor sheeting and also found in the design of an outdoor pergola

Type and finish:
Laminated floor sheeting that (similar to the weathered steel panels) refer to the idea of an old material with a new/modern finish (that connection between the "old" and the "new")

Fig 4.3.BY: Stone (Author, 2021)

Stone:

Concept linkage:
The existing stone Monument allows for the use of stone within the design.

Function:
Functions as a semi-open/ semi-public wall.

Fig 4.3.BZ: Fabric (Author, 2021)

Fabric:

Concept linkage: The Paterson Biplane made use of thick woven fabric to cover the structures of the wings. Similar to that, the Pilot's Hub aim to make use of fabric to design pergolas that stretch the fabric out over the structural frame and link that to the historical Paterson Biplane.

Figures 4.3.CA to 4.3.CE show the layout and three-dimensional approach presented in the final External Review. The development of these three-dimensional renders forced me to look at the possibilities of detail and ways in which the various materials can be combined to have an integrated whole. From here on attention was given to the refinement of the floor plan as well as possibilities for façade development.

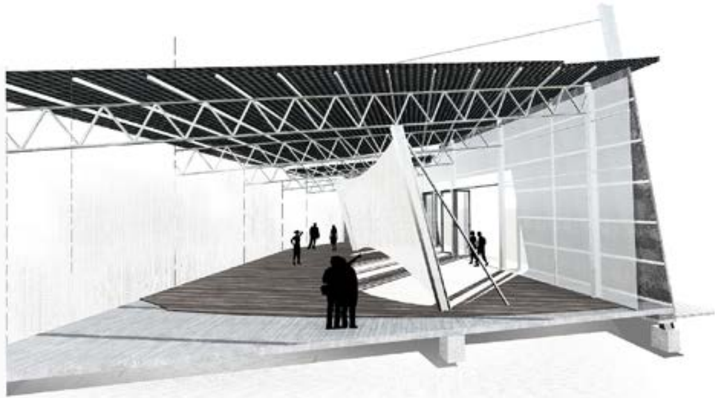


Fig 4.3.CA: Section development and looking at its three-dimensional representation (Author, 2021)

Fig 4.3.CB: Exploring with possible facade development (Author, 2021)

Fig 4.3.CC: North-west elevation (Author, 2021)

Fig 4.3.CD: Accommodtaion facade development (Author, 2021)

Fig 4.3.CE: Accommodtaion facade development (Author, 2021)

4.4 CONCLUSION

From all the information gathered, the Pilot’s Hub now has an added richness to its design process. The entire process is an integration of structure, form, and aesthetics. Through the analysis of all elements, the design will now be able to move into the final stage.

Fig 4.3.: North-West view

Fig 4.3.: Overall model

Fig 4.3.: Student accommodation units

Fig 4.3.: View form the north

Fig C: Airplane (Aviation Central, 2021: online)

part c

the writable

The Writable Perspective is a combination of the Readable and the Memorable parts where the word, “Writable” refer to the final written word that the thesis document built up toward. This part shows my final design synthesis that reflects on all the topics discussed in the Readable and the Memorable Part. This is the concluding chapter.

05 FINAL DESIGN SYNTHESIS

06 TECHNICAL REPORT

07 REFLECTION & CONCLUSION

5.1 INTRODUCTION

05

final design synthesis

This is the Pilot's Hub

This chapter present the final three-dimensional design of the Pilot's Hub that include the final site plan, floor plans, sections, elevations, and images that reveal the feeling of the different designed spaces.

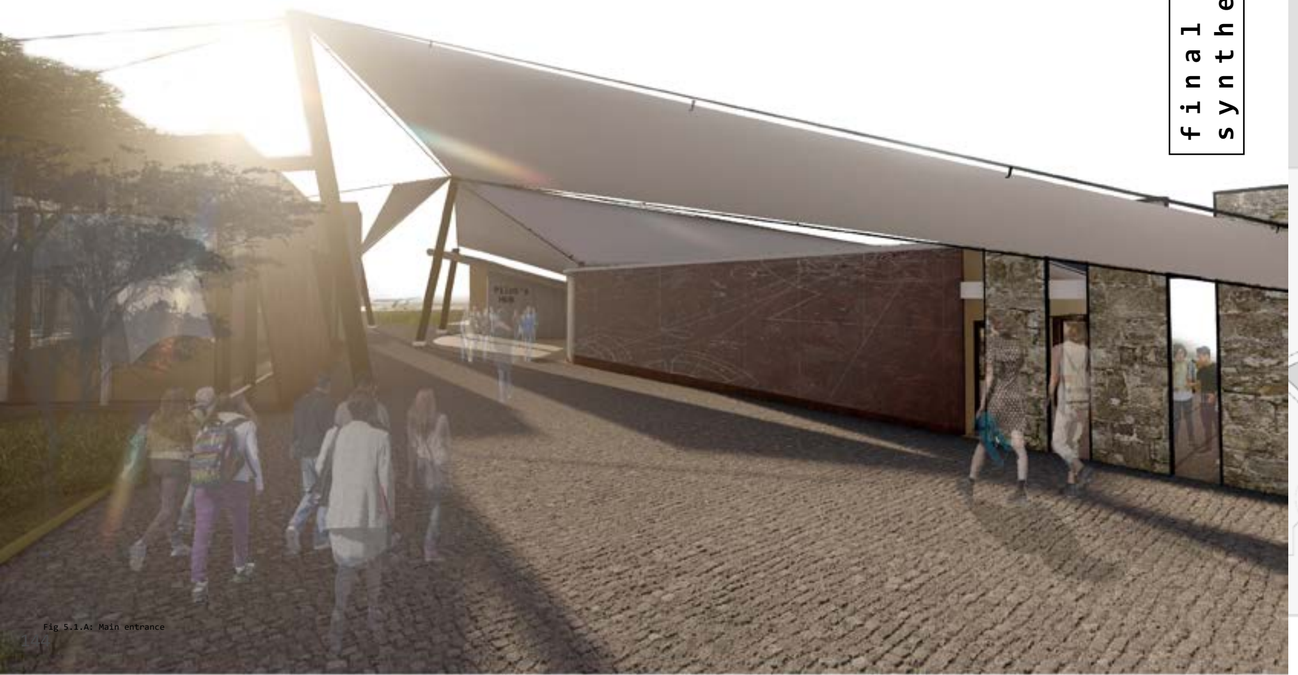


Fig 5.1.A: Main entrance

Fig 5.2.A:

SITE PLAN

01. Viewing pavilion
02. Viewing tower
03. Pilot shop
04. Restaurant
05. Female WC
06. Male WC
07. Kitchen
08. Freezer
09. Cold Fridge
10. Dry storage
11. Cooking area
12. Receiving area
13. Dosposal
14. Cold preperation
15. Dish washing
16. Main gathering space
17. Walkway to model plane flying field
18. Model plane flying field
19. Drop of zone
20. Student gathering hub
21. Outdoor gathering
22. Ramp leading to accommodation
23. Student/ visitors accommodation
24. Accommodation parking
25. Road leading to Pilot's Hub
26. Historical Pioneers of Aviation Museum and Monument
27. Entrance from secondary road
28. Public parking
29. Main entrance
30. Reception & lobby
31. Museum showcasing the Compton Paterson Biplane
32. Medical station
33. Managers office
34. Accounts management office
35. Flight instructor's admin office
36. Staff entrance
37. Kitchenette
38. Stairs to mezzanine level
39. Public gathering space
40. Multifunctional hall/ exhibition lounge
41. Instructor crew room with viewing deck
42. Classroom
43. Student lounge with viewing deck
44. Study pod
45. Announcement board
46. Basic training briefing room
47. Exam room
48. Airbus briefing room
49. Cockpit procedure training room
50. Female lockerroom
51. Storage
52. Male Lockerroom
53. Simulator room
54. Courtyard
55. Semi-open walkway
56. Hangar
57. Workshop and general storage
58. Parking apron
59. Taxiway
60. Staff parking

10 20

Fig 5.2.8: OVERALL GROUND FLOOR PLAN

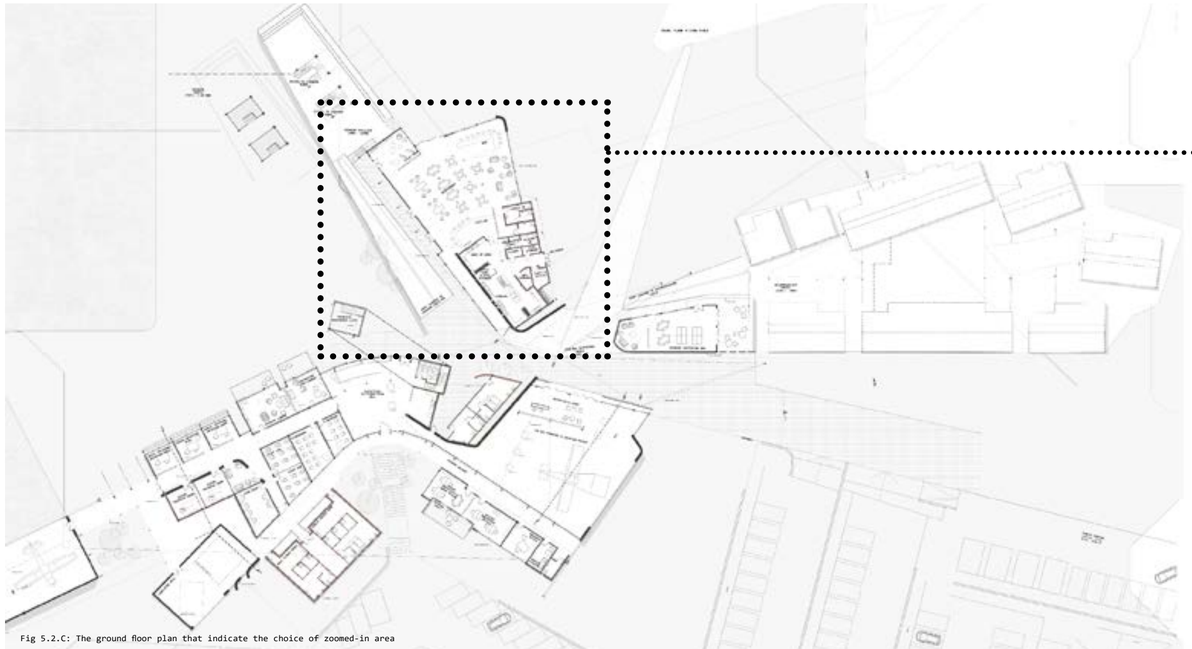


Fig 5.2.C: The ground floor plan that indicate the choice of zoomed-in area

These facilities are for both public and pilots/ students to enjoy

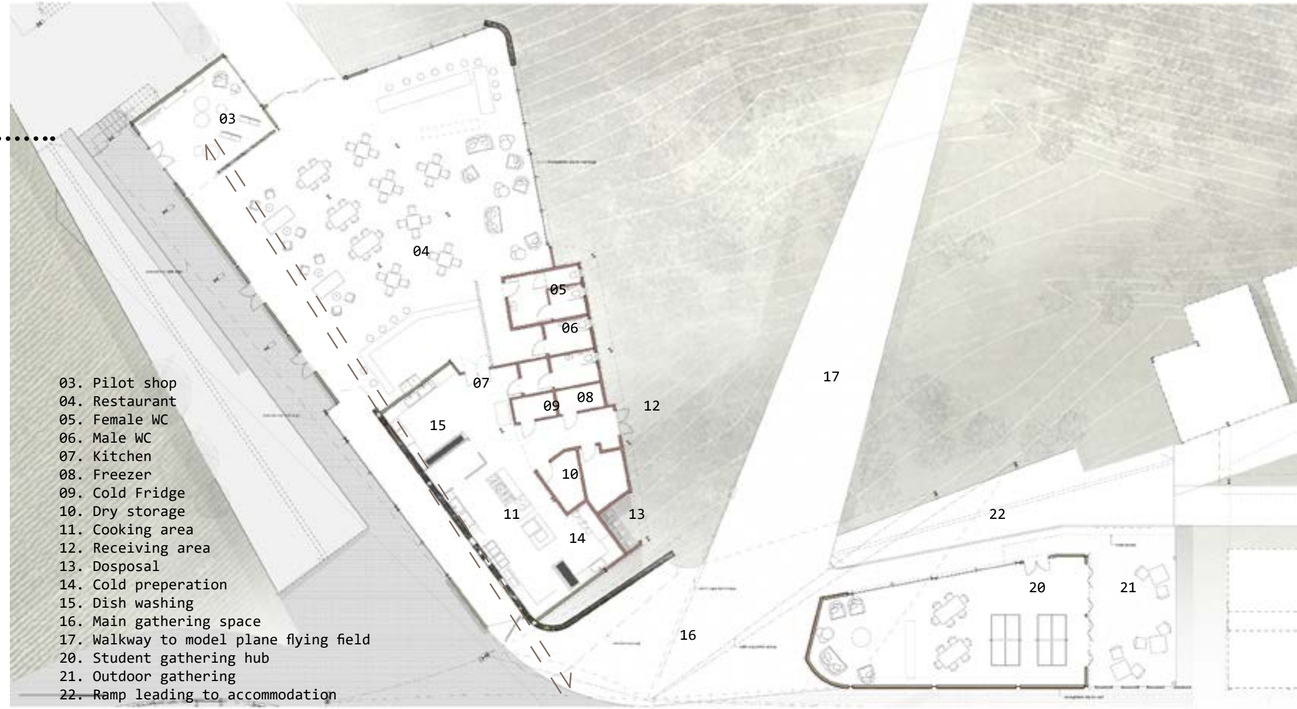


Fig 5.2.D:
ZOOMED GROUND FLOOR PLAN: CENTRAL GATHERING SPACE AND ENTERTAINMENT

Fig 5.2.E:Walkway leading toward viewing pavilion and viewing towers

Fig 5.2.F: Interior of pilot shop and restaurant

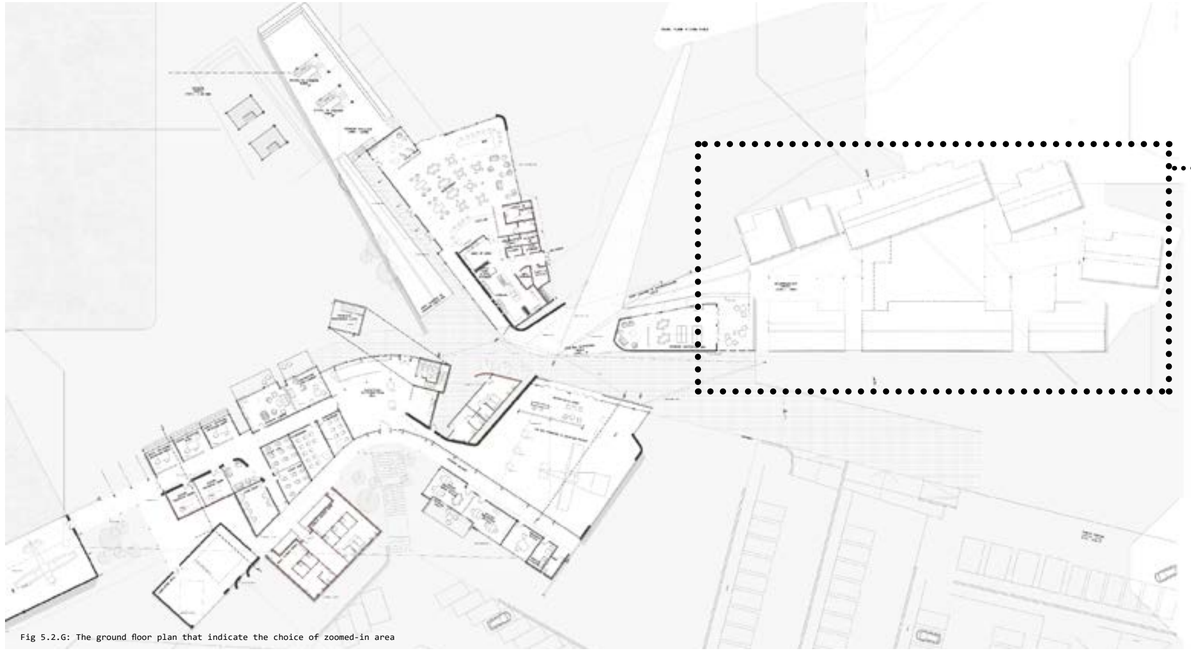


Fig 5.2.G: The ground floor plan that indicate the choice of zoomed-in area

These facilities are for the students to live in

A. Storage
B. Laundry room
C. Outdoor drying yard
D. Outdoor gathering
E. Living area
F. Kitchen
G. Room 01
H. Room 02
I. WC
J. Braai area
K. Courtyard

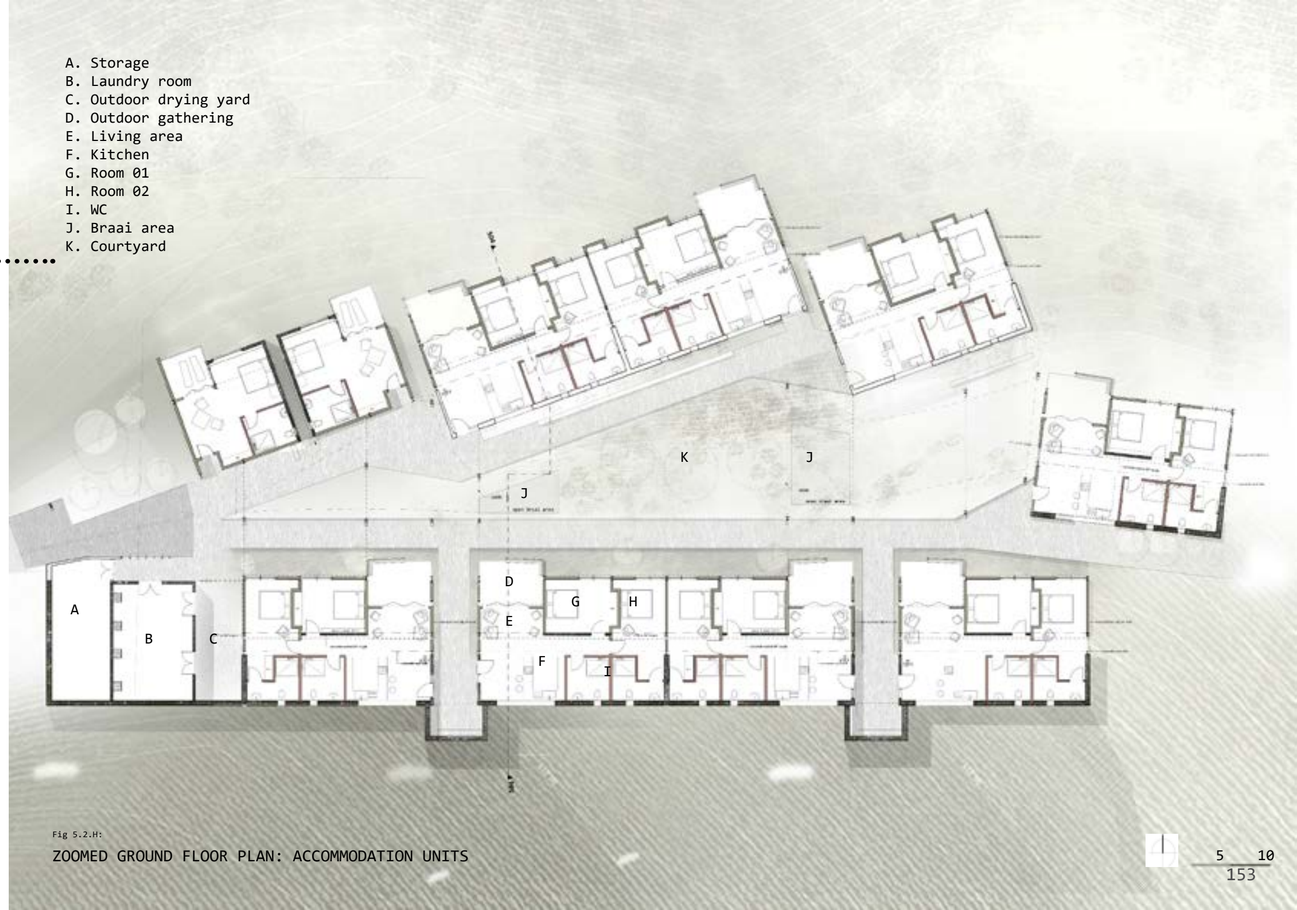


Fig 5.2.H:
ZOOMED GROUND FLOOR PLAN: ACCOMMODATION UNITS

Fig 5.2.1: Section 01

Fig 5.2.3: Student accommodation

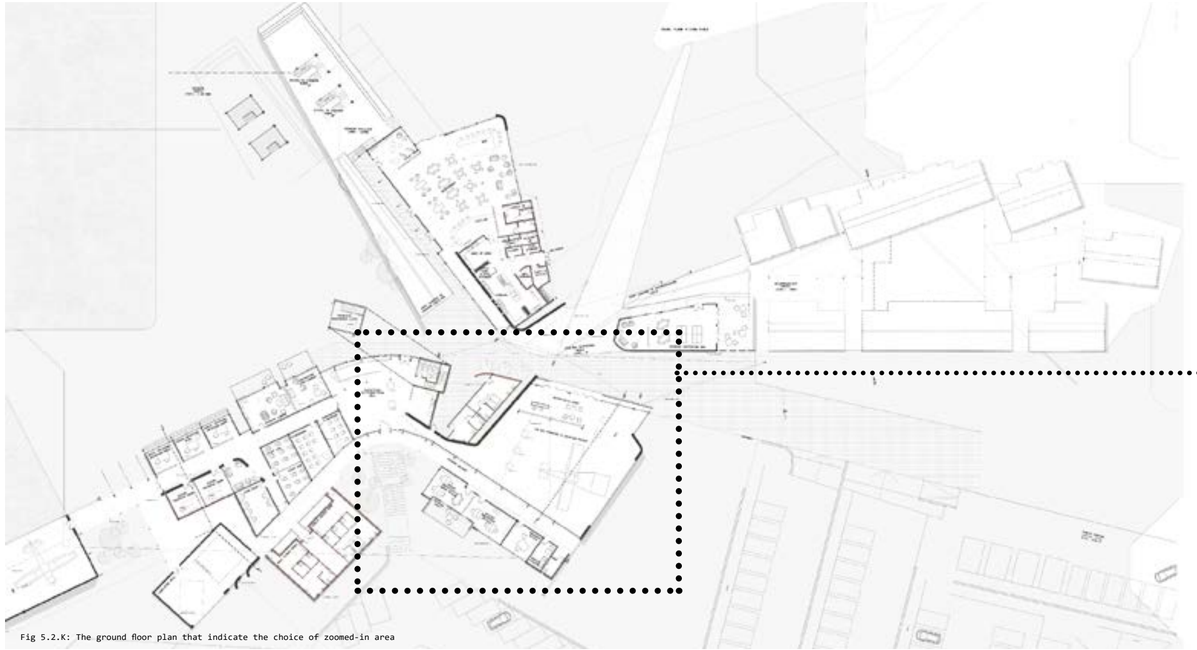


Fig 5.2.K: The ground floor plan that indicate the choice of zoomed-in area

These facilities are for both public and pilots/ students to enjoy and become the central space that open up toward the Museum (that honour the Pioneers of Aviation Museum)

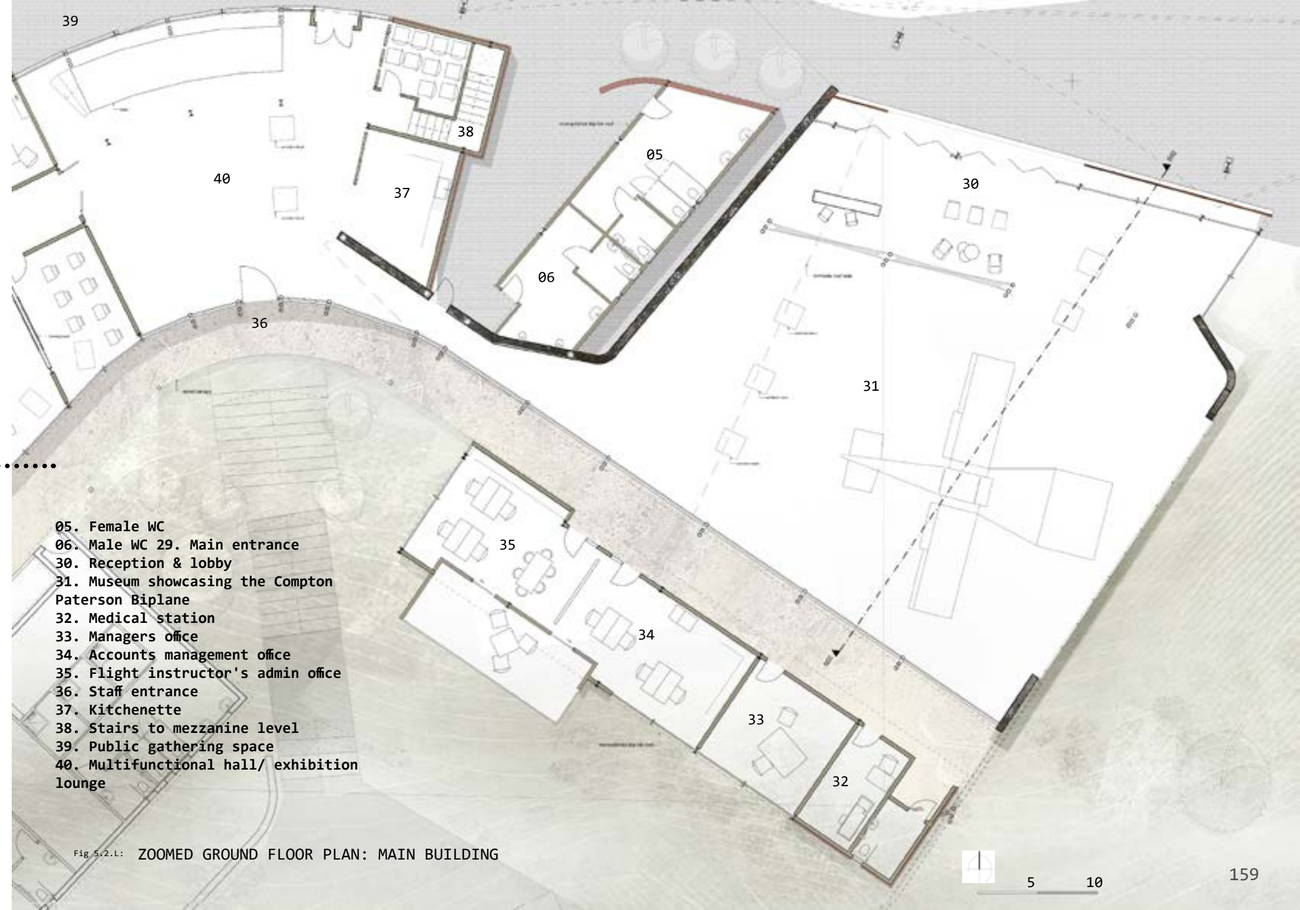


Fig 5.2.L: ZOOMED GROUND FLOOR PLAN: MAIN BUILDING

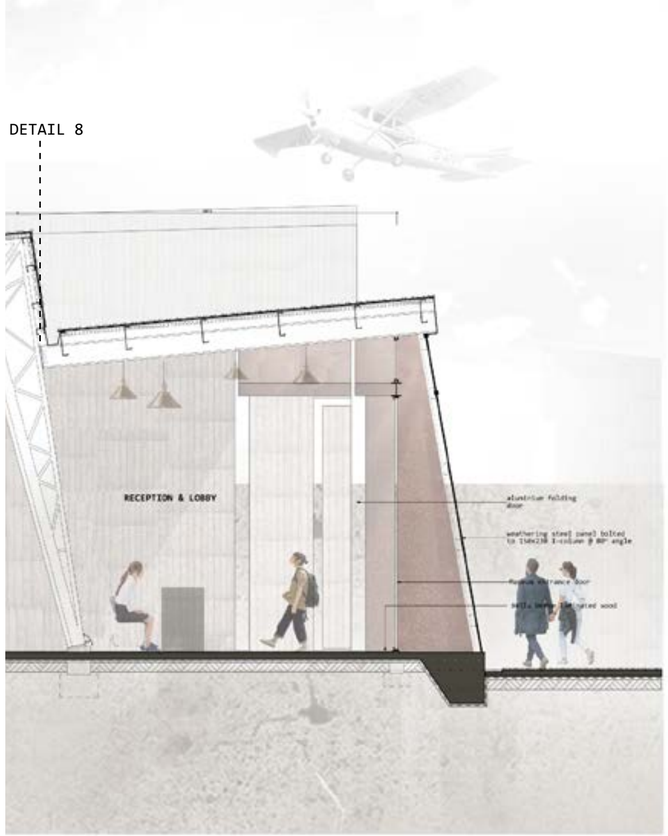


Fig 5.2.M: Section 02

Fig 5.2.0: The Museum that holds the Compton Paterson Biplane

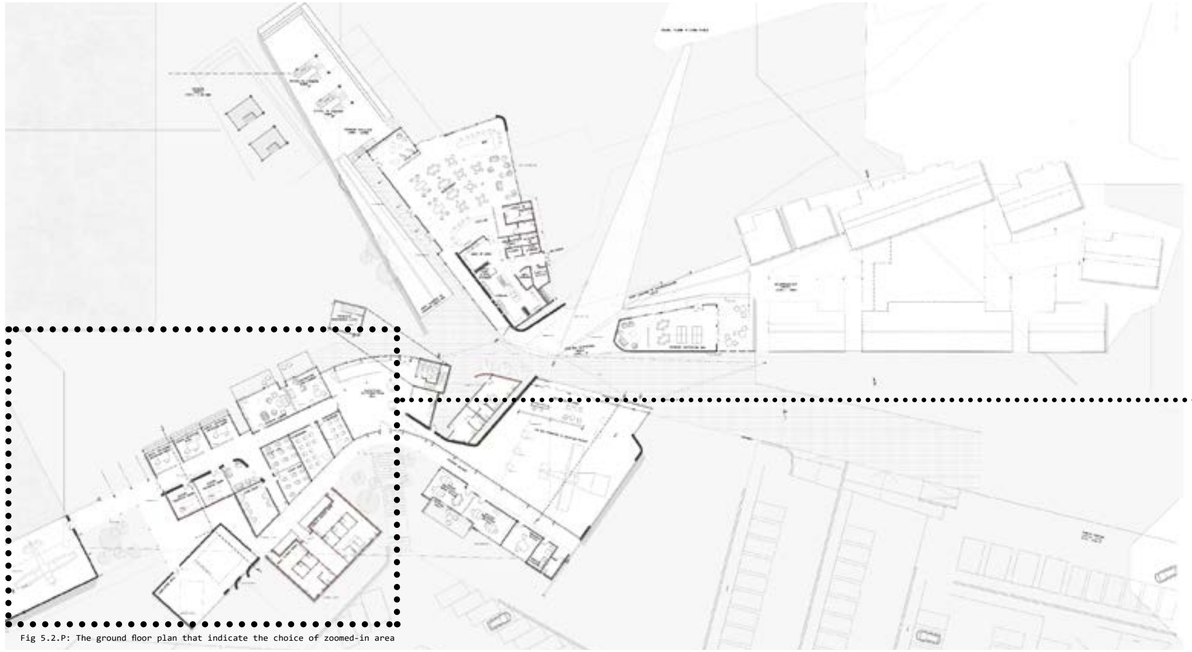


Fig 5.2.P: The ground floor plan that indicate the choice of zoomed-in area

These training facilities are only for the students, instructors, pilots, and other staff members

Fig 5.2.Q:

ZOOMED GROUND FLOOR PLAN: TRAINING FACILITIES

41. Instructor crew room with viewing deck
42. Classroom
43. Student lounge with viewing deck
44. Study pod
45. Announcement board
46. Basic training briefing room
47. Exam room
48. Airbus briefing room
49. Cockpit procedure training room
50. Female lockerroom
51. Storage
52. Male Lockerroom
53. Simulator room
54. Courtyard
55. Semi-open walkway
56. Hangar

IN SITU CONCRETE

This suggest to spaces of hierarchy within the plan layout of the Pilot's Hub.
Board formwd finish that give the idea of a rough textured finish to contribute toward the concept of "making". This board formed finish will seem as if hand made by the builders which will give it a poetical/ interactive façade for the user to experience.

KLIP-LOK ROOF SHEETING

Metal are used as cladding material in the design of all aeroplanes. Corrugated metal roof sheeting with exposed roofing screws that add to the concept of making use of standardised elements in the design thereof.

WOOD

This is a direct reference to the wooden beams used in the structural design of the Paterson Biplane. Used as floor sheeting and also found in the design of an outdoor pergola.

STONE

The existing stone Monument allows for the use of stone within the design to reflect back on the historical site.

Fig 5.2.R: Axonometric considering materials and structure

Fig 5.2.S: Courtyard space showing transition from the training facilities to the hangars

Fig 5.2.T: Overall perspective

Fig 5.2.U: North elevation view

Fig 5.2.V: East elevation view

Fig 5.2.W: North-West elevation

Fig 5.2.X: West elevation

Fig 5.2.Y: Model

Fig 5.2.Z: Model

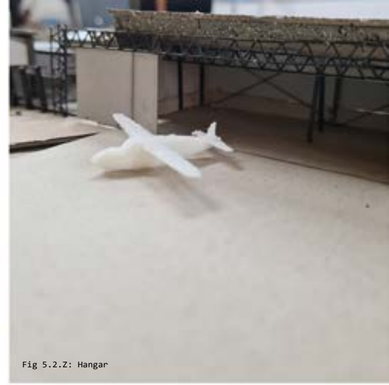


Fig 5.2.Z: Hangar

Fig 5.2.AA: Existing historical museum and monument

Fig 5.2.AB: Roofs

Fig 5.2.AC: Training facilities

Fig 5.2.AD: Main entrance

6.1 INTRODUCTION

The architectural design of the Pilot's Hub reflects the character of the investigated theories and my architectural application thereof, through the explanation of the entire design process. The final design synthesis reveals the compilation of thoughts and concepts into the final design layout. This next chapter explains the functionality of the Pilot's Hub by taking the building's response to climate, site, landscape, and details into consideration.

Fig 6.1.A: The Paterson biplane porpeller (Author, 2021)

6.2 REPSONSE TO SITE, LANDSCAPE, VEGETATION

Vegetation:

The surrounding landscape in which the Pilot's Hub finds itself comprise the typical characteristics of a cosmic landscape. These characterise formulates a picturesque image of a broad landscape and open sky. The vegetation found on site is low shrublands, grass, thorn bushes, karee, and acacia trees (previously discussed in 2.3).

In response to the Pilot's Hub, the site plan (figure 6.2.A) is a clear indication of the way the natural growth of trees are treated. The site plan shows how the build-up of the Pilot's Hub divides the landscape into two divisions. Division A (indicated in figure 6.2.A) is open for all the users/ visitors to be able to experience a scenic view toward the Kimberley Airport Airfields. Therefore, all existing trees that obscure the view toward the Airport, are taken out and replanted. Division B comes in contrast with division A by allowing the natural growth of trees. Therefore, decorating the Pilot's Hub with the typical characteristics of the cosmic landscape and becoming a natural gallery.

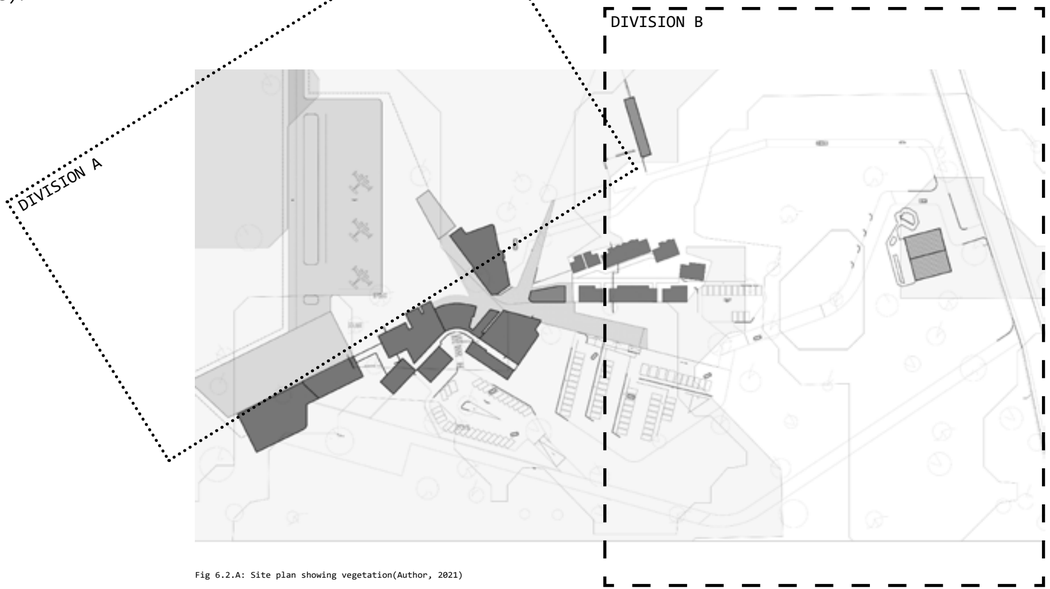


Fig 6.2.A: Site plan showing vegetation(Author, 2021)

COURTYARD DETAILS:

Taking a closer look at the vegetation that touches the Pilot's Hub, figure 6.2.B show the way courtyard design details were taken into consideration. This figure show consideration is given to material, thresholds, and space for gathering.

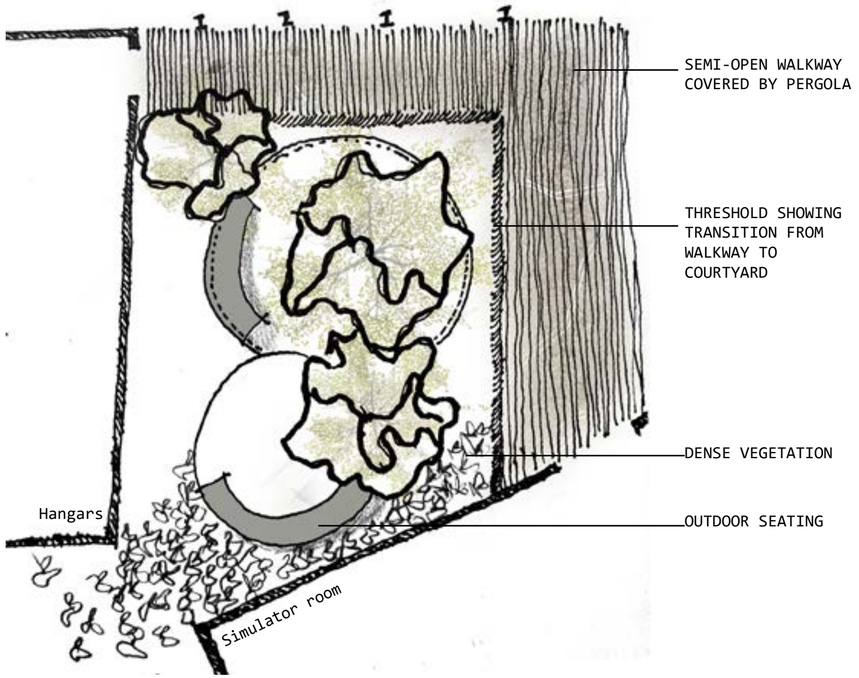


Fig 6.2.B: Courtyard detail (Author, 2021)

Another characteristic of the cosmic landscape is the dry climate.

Kimberley is known for its hot winters and mostly dry seasons with occasional heavy storms. Therefore, as part of the design process, the Pilot's Hub must make use of the best possible systems that respond to the harsh sun conditions, heat, and water interaction on site.

Water:

Water preservation forms an integral part of any design that is placed in a dry climate. The aim for the design of the Pilot's Hub is to preserve water and re-use it where possible. Therefore, a rainwater harvesting system (Schmidt, 2013) (figure 6.3.A) is placed on site. The advantages of this system:

- Collect rainwater from the roof
- Rainwater stored in a tank and re-used
- Operated pump to remove any solids
- Used for flushing toilets

This tank is also connected to municipal lines that provide water when the tank is low on rainwater supply. A responsible party should always empty the pump when a rainstorm is expected to prevent overflow from taking place and through the application of this system, the design of the Pilot's Hub will contribute toward the conservation of water.

For further preservation of water, greywater can also be re-used. This is water that comes from hand washbasins, washing machines and showers and can be gathered and re-used for the watering of plants (figure 6.3.B). This greywater recycling system comprises a large surge tank with a pump and a filter.

Stormwater is controlled through the use of a French drain system to prevent overflowing from taking place (figure 6.3.C).

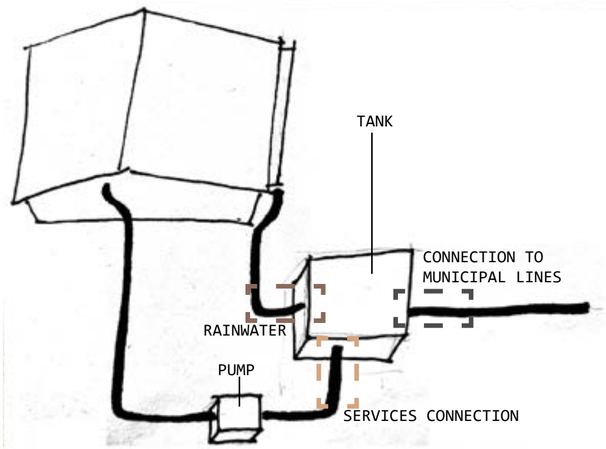


Fig 6.3.A: Rainwater harvesting system (Author, 2021)

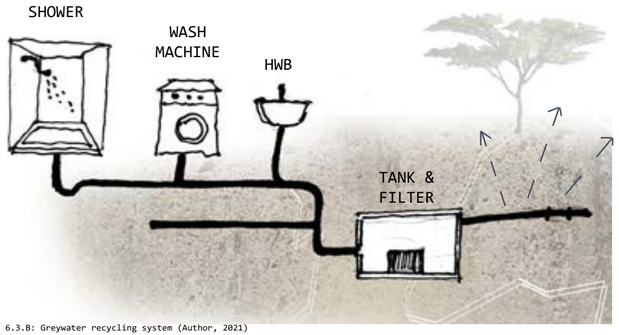


Fig 6.3.B: Greywater recycling system (Author, 2021)

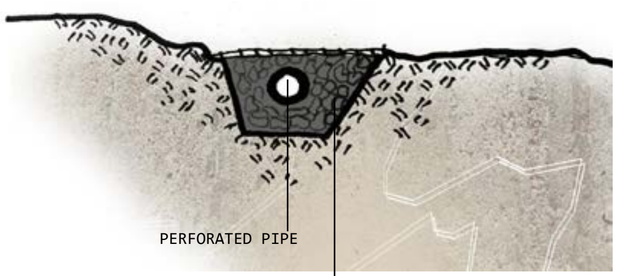


Fig 6.3.C: French drain [DETAIL 1] (Author, 2021)

Superstructure and thermal mass:

The core structure of the Pilot's Hub comprise of a frame structure that expose itself in certain spaces and in is kept enclosed in other. For division between indoor and outdoor spaces, in-fill concrete walls allow for the frame to be exposed and also allow the walls to go above a height of 3 meter with the option of choosing the best type of formwork that will give a layer of texture to these concrete walls.

Due to the emphasis on view, the ceiling heights vary from 3.5- to 7-meter-high walls. Large glass facades are placed on certain facades and steel roofs are used within most of the design layout. Therefore, thermal mass also need to be taken into consideration to prevent this large volumetric mass from overheating.

Thermal mass is a property that enables a building to absorb, store, and release heat by means of the type of material used. In the design of the Pilots Hub, each material has a significant linkage with the concept of the building but also take the practical sue of the types of material not consideration. The following choices were made:

Concrete wall and roof structure:

This help to cool down the space. In the construction of the accommodation units (figure 6.3.D), concrete walls, and roof cover most of the units to prevent that hight risk of overheating from taking place within those living units.

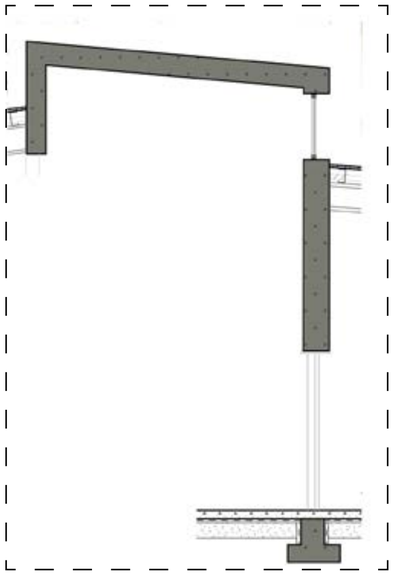


Fig 6.3.D: Concrete wall and roof structure (Author, 2021)

Vegetation:

Vegetation are also used as a way of creating shaded walking for people to transition between the open spaces. The northern room windows in the accommodation units also have trees that still give them that shade during the day (figure 6.3.E).

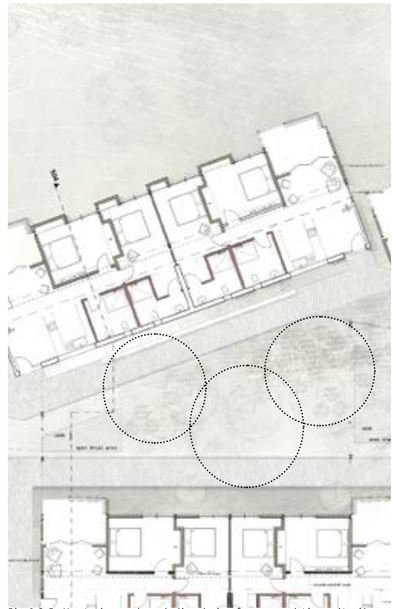


Fig 6.3.E: Vegetation used as shading device for accommodation units (Author, 2021)

Steel roofs:

This type of roof system is known to absorb heat; therefore, the decision is made to make use of geothermal cooling.

This type of cooling (and heating) system makes use of a water-based solution circulation through underground pipes where the ground heat is absorbed and transferred to a geothermal heat pump (Dandelion, 2021: online). Figure 6.3.F show an example of a Dandelion Geothermal system used inside a home:

The Pilot's Hub will follow a similar approach (figure 6.3.G).

The advantages of this type of system are:

- Average a 20-year life span;
- Little electricity used;
- Cooling and heating;
- Little maintenance where one only need to change air filters every 6 months;
- More efficient; and
- Low operating costs (Dandelion, 2021: online).

The system comprise of two important elements that are the geothermal heat pump and the buried pipe system (also shown in figure 6.2.F).

Fig 6.3.F: Geothermal cooling system (Dandelion, 2021: online)

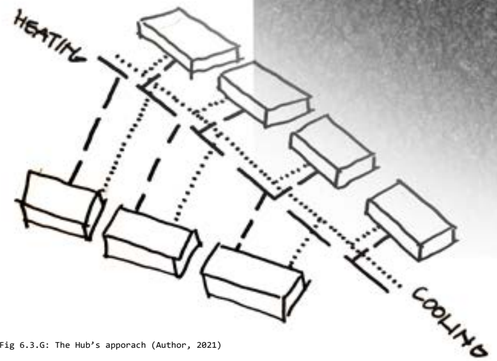


Fig 6.3.G: The Hub's apporach (Author, 2021)

Space requirements:

There are certain facilities required to accommodate the programme of a flight training school. One of the important spaces required is the simulator room. Based on the type of simulators chosen for this programme:

ALS 250 Simulator and

A320 Airline Simulator,

the spatial requirements for this room are:

Minimum room height = minimum room height + 1000 mm

4550 mm

Room length 10000 mm

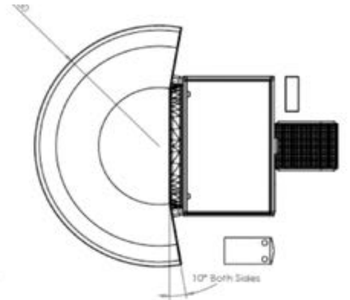
Room width 7000 mm

Entry door width 3600 mm

Entry door height 2910 mm (MPS, 2021: pdf)

These requirements allow for easy installation and correct airflow for the projectors. During installation, the individual components are put together like a puzzle. Both these two simulators come in their case and need no special type of floor system.

The system comprises a base frame, visual dome, instructor cabin, and cockpit (figure 6.4.A).



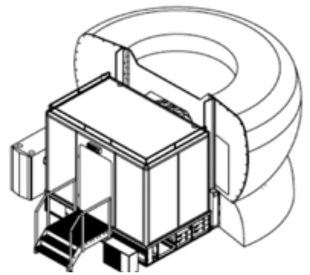


Fig 6.4.A: Simulator parts (MPS, 2021: pdf)

The flooring of the Simulator room: Industrial quality and anti-static floor material and coating with a static load capacity of 230.7 kg per s/f.

There are two air condition units built into the simulator but should the Simulator room also have its own air conditioning that regulates and control the environment. The building ventilation system should filter the air frequently and make use of filters for the removal of particles (MPS, 2021: 3-8).

User requirements:

A1- entertainment and public assembly

A3- places of instruction

C2- museum

J4- parking garage

H2- dormitory

(SANS, 2021: online)

Substructure:

Strip foundations for load bearing walls (figure 6.5.A) and pad foundations (figure 6.5.B and 6.5.C) for the main structure that comprise of a steel column and beam (frame) structure.

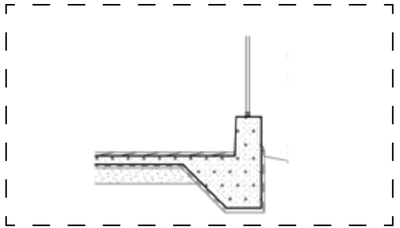


Fig 6.5.A: Foundation (Author, 2021)

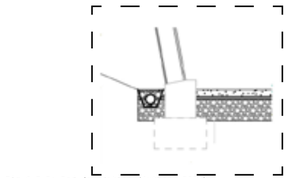


Fig 6.5.B: Pad foundation (Author, 2021)

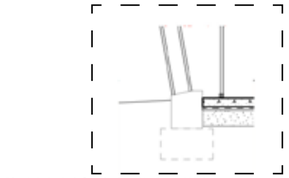


Fig 6.5.C: Pad foundation (Author, 2021)

Superstructure:

Main structural system: steel column and beam system

Walls: Load-bearing brick walls used where services are placed. The simulator room will have a brick cavity wall with acoustic insulation to prevent sound from traveling (figure 6.5.D).

Reinforced load-bearing concrete walls used in accommodation units and also in the main building where the roof and wall become one (see figure 6.3.D).

Other walls are: in-fill concrete walls that are non-loadbearing

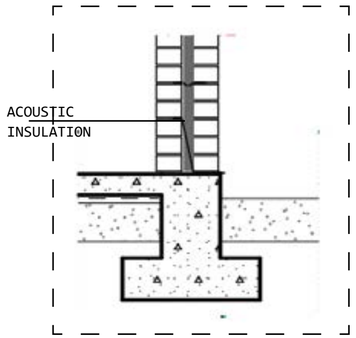


Fig 6.5.D: Cavity wall with acoustic insulation (Author, 2021)

Roofs:

Roof trusses:

Steel roof trusses are used and differ in depth dependant on the spanning distance. The proposed grid layout varies from 5 meter to 12-meter spans. Girder roof trusses are used in large spanning areas and I-beams used for closer spans. Figure 6.5.F show where both types of roof trusses are used.

Reinforced concrete roofs that will comprise of a rib and block supporting frame.

Steel roof structure as the main roof system used throughout the design and shown in the detail drawing of figure 6.5.G.

For acoustic purposes, a suspended acoustic (secondary) ceiling are hung below the structural ceiling (figure 6.5.H). This type of ceiling also hide all the mechanical, plumbing, and electrical installations from the view of the visitor.

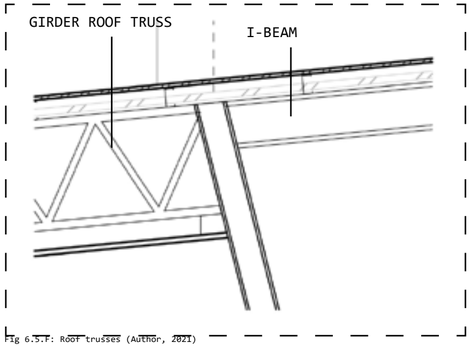


Fig 6.5.F: Roof trusses (Author, 2021)

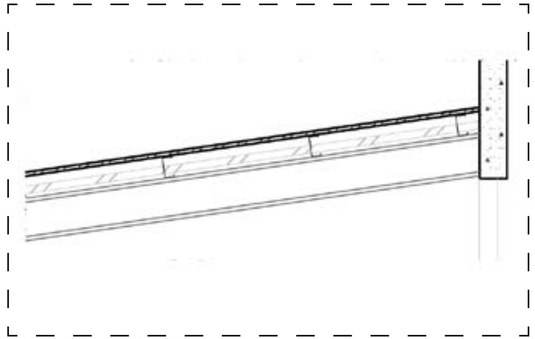


Fig 6.5.G: Steel roof (Author, 2021)

Fig 6.5.H: Ceiling (Coury, 2020: online)

The following images show exploration with detail taken from the sections:

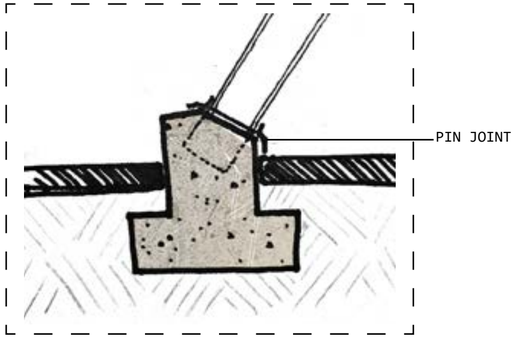


Fig 6.5.I: **[DETAIL 2]** Steel column foundation (Author, 2021)

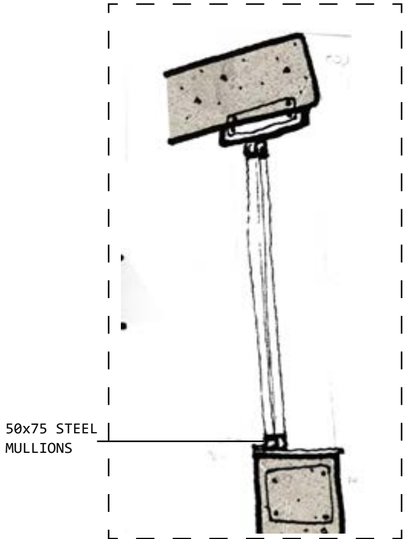


Fig 6.5.K: **[DETAIL 4]** Window detail (Author, 2021)

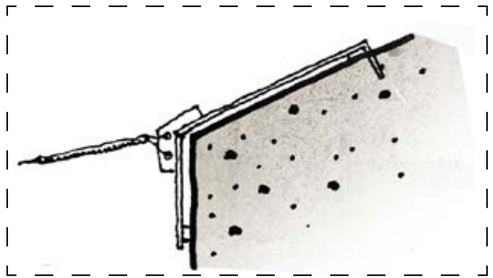


Fig 6.5.J: **[DETAIL 3]** Cable connection to concrete roof (Author, 2021)

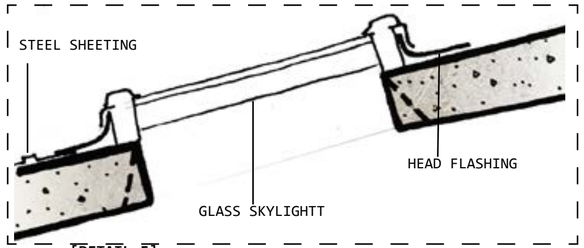


Fig 6.5.L: **[DETAIL 5]** Skylight (Author, 2021)

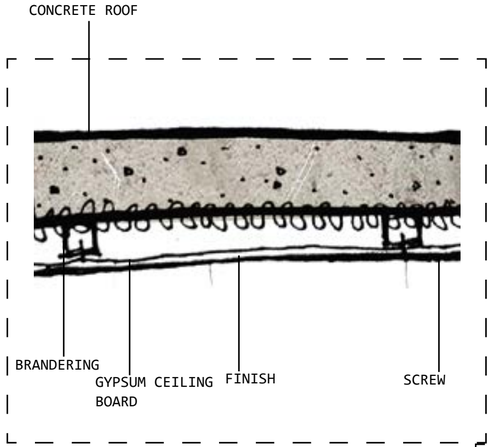


Fig 6.5.M: **[DETAIL 6]** Conventional ceiling board (Author, 2021)

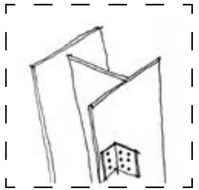


Fig 6.5.O: **[DETAIL 8]** Angle cleat bolted connection (Author, 2021)

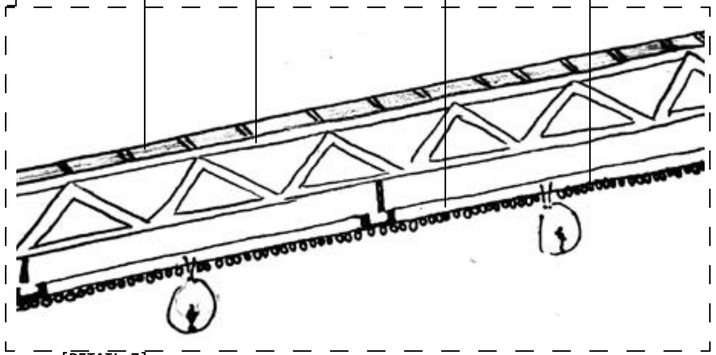


Fig 6.5.N: **[DETAIL 7]** Suspended acoutsic ceiling (Author, 2021)

Figure 6.6.A show the main gathering space. When visitors approach the Pilot's Hub, they enter into the main gathering space (placed between the two buildings) and from there on, they have the freedom of taking any path they want. This central space forms the hierarchy of the design layout as it becomes the place where both pilot and visitor can interact with one another, and it forms the heart of the design (presented in Figures 6.6.B and 6.6.C).

Both visitors and pilots/ students will experience a sense of freedom of movement. Each path is chosen, leads to a specific destination, just like a pilot forms his routes toward a specific place whilst still being able to experience that sense of 'freedom'.

In terms of vertical circulation, figure 6.6.D show the idea of "taking flight". They enter into a horizontally focused scene, when they get to the central gathering space, they experience this immediate sense of vertical hierarchy when looking up to the fabric pergolas. Walking further toward the viewing towers, the ground level elevates into the air, as if taking off. Until finally reaching the endpoint where they can climb up the towers and become part of that full 360-degree view that the vertical circulate creates.

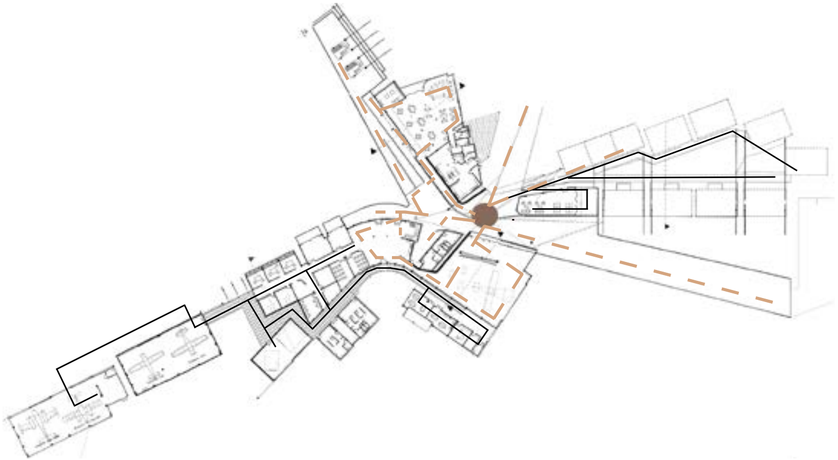


Fig 6.6.A: Circulation (Author, 2021)

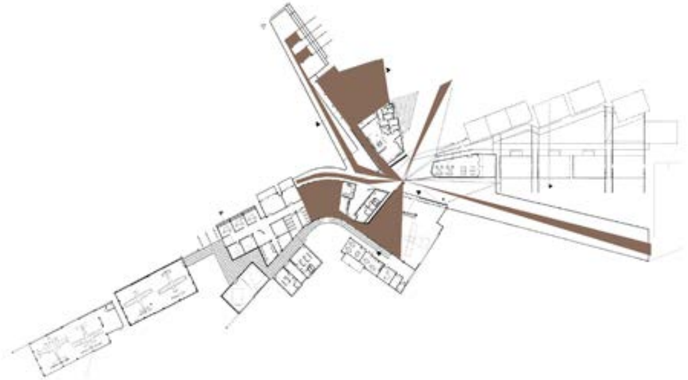


Fig 6.6.B: Circulation for the public (Author, 2021)

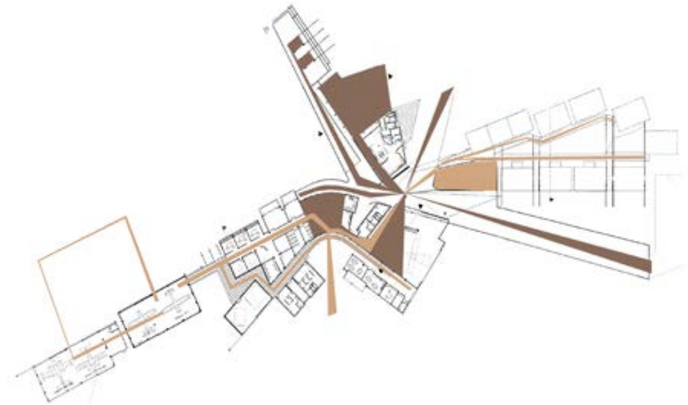


Fig 6.6.C: Circulation for the pilots/ students (Author, 2021)

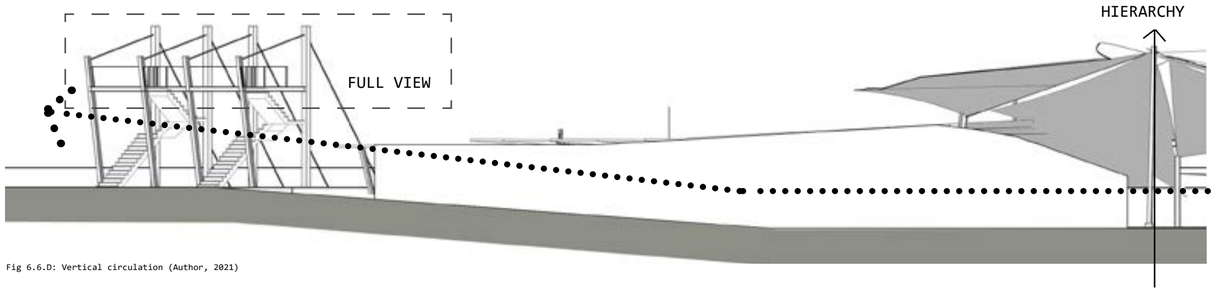
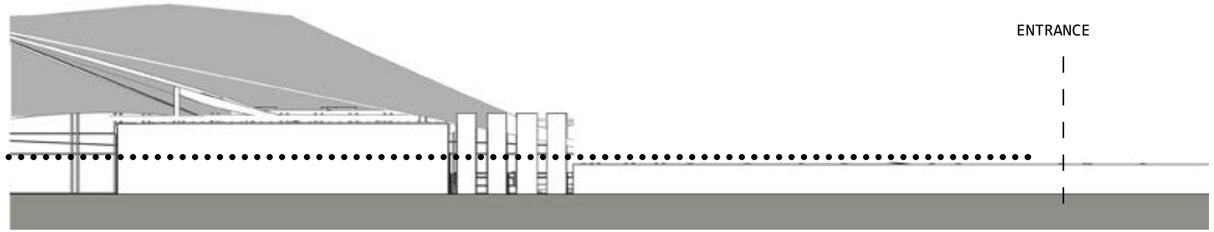


Fig 6.6.D: Vertical circulation (Author, 2021)



6.7 OTHER SERVICES

Figure 6.7.A show the fire exits:

Fire hydrants will also form an integral part of service supply.

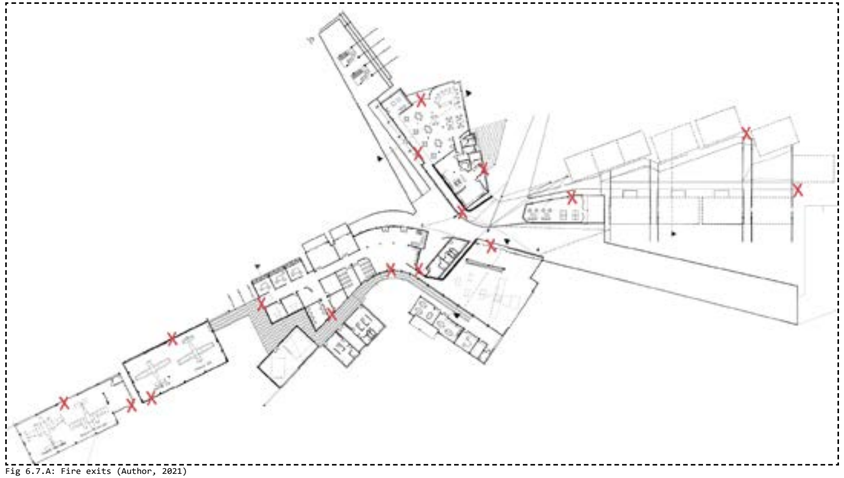


Fig 6.7.A: Fire exits (Author, 2021)

Figure 6.7.B show the placing of the water tanks (explained in 6.3).

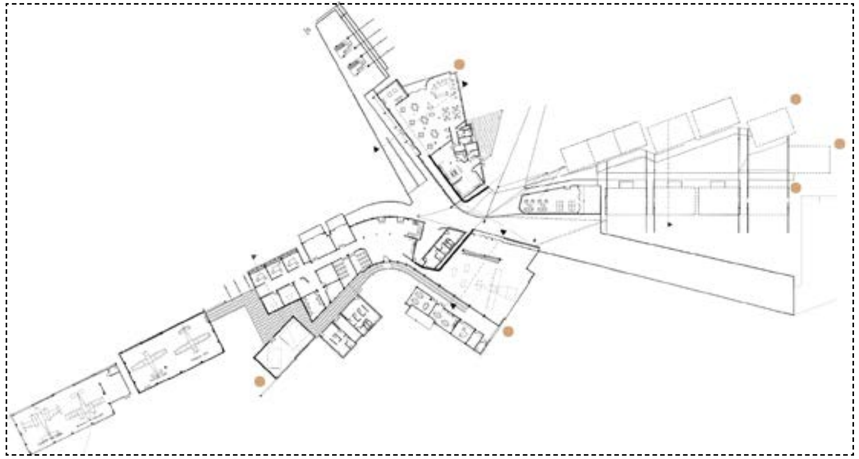


Fig 6.7.B: Water harvesting tanks layout on plan (Author, 2021)

Figure 6.7.C show the various parking layout where wheelchair parking is also accommodated.

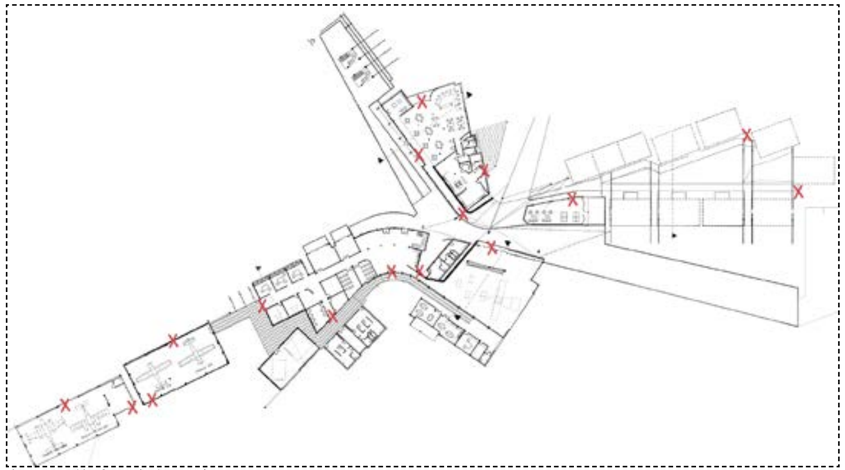


Fig 6.7.C: Parking layout (Author, 2021)

6.8 CONCLUSION

In conclusion, the final design synthesis (uncovered in Chapter 5) is made up of a set of technical explored elements. These elements portray possibilities that show the building's response to climate, site, vegetation, and design techniques. By responding to these topics, one immediately starts to solve any unresolved issues.

This chapter helped me deepen my thought process by thinking about the best systems and construction techniques that should be used for the build of the Pilot's Hub.

07

reflection & conclusion

Reflecting on the final year, the entire process taught me that: **perseverance is key**.

During the various stages of the design development process, each stage revealed something new about the project. The project started with a personal interest in the topic of aviation and aerodynamics. From the start, my goal was to incorporate aerodynamics into the design of the building that will reveal something new and existing.

The process started with the touchstone: Personally, the touchstone revealed that exact representation of the integration of standardised elements and ‘poetical intervention’.

Thereafter, a site visit took place that allowed me to take a closer look at how this touchstone could be incorporated into the landscape. Surprised by the Pioneers of Aviation Museum, I realised how important it was to preserve the memory of this Museum that will allow other people to also experience that feeling of the historical site. The site gave me that immediate realisation of working with the 360-degree view offered. I also found the close connection with the Kimberley Airport interesting and knew that the existence thereof could lead to more possibilities in the design of the proposed Pilot’s Hub.

Back in Bloemfontein, the process of deciding upon three concepts was a battle at first. To decide upon my three concepts, I started thinking back on the landscape and the possibilities that it could bring. The three concepts chosen, helped to enhance and develop my thought process on the compilation of a kit of parts.

Thereafter, the process went from concept to form giving. With so many ideas in mind, the first layout proposal reflected very little of the idea of ‘openness’, view, and movement. After the first external review, a total shift in mindset took place which led me to a much-improved layout proposal that links with the idea of movement, views, and communication with the landscape.

The design development process left me facing many challenges and changes that exposed both my strengths and weaknesses. During this process, I found that my strength lies in good research and an in-depth understanding of the topic. Furthermore, looking at the practical exploration of the design in terms of structure and necessary facilities caused me to limit myself with the idea of “explorative” thinking.

During the course of uncovering my thesis, I realised how important it is to have a strong theoretical discourse to allow the exploration of a wide range of possibilities within the design process. My theoretical approach toward designing the Pilot’s Hub helped me to make use of specific elements, uncovered within the discourse, within the design that forced me to think about the finer details.

In terms of the upcoming final examination, I want to prepare my design even more by working with finer detail therefore, I will allow minor changes to be made

The Readable Perspective introduced the reader to the aims of the Pilot’s Hub that focus on the importance of re-establishing the aviation community and making use of the historical site to show the transition from that what once existed to the “new” representation thereof.

The Memorable Perspective proposed various ideas that focus on standardisation and the implementation of my “kit of parts”/ “design tools” to become a form of “poetry”. Lastly, the Writable Perspective reflects that feeling which I aimed to create.

WORKS CITED

ACSA, 2019. MANUAL OF PROCEDURES FOR WORKING AIRSIDE FOR REHABILITATION OF TAXIWAYS AT O.R TAMBO INTERNATIONAL AIRPORT. South Africa: ACSA. Available from: https://www.airports.co.za/Documents/Volume%205%20Procedure%20for%20working%20Airside.pdf

Aeronautical Radio, Inc. (ARINC), 2021. FAKM - Kimberley Airport | SkyVector. [online]. Skyvector.com. Available from: <https://skyvector.com/airport/FAKM/Kimberley-Airport> [Accessed 1 September 2021].

AIP South Africa, 2021. Aerodromes. [pdf]. AIP South Africa. Available from: http://www.caa.co.za/Aeronautical%20Information%20Publication/Aerodromes.PDF [Accessed 15 July 2021].

Alexander, M., 2021. South Africa's weather and climate - South Africa Gateway. [online]. South Africa alexanderfontein. Available from: <https://southafrica-info.com/land/south-africa-weather-climate/> [Accessed 21 September 2021].

Allen, G. 2010. Do Daniel Libeskind's Awesome Machines Mean I Have To Stop Hating His Work? – greg.org. [online]. lunderGreg.org. Available from: <https://greg.org/archive/2010/08/28/do-daniel-libeskinds-awesome-machines-mean-i-have-to-stop-hating-his-work.html> [Accessed 22 May 2021].

Atlas, 2018. Dulles International Airport by Eero Saarinen & Associates (280AR) — Atlas of Places. [online] Atlasofplaces.com. Available from: <https://www.atlasofplaces.com/architecture/dulles-international-airport/> [Accessed 25 May 2021].
Aedo, S., 2014. *RP House / CMA Arquitectos*. [online] ArchDaily. Available at: <https://www.archdaily.com/629453/rp-house-cma-arquitectos?ad_medium=gallery> [Accessed 9 October 2021].

Aviation Central, 2021. M.J.L Weston Archives - Aviation Central. [online] Aviation Central. Available at: <https://www.aviationcentral.co.za/tag/m-j-l-weston/> [Accessed 6 October 2021].

Brooke, 2014. A Sneak Peek at The DoSeum, San Antonio's New Children's Museum. [online] AlamoCityMoms. Available at: <https://alamocitymoms.com/in-and-around-san-antonio/things-to-do/a-sneak-peek-at-the-do-seum-san-antonios-new-childrens-museum/> [Accessed 3 October 2021].

Braas, N. 2014. Nico Braas Collection. Portland: 1000aircraftphotos. Available at: https://1000aircraftphotos.com/Contributions/Braas/12378.htm [Accessed 1 October 2021].

Butt, C. 2016. San Antonio Children's DoSeum. [online]. Texas: Lake, Flato. Available at: https://www.lakeflato.com/civiccultural/san-antonio-childrens-doseum/ [Accessed 14 July 2021].
Beneš , Michl, 2021. *ATR Cockpit Procedure Trainer | Czech Aviation Training Centre*. [online] Catc.cz. Available at: <https://www.catc.cz/en/atr-cockpit-procedure-trainer/> [Accessed 5 October 2021].

CapeFarmMapper, 2021. Map of Kimberley. South Africa. Available at: https://gis.elsenburg.com/apps/cfm/ [Accessed 15 September 2021].

CessnaAircraftCompany, 2009. Cessna 172 vs Cessna 182 – The Ultimate Buyers Guide. [online] AeroAvion. Available at: <https://www.aeroavion.com/cessna-172-vs-cessna-182-ultimate-buyers-guide/> [Accessed 5 October 2021].

Charleson, A. 2014. *Structure as Architecture: A Source Book for Architects and Structural Engineers*. 2nd ed. London: Routledge.

Christie, H. 2020. Aircraft Propeller Basics | Southern Wings. [online]. Southern Wings. Available from: <https://www.southernwings.co.nz/aircraft-propeller-basics/> [Accessed 22 May 2021].

City of Kimberley, 1994. City of Kimberley Zoning Bylaw. [pdf]. Kimberley. Available at: https://kimberley.civicweb.net/filepro/document/1467/2017-09-26_Bylaw1850_Zoning_Consolidated.pdf?handle=72295DF1857D4E3B9A0EE1B9B2CB0B5A [Accessed 23 Jul. 21].

Civil Aviation Authority, 2017. *Aeronautical Information Package: General*. South Africa.

Coury, C., 2020. What are the Types of Suspended Acoustic Ceilings?. [online] 9Wood. Available at: <https://www.9wood.com/blog/what-are-the-types-of-suspended-acoustic-ceilings/> [Accessed 11 October 2021].

Cranbrook Academy of Art, 2021. Three Lessons in Architecture: The Machines - Libeskind. [online]. Libeskind. Available from: <https://libeskind.com/work/cranbrook-machines/> [Accessed 22 May 2021].

CWRoofing, [n.d.]. Corrugated Metal Roofing | CW Roofing & Construction | Wise County, TX. [online] CW Roofing & Construction. Available at: <https://cwroofingdfw.com/corrugated-metal-roof/> [Accessed 3 October 2021].

Dandelion, 2021. How Geothermal Heating & Cooling Works - Dandelion Energy. [online] Dandelion Energy. Available at: <https://dandelionenergy.com/how-geothermal-works> [Accessed 11 October 2021].

Dehghan, Y. 2018. *A VISUAL ANALYSIS OF LIBESKINDS ARCHITECTURE: DESCRIPTION OF SELECTED BUILT WORKS*. Thesis (MArch). Middle East: Middle East Technical University.

Derun, 2021. Corten steel. [online] Derunmetal.com. Available at: <https://www.derunmetal.com/Corten-Steel-Suppliers-Near-Me-Corten-steel-price-list-pd44860273.html> [Accessed 9 October 2021].

DIY, 2021. What Is Laminate Wood? | Cut The Wood. [online] Cut The Wood. Available at: <https://cutthewood.com/diy/what-is-laminate-wood/> [Accessed 9 October 2021].

Education, 2021. Dulles International Airport. [online] User.eng.umd.edu. Available from: <https://user.eng.umd.edu/~austin/ence353.d/lecture-material2021/Dulles-Airport-Cable-Structure-Eero-Saarinen.pdf> [Accessed 26 May 2021].

Fowler, P. 2008. Biplane taking off. [online]. China: HPC. Available at: https://www.hpcbristol.net/visual/ru-s022 [Accessed 6 October 2021].

Goodall, M., n.d. Paterson biplane. [online] Flyingmachines.ru. Available at: <https://flyingmachines.ru/Site2/Crafts/Craft28459.htm> [Accessed 9 October 2021].

Google Earth, 2021. Google Earth perspective view. [online]. Available at: https://satellite-map.gosur.com/

Historical Society of Kimberley and the Northern Cape, [n.d.]. Pioneer of Aviation Museum. Unpublished document. Kimberley: Historical Society of Kimberley and the Northern Cape.

ICAO CAIRO, 2017. Overview ICAO Standards and Recommended Practices for Aerodrome Safeguarding. South Africa: ICAO CAIRO
International Civil Aviation Organisation. 2005. Aerodrome Design Manual: Taxiways, Aprons and Holding Bays. [9157] AN/901. Available from: https://skybrary.aero/bookshelf/books/3090.pdf [Accessed 29 July 2021].

INTERNATIONAL CIVIL AVIATION ORGANIZATION, 2018. Aerodrome and design operations: Aerodromes. Annex 14 (Ed. 18). South Africa. Available from: https://www.iacm.gov.mz/app/uploads/2018/12/an_14_v1_Aerodromes_8ed._2018_rev.14_01.07.18.pdf [Accessed 27 July 2021].

Ioannidou, E. 2010. Humanist machines: Daniel Libeskind's "Three Lessons in Architecture". [online]. Semanticscholar.org. Available from: <https://www.semanticscholar.org/paper/Humanist-machines%3A-Daniel-Libeskind%E2%80%99s-%E2%80%9CThree-in-Ioannidou/4d7aad6b54d2683eaffae6ccd8423c49ddc12274#references> [Accessed 22 May 2021].

Jen, J. 2011. Washington Dulles International Airport, Eero Saarinen (1962). [online]. Jasonjen89's Blog. Available from: <https://jasonjen89.wordpress.com/2011/01/21/dulles/amp/> [Accessed 24 May 2021].

Kaim, D., 2021. Laminated Glass vs. Tempered Glass - What's the Difference?. [online] Thomasnet.com. Available at: <https://www.thomasnet.com/articles/custom-manufacturing-fabricating/laminated-glass-vs-tempered-glass/> [Accessed 9 October 2021].

Kung, E., 2021. Fuel Management. [online] Aviation.govt.nz. Available at: <https://www.aviation.govt.nz/assets/publications/gaps/caa-gap-fuel-management-web.pdf> [Accessed 6 October 2021].

Le Corbusier, 1923. *Towards a new architecture*. Translated by Etchells, F. 1986. Mineola: New York.

Le Corbusier, 1954. *The Modular: A harmonious measure to the human scale*. Washington: Library of Congress.

Lehman, M.L. 2011. How sensory design brings value to buildings and their occupants. *Intelligent Buildings International*, 3 (1), pp. 46-54. DOI: 10.3763/inbi.2010.0011

Lehman, M.L., [n.d.]. What makes poetics architecture?. *Maria Lorena Lehman* [online]. Available from: *https://www.marialorenalehman.com/blog/what-makes-poetic-architecture/*

Lemons, S., 2021. *Westline Training*. [online] WestlineAviation. Available at: <https://www.westline.co.za/> [Accessed 6 October 2021].

Libeskind, D. 1992.*Countersign*. Rizzoli

Libeskind, D. 1994. *Radix-Matrix*. New York: Prestel

Libeskind, D. 2000. *The Space of Encounter*. Universe Publication.

Lippsmeier, G. 2018. Centring Africa: Postcolonial Perspectives on Architecture. [online] E-flux.com. Available from: <https://www.e-flux.com/announcements/195657/centring-africa-postcolonial-perspectives-on-architecture/> [Accessed 26 May 2021].

Lucas, J. 2015. What Is Aerodynamics?. [online]. Livescience. Available from: <https://www.livescience.com/47930-what-is-aerodynamics.html> [Accessed 20 May 2021].

Lund, N. 2020. The Top 5 Training Aircraft. [online]. Globalair. Available from: <https://blog.globalair.com/post/2020/10/01/the-top-5-training-aircraft2> [Accessed 20 May 2021].

Lunderstedt, S. 1966. Pioneers of Aviation Museum. Unpublished document. Kimberley: Historical Society of Kimberley and the Northern Cape.

Maden, F. 2008. Between deconstructivist architecture and hyper-historicism: Daniel Libeskind and Turkish architects. Thesis (March). Izamir: Graduate School of Engineering and Sciences of Izmir Institute of Technology.

McGregor, 2021. Pioneers of Aviation Museum in Kimberley, Northern Cape. [online]. Sa-venues. Available from: <https://www.sa-venues.com/things-to-do/northerncape/pioneers-of-aviation-museum/> [Accessed 25 February 2021].

MPS, 2021. *FSTD Technical Manual: Site preparation and requirements*. [pdf]. Hong Kong: MPS

Musson, S., Niemann, A. 2021. 43 Air School. [online] South Africa: Port Alfred. Available at: <https://www.43airschool.com/breaking-aviation-news-43-air-school-acquires-stake-in-ptc-aviation/> [Accessed 1 October 2021].

Naude, X. 2021. Frozen Airline Transport Pilot Licence, Grade 2 Instructor). Personal interview about aspects of flight training. Pretoria, 6 May.
Naude, X., 2021. Xane Naude.[online]. Available at: https://www.instagram.com/xane_naude/ [Accessed at 23 Jul. 21].

Naughton, L. 2012. Lady Heath and South African Aviation History. [online]. South Africa: PE. Available at: http://ladyicarus.blogspot.com/2012/12/lady-heath-and-south-african-aviation.html [Accessed 6 October 2021].

NASM Explainer, 2014. How does the tail of an airplane help it during flight? | How Things Fly. [online]. Howthingsfly.si.edu. Available from: <https://howthingsfly.si.edu/ask-an-explainer/how-does-tail-airplane-help-it-during-flight> [Accessed 22 May 2021].

Nerlinger, H., 2021. Alsim - AL250 Virtual Tour. [online] Alsim.com. Available at: <https://www.alsim.com/cms/wp-content/themes/alsim/assets/alsim_vr/alsim_al250/index.html> [Accessed 5 October 2021].

Niemann, A., Westoby, W., 2021. PTC Aviation. [online] South Africa: Port Alfred. Available at: http://www.ptcaviation.co.za/our-team/ [Accessed 1 October 2021].

Oechslin, W., Wang, W. 1987. Assemblage. *Les Cinq Points d'une Architecture Nouvelle*, 41 (4), pp. 82-93. doi.org/10.2307/3171037

Ott, C., 2021. Nordeste Curuguaty Offices / Mínimo Común Arquitectura. [online] ArchDaily. Available at: <https://www.archdaily.com/956884/nordeste-curuguaty-offices-minimo-comun-arquitectura> [Accessed 2 October 2021].

Pastor, C.E. 2014. *Allegory as language: Narration and representation in the work of Daniel Libeskind*. Expression grafica arquitectonica, 10, pp. 126- 137. doi: 10.495/ega.2014.2174

Pavka, E. 2001. AD Classics: Jewish Museum, Berlin / Studio Libeskind. [online]. ArchDaily. Available from: <https://www.archdaily.com/91273/ad-classics-jewish-museum-berlin-daniel-libeskind> [Accessed 23 May 2021].

Peltier, J. [n.d.]. Piper PA-34 Seneca: One of the Last of It's Kind. [online]. Curimedia Photography. Available at: https://disciplesoflight.com/piper-pa-34-seneca/ [Accessed 1 October 2021].

Pretorius, D., 2021. Kitty Hawk Aerodrome. [online] Fakt.co.za. Available at: <http://www.fakt.co.za/airfield_info.html> [Accessed 6 October 2021].

ProffesionalAviationServices, 2019. Our History. [online] Wonderboom National Airport. Available at: <https://www.wonderboomairport.co.za/?page_id=158> [Accessed 6 October 2021].

PTC Aviation, 2021. Home - PTC Aviation. [online]. PTC Aviation. Available from: <http://www.ptcaviation.co.za/> [Accessed 1 September 2021].

Raman, P.G. 2009. *Integrating research, practise and teaching*. Unpublished document. Johannesburg: University of Johannesburg.

Rodrigue, J., Notteboom, T., 2021. *3.1* – Transportation and Economic Development | The Geography of Transport Systems. [online]. Transportgeography.org. Available from: <https://transportgeography.org/contents/chapter3/transportation-and-economic-development/> [Accessed 14 July 2021].

SACAA, 2021. SACAA. [online]. South Africa: Civil Aviation Authority. Available from: <http://www.caa.co.za/Pages/Default.aspx> [Accessed 23 August 2021].

SANS, 2021. SANS 10400 | Insulpack. [online] Insulpack.co.za. Available at: <https://insulpack.co.za/sans-10400/> [Accessed 10 October 2021].

Schmidt, S., Pinheiro, D., le Roux, F. (Ed). 2013. ***Architective.*** **Johannesburg: Architective Publications.**

Schafer, D. 2018. Animals. [online]. South Africa: Facebook. Available at: https://www.facebook.com/AlexandersfonteinGameFarm/ [Accessed 7 October 2021].

Seamon, D. 1993. Catalonian Landscape. In: Norberg-Schulz, C. (Ed.). *Dwelling, Seeing, and Designing: Toward a Phenomenological Ecology*. New York: State University of New York Press, pp. 165.

SkyTime, 2021. Routes: Kimberley Airport. Springs Airfield, [online]. Gauteng: SkyTime. Available at: <https://sky-time.co.za/routes/> [Accessed 1 October 2021].

Sol Plaatje Municipality, 2020. Integrated Development Plan (IDP). [pdf]. Sol Plaatje Municipality. Available at: http://www.solplaatje.org.za/CityManagement/Reporting/IDP/Final%20Adopted%20IDP%202021-2022.pdf [Accessed 23 Jul. 21].

South Africa. 1998. *National Environmental Management Act,* Act 107 of 1998. Cape Town: Office of the president.

South Africa. 2009. *Civil Aviation Act, Act 13 of 2009*. Pretoria: Government Printer.

SOUTH AFRICAN CIVIL AVIATION TECHNICAL STANDARDS, 2011. Civil Aviation Regulations: Civil Aviation Technical Standards. South Africa. Available from: http://www.caa.co.za/Legal%20Documents/SACATS_2011.pdf [Accessed 28 July 2021].

South African Model Aircraft Association. 2012. *Operations Manual*. [pdf]. South Africa: SAMAA

Southard, R.L. 2015. Postmodernisms: Theories and Analyses of Architecture II | Design versus Non-Design: Agrest's Alternative Proposition. [online]. Blogs.cornell.edu. Available from: <https://blogs.cornell.edu/arch5302sp15/2015/03/17/design-versus-non-design-agrests-proposition-of-an-alternative/> [Accessed 24 May 2021].

Studio Libeskind,[n.d]. Imperial War Museum North | Studio Daniel Libeskind - Arch2O.com. [online] Arch2O.com. Available at: <https://www.arch2o.com/imperial-war-museum-north-studio-daniel-libeskind/> [Accessed 9 October 2021].

STL, 2020. *43 Air School: Next generation training*. [pdf]. 43 Air School. Available from: <https://www.43airschool.com/wp-content/uploads/2021/06/General-Info-Brochure.pdf/> [Accessed 1 September 2021].

Stroh, L. 2017. Obstacles. [online]. South Africa: Civil Aviation Authority. Available from: http://www.caa.co.za/Safety%20Seminars%20and%20Presentations/Obstacles.pdf [Accessed 23 Aug. 21].

StructureCraft, 2019. North Surrey Sports & Ice Complex. [online]. StructureCraft Builders. Available from: <https://structurecraft.com/projects/north-surrey-sport-and-ice-complex> [Accessed 27 May 2021].

Sveiven, M. n.d. AD Classics: Dulles International Airport / Eero Saarinen. [online]. ArchDaily. Available from: <https://www.archdaily.com/102060/ad-classics-dulles-international-airport-eero-saarinen> [Accessed 24 May 2021].

Swimmer, L. 2016. San Antonio Children's DoSeum. [online]. Texas: Lake, Flato. Available at: https://www.lakeflato.com/civiccultural/san-antonio-childrens-doseum/ [Accessed 14 July 2021].

Temple, J. 2015. "Big" Aeroplane Safety: A Cessna 340/340A buyer's guide. [pdf]. California: Aircraft Covers. Available at: https://www.jerrytemple.com/wp-content/uploads/2018/11/Big-Airplane-Safety-A-Cessna-340-340A-Buyers-Guide.pdf [Accessed 1 October 2021].

Temple, J., 2021. Cessna Flyer Association - "Big Airplane" Safety: A Cessna 340/340A buyer's guide. [online]. Cessnaflyer.org. Available at: <https://www.cessnaflyer.org/cessna-twins/cessna-340/item/783-big-airplane-safety-a-cessna-340-340a-buyer-s-guide.html> [Accessed 1 September 2021].

TheCoves, 2021. The Coves: The perfect lifestyle for everyone. [pdf]. South Africa. Available at: https://thecoves.co.za/wp-content/uploads/2021/05/a4corporateprofile-thecoves-download.pdf [Accessed 6 October 2021].

TPA, 2004. Print of Filming Take-Off. [online] Media Storehouse Photo Prints. Available at: <https://www.mediastorehouse.co.uk/fine-art-storehouse/hulton-archive-prints/topical-press-agency/filming-take-off-12021192.html?prodid=676#modalClose> [Accessed 11 October 2021].

van der Heijden, J., 2021. Flight Simulators | MPS. [online]. MPS. Available from: <https://www.mps.aero/flight-simulators/?web=1&wdLOR=c6D605447-208A-452B-AE7F-8C65CCBC7A0F> [Accessed 1 September 2021].

Weak, C.T. 2016. *Daniel Libeskind's three lessons in architecture*. UCARE Research (Undergraduate). Nebraska: University of Nebraska-Lincoln.

Weatherspark.com. 2021. Average Weather in Kimberley, South Africa, Year Round - Weather Spark. [online]. Available from: <https://weatherspark.com/y/90479/Average-Weather-in-Kimberley-South-Africa-Year-Round#Sections-Humidity> [Accessed 25 February 2021].

Western Cape Government, 2015. Environmental Affairs & Development Planning: Environmental Impact Assessment. South Africa. Available from: https://www.westerncape.gov.za/eadp/files/atoms/files/EIA_2015.pdf [Accessed 27 July 2021].

Wikipedia, 2020. Dulles International Airport - Wikipedia. [online] En.wikipedia.org. Available from: <https://en.wikipedia.org/wiki/Dulles_International_Airport> [Accessed 25 May 2021].

Windfinder, 2021. Wind and weather statistic Kimberley Airport. [online]. Windfinder.com. Available from: <https://www.windfinder.com/windstatistics/kimberley_airport> [Accessed 21 September 2021].

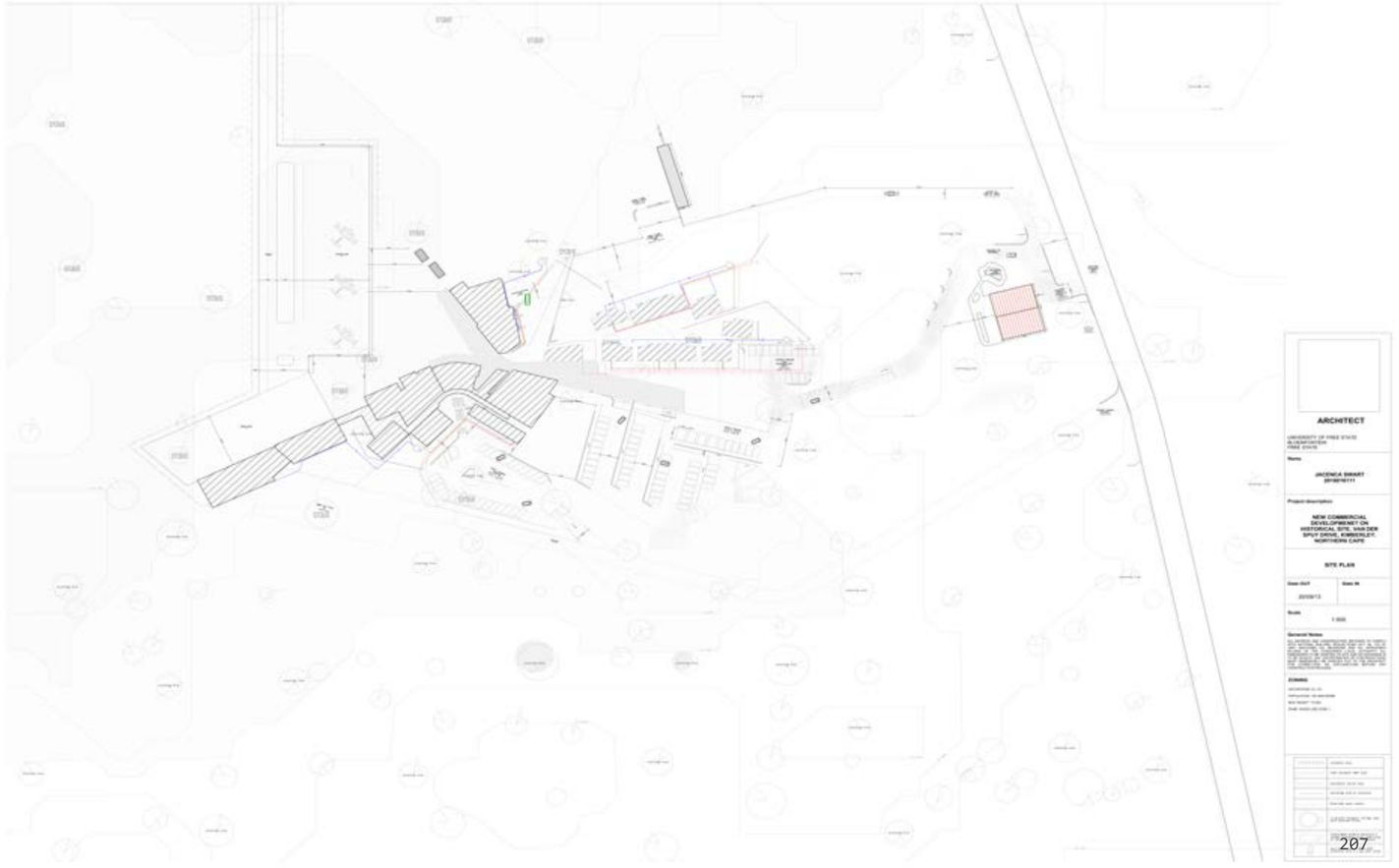
WordPress, 2012. Le Corbusier's Maison Cook. [pdf] n.p.. Available from: https://miriamsarch.wordpress.com/2012/11/17/le-corbusiers-maison-cook/ [Accessed 26 Jul. 21].

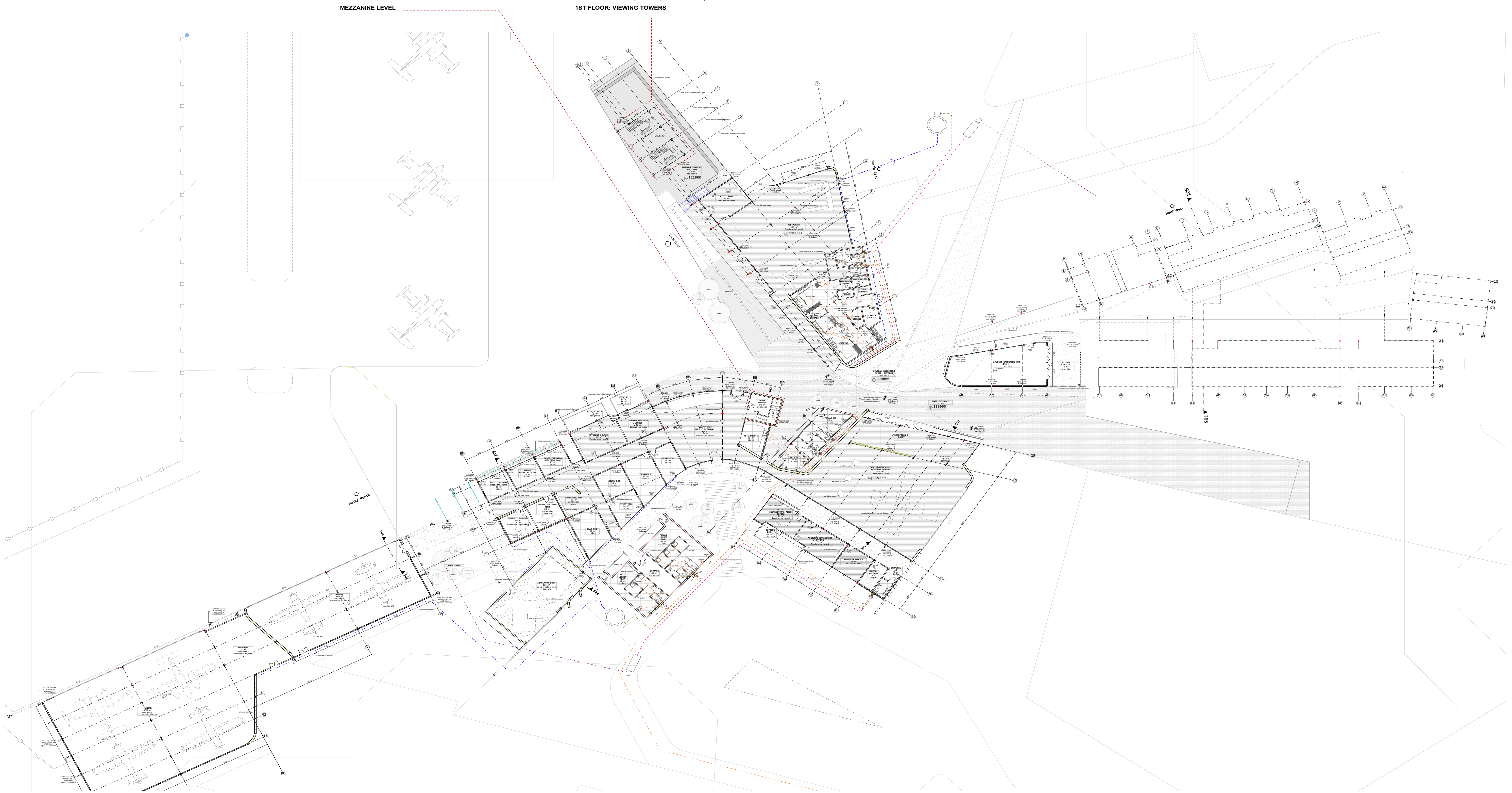
WordPress, 2018. *Le Corbusier's Five Points of Architecture*. [PDF] n.p. Available from: <http://Le Corbusier's Five Points of Architecture> [Accessed 22 May 2021].

Writer, S. 2018. Boeing anticipates massive global demand for pilots – here's how much a licence costs in South Africa. [online]. Businesstech. Available from: <https://businesstech.co.za/news/business/260655/boeing-anticipates-massive-global-demand-for-pilots-heres-how-much-a-licence-costs-in-south-africa/,> [Accessed 20 May 2021].

wtww, n.d. Dulles International Airport. [online] WTTW Chicago. Available from: <https://interactive.wttw.com/tenbuildings/dulles-international-airport> [Accessed 25 May 2021].

ANNEXTURE:
technical documentation





ARCHITECT

UNIVERSITY OF FREE STATE
BLOEMFONTEIN
FREE STATE

Name

JACENCA SWART
2016016111

Project description

NEW COMMERCIAL DEVELOPMENET ON HISTORICAL SITE, VAN DER SPUY DRIVE, KIMBERLEY, NORTHERN CAPE

OVERALL GROUND FLOOR PLAN

Date OUT	**Date IN**
21/11/30	

Scale 1:200

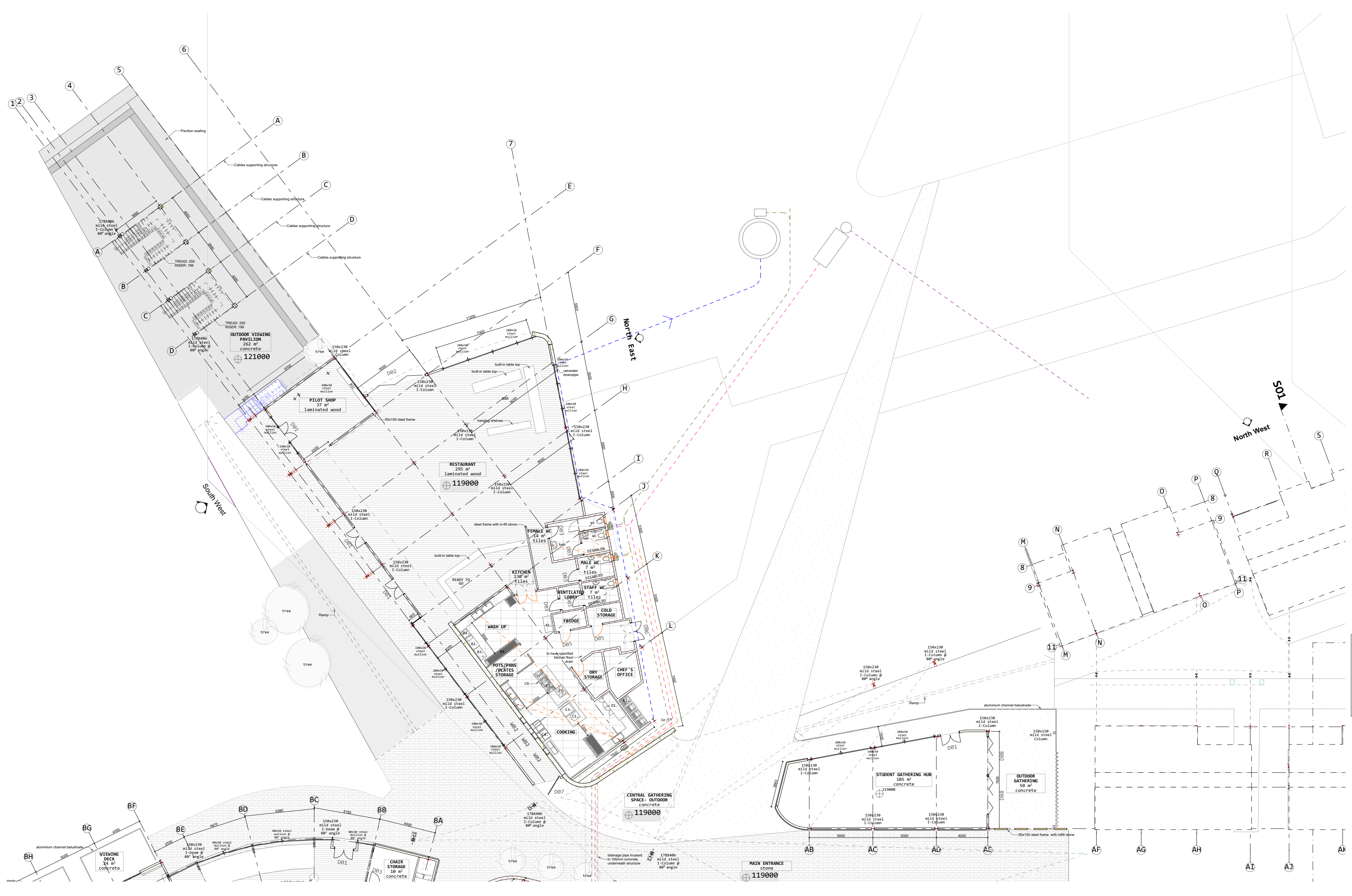
General/ Notes

ALL MATERIAL AND CONSTRUCTION METHODS TO COMPLY WITH NATIONAL BUILDING REGUALTIONS (ACT No. 103 OF 1997) INCLUDING ALL REVISIONS AND ALL APPLICABLE BYLAWS OF THE CONCERNED LOCAL AUTHORITY ALL DIMENSIONS TO BE VERIFIED ON SITE AND NO DRAWINGS IS TO BE SCALED. ANY DISCREPANCIES OR CONTRADICTIONS MUST IMMEDIATELY BE POINTED OUT TO THE ARCHITECT FOR CORRECTION OR EXPLANATIONS BEFORE ANY CONSTRUCTION PROCEED.

KITCHEN INFORMATION:

A] RECEIVING AREA		
A1.	SPLASH BACK TABLE	600 x 1800
A2.	3 SHELVES STAINLESS STEEL TROLLEY	600 x 1800
B] WASH UP		
B1.	SINGLE BOWL DISHWASHER INLET SINK	560 x 600
B2.	SINGLE BOWL DISHWASHER OUTLET SINK	1100 x 600
B3.	STAINLESS STEEL DIRTIES TABLE	1000 x 550
B4.	RACK	3000 x 495
C] COOKING		
C1.	1 KW STEAMCLUB PLUS, BOILERLESS STEAMER	533 x 610
C2.	AEG FULL GAS STOVE/OVEN	960 x 700
C3.	ELECTRIC FRY-TOP CHROMIUM PLATED, FT-E910 C L	800 x 930
C4.	HIGH SPEED DOUBLE TWIN PAN SMARTCHEF FRYER HEAVY DUTY 4 X 15LITRE	800 x 825
C5.	INDUCTION COOKING RANGE	800 x 730
C6.	90cm EXTRACTOR FAN- GLASS + STAINLESS STEEL	900 x 700
D] COLD PREPERATION		
D1.	2240 S/STEEL UNDERCOUNTER REFRIGERATOR	2240 x 700
E] DISPOSAL		
E1.	PLASTIC DISPOSAL BIN	720 x 580

rainwater pipe
25mm rainwater HDPE pipe
wastewater outlet pipe
discharge pipe to courtyard
Municipal water supply
in-ground rainwater storage tank with attached filter
3790x1200mm BioRock Monoblock-3 sewage treatment plant comprising of primary tank and bioreactor
each WC to have a 100mm UPVC stubstack with a 2 way vent valve



SEGMENT OF GROUND FLOOR PLAN THAT INCLUDE MAIN ENTRANCE AND MUSEUM
SCALE 1:100

ARCHITECT

UNIVERSITY OF FREE STATE
BLOEMFONTEIN
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Name

JACENCA SWART
2016016111

Project description

NEW COMMERCIAL DEVELOPMENET ON HISTORICAL SITE, VAN DER SPUY DRIVE, KIMBERLEY, NORTHERN CAPE

SEGMENT OF FLOOR PLAN

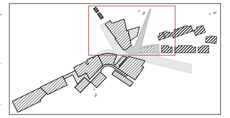
Date OUT	Date IN
21/11/30	

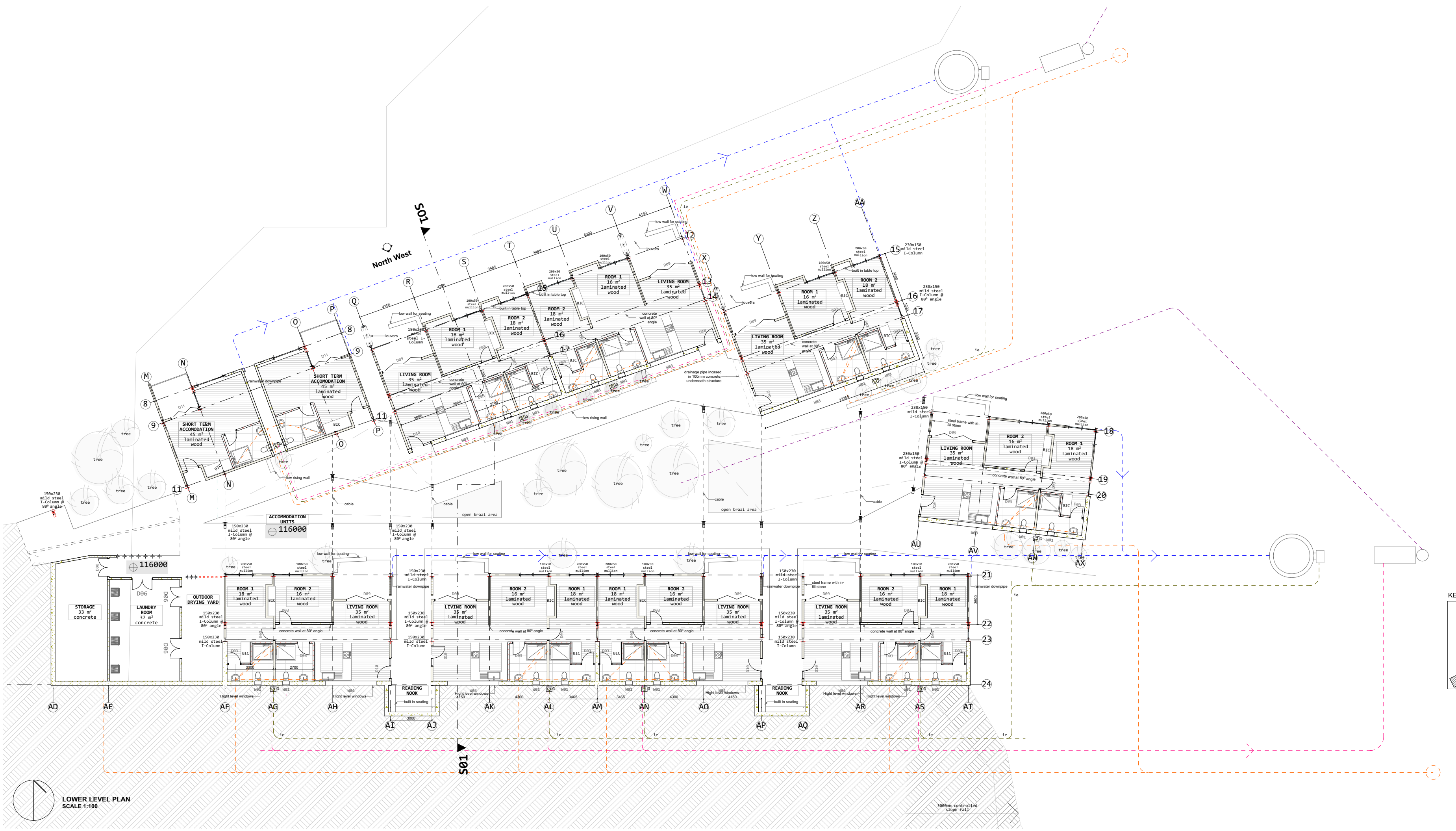
Scale 1:100

General/ Notes

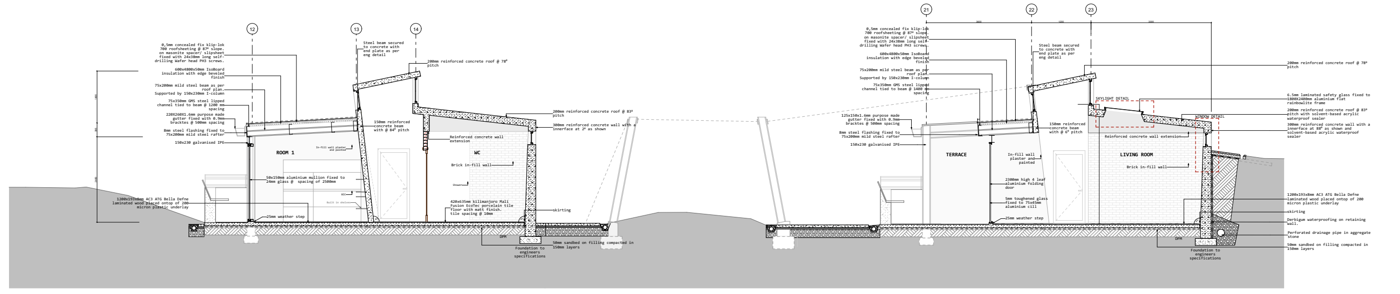
ALL MATERIAL AND CONSTRUCTION METHODS TO COMPLY WITH NATIONAL BUILDING REGUALTIONS (ACT No. 103 OF 1997) INCLUDING ALL REVISIONS AND ALL APPLICABLE BYLAWS OF THE CONCERNED LOCAL AUTHORITY ALL DIMENSIONS TO BE VERIFIED ON SITE AND NO DRAWINGS IS TO BE SCALED. ANY DISCREPANCIES OR CONTRADICTIONS MUST IMMEDIATELY BE POINTED OUT TO THE ARCHITECT FOR CORRECTION OR EXPLANATIONS BEFORE ANY CONSTRUCTION PROCEED.

KEY PLAN:

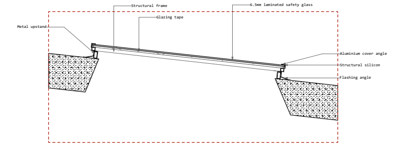




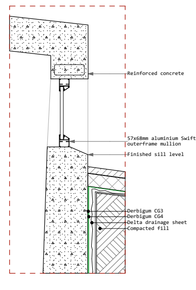
LOWER LEVEL PLAN
SCALE 1:100



SECTION 01
SCALE 1:50



SKYLIGHT DETAIL
SCALE 1:10



WINDOW DETAIL
SCALE 1:10

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NEW COMMERCIAL DEVELOPMENET ON HISTORICAL SITE, VAN DER SPUY DRIVE, KIMBERLEY, NORTHERN CAPE

BASEMENT PLAN; SECTION 01; DETAILS

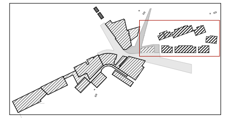
Date OUT	Date IN
21/11/30	

Scale 1:100; 1:50; 1:10

General/ Notes

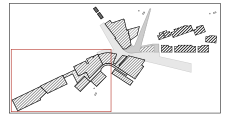
ALL MATERIAL AND CONSTRUCTION METHODS TO COMPLY WITH NATIONAL BUILDING REGUALTIONS (ACT No. 103 OF 1997) INCLUDING ALL REVISIONS AND ALL APPLICABLE BYLAWS OF THE CONCERNED LOCAL AUTHORITY ALL DIMENSIONS TO BE VERIFIED ON SITE AND NO DRAWINGS IS TO BE SCALED. ANY DISCREPANCIES OR CONTRADICTIONS MUST IMMEDIATELY BE POINTED OUT TO THE ARCHITECT FOR CORRECTION OR EXPLANATIONS BEFORE ANY CONSTRUCTION PROCEED.

KEY PLAN:



SEGMENT OF GROUND FLOOR PLAN THAT INCLUDE TRAINING PROGRAMME
SCALE 1:100

KEY PLAN:



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Date OUT 21/11/30
Date IN

SEGMENT OF PLAN

Scale 1:100

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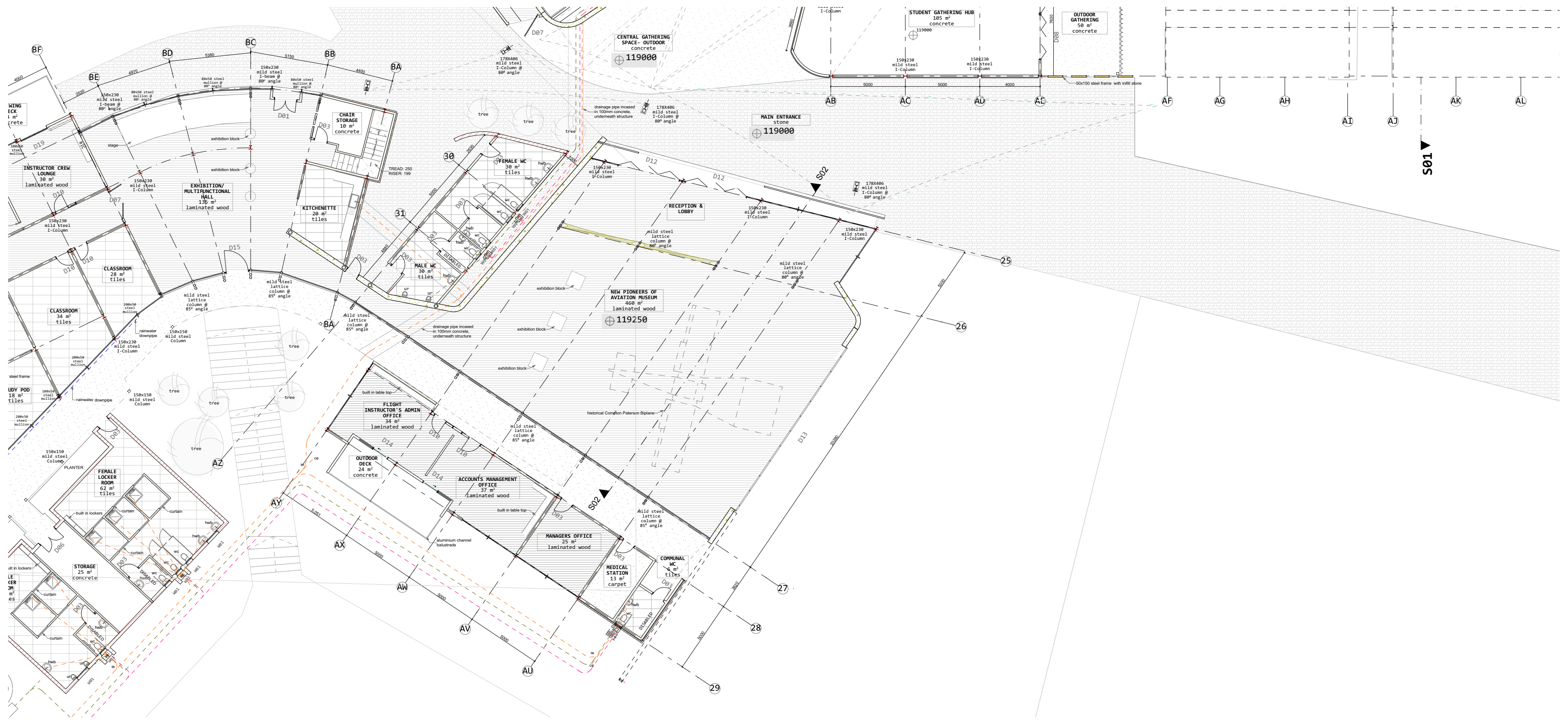
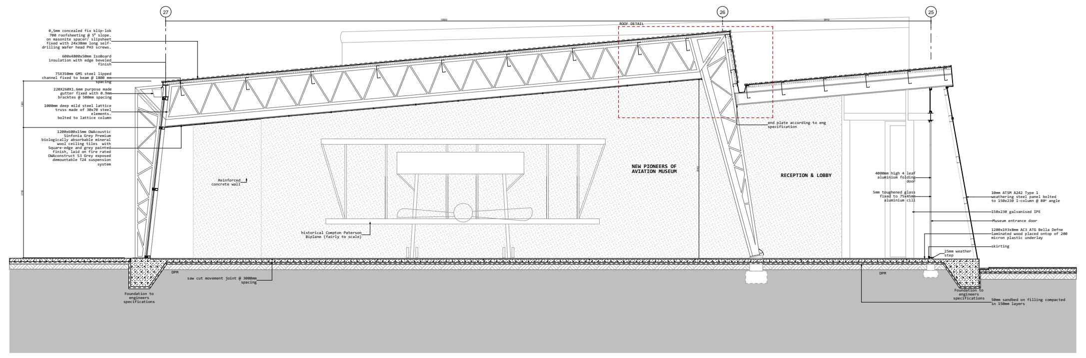
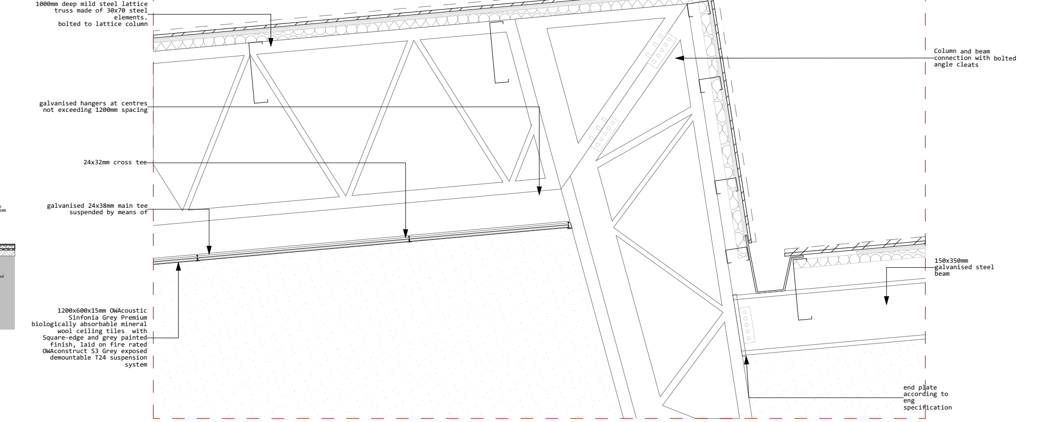
	rainwater pipe
	25mm rainwater HDPE pipe
	wastewater outlet pipe
	discharge pipe to courtyard
	Municipal water supply
	in-ground rainwater storage tank with attached filter
	3790x1200mm BioRock Monoblock-3 sewage treatment plant comprising of primary tank and bioreactor
	each WC to have a 100mm UPVC stubstack with a 2 way vent valve



SEGMENT OF GROUND FLOOR PLAN THAT INCLUDE MAIN ENTRANCE AND MUSEUM
SCALE 1:100



SECTION 02
SCALE 1:50



ROOF DETAIL
SCALE 1:10

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SEGMENT OF FLOOR PLAN; SECTION 02; DETAIL

Date OUT 21/11/30
Date IN

Scale 1:100; 1:50; 1:10

General/ Notes
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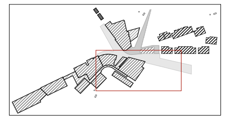
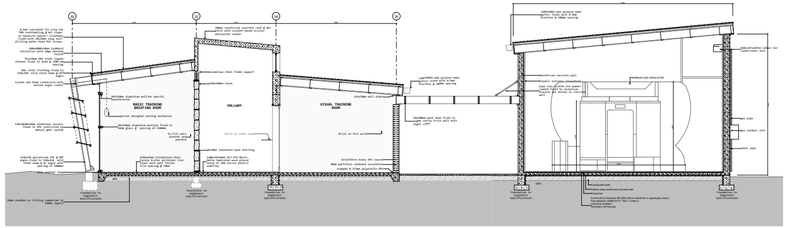
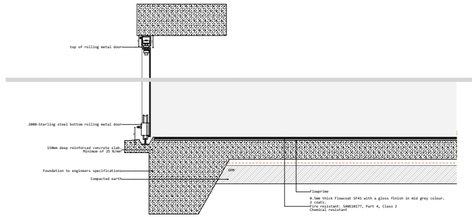
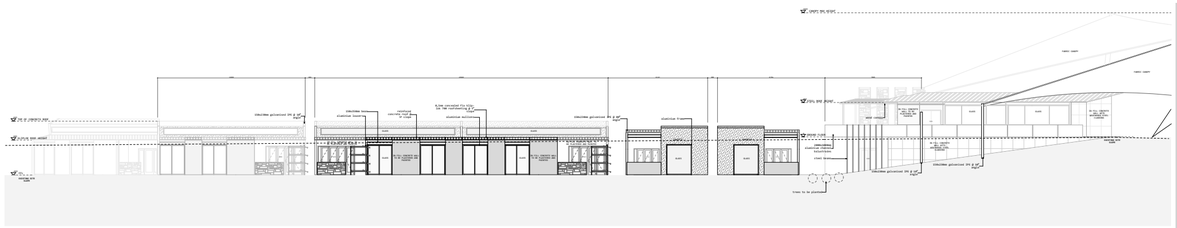




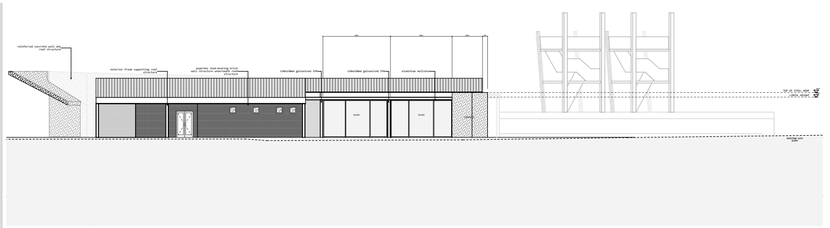
SECTION 03
SCALE 1:50



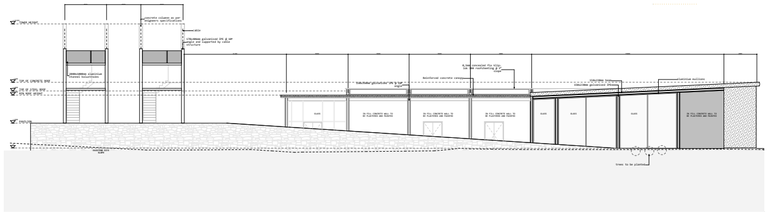
SECTION 04- SHOWING A DETAIL OF THE FLOOR SYSTEM AND DOOR TYPE FOR AIRCRAFT HANGAR CONSTRUCTION
SCALE 1:10



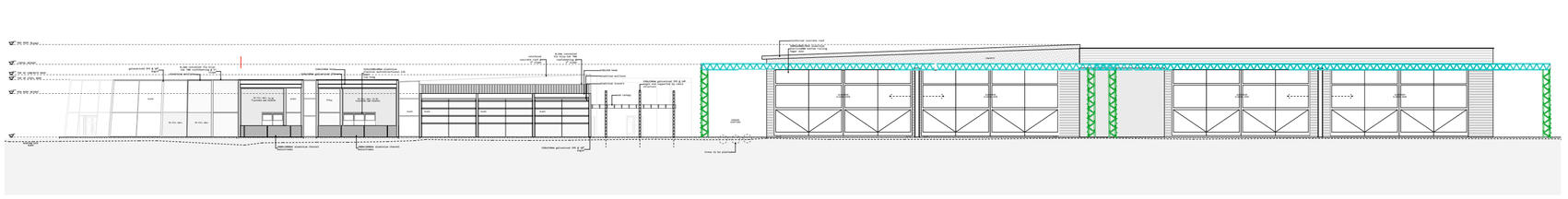
NORTH WEST
SCALE 1:100



NORTH EAST
SCALE 1:100



SOUTH WEST
SCALE 1:100



WEST/ NORTH
SCALE 1:100

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SECTIONS; ELEVATIONS

Date OUT	Date IN
21/11/30	

Scale
1:100; 1:50; 1:10

Generall Notes

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To whom it may concern:

I hereby declare that the architectural thesis entitled: *Pilot's Hub,* by Miss Jacenca Swart has been language edited by me according to the tenets of academic discourse. The final responsibility to implement any suggested language changes resides with the student.

Editor: Laurette Malan (BA Ed, (UP) BA Hons (German) (UP) MPhil (Business Ethics)(UP)

Signature:

Date: 11 October 20 21