
complex projects

TU Delft

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COMPLEX PROJECTS
DESIGN BRIEF P2

Student
Bas Roijers [4643763]

Tutors
Marija Mateljan
Yagiz Soylev

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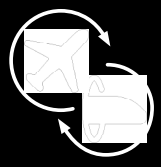

DESIGN BRIEF

PASSENGER TRANSIT: FROM PLANE TO POD

A SPATIAL DESIGN PROPOSAL INVESTIGATING THE EXCHANGE OF PASSENGERS BETWEEN AVIATION AND HYPERLOOP AT BERLIN BRANDENBURG AIRPORT, 2040

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INTRODUCTION

This research investigates the transfer of passengers between intercontinental aviation and the new European Hyperloop system, at Berlin Brandenburg Airport Willy Brandt. If we look at the example of the Hyperloop system specifically, traveling speeds grow exponentially, almost comparable with those of aviation. With new systems integrating into existing infrastructure, we might have to adjust our design approach and solutions regarding passengers transferring between those modes.

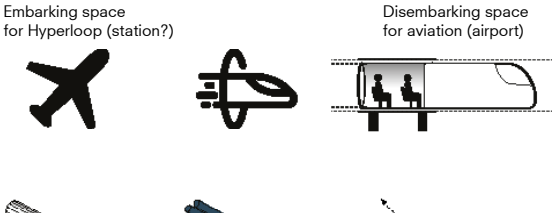

FIG 01: HYPERLOOP - AVIATION TRANSIT SPACE. DOTTED SQUARE INDICATES THE AREA / SPACE / FACILITY THAT DOES NOT EXIST OR IS NOT OPTIMISED FOR AVIATION TO HYPERLOOP TRANSIT

This paper opts to provide a structure to investigate what is 'in between' those transport modes: there where exchange of passengers takes place. [Fig. 01] We achieved great speeds above, and now great speeds below, but what about what happens in between? Do we interrupt those fast transport modes whilst transferring slowly due to the typical waiting time, like we see at airports? [Fig. 02] Or are there new possibilities emerging, taking away unwanted waiting times whilst maintaining the wanted waits?

The problem statement is defined as follows: no transfer connection between aviation and Hyperloop for passengers exists yet, as a direct consequence of the Hyperloop system still being in a rather conceptual design phase. This results in a unique opportunity to develop, conceptualise, investigate and speculate about what an architectural design intervention facilitating passenger transfer looks like. There are barely any design solutions proposed, and they typically do not go in depth regarding previously named issues.

The context of this research is set in the year 2040, with the hypothesis that European flights are largely taken over by high speed rails and the European Hyperloop network.

Ultimately, this leads to the following research question: What does an architectural design proposal facilitating passenger transition between intercontinental aviation and the European hyperloop network look like for the specific case of Berlin Brandenburg Airport?

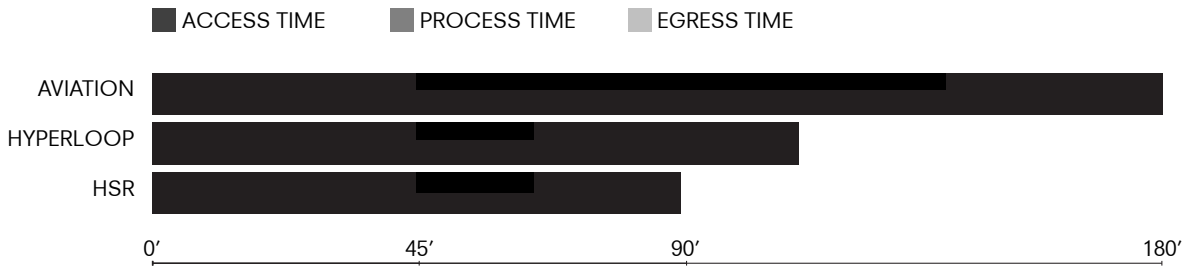

FIG 02: OVERVIEW COMPARISON TOTAL OUT-OF-VEHICLE TIME THREE TRANSPORT MODES

RESEARCH QUESTION

01: What does an architectural design proposal facilitating passenger transition between intercontinental aviation and the European hyperloop network look like at Berlin Brandenburg Airport in 2040?

SUB-RESEARCH QUESTIONS

02: Is there a need to develop a new building type to facilitate passenger exchange between aviation and Hyperloop, or can we use current design solutions used in other transport modes?

03: How does the passenger flow differ from conventional transportation and how should the design proposal anticipate on the differences or similarities?

04: How or should waiting time between the transfers be optimised, when critically looking at the (dis) embarking procedure and sequences?

RESEARCH FRAMEWORK

The airspace in Europe and especially on the flight routes around London - Amsterdam - Frankfurt - Berlin - Istanbul are reaching a problematic density in the near future. Those mainly short haul flights are inefficient and polluting. The increase of aviation will form a bigger and bigger problem as time passes.

As a result, high speed rail systems (HSR) will further develop and grow more popular. New transport systems such as the Hyperloop will compete with HSR and aviation alike, making way for a more sustainable mode of traveling.

Expectedly, the Hyperloop system will mainly develop on an international and European level, and not on an intercontinental level in the foreseeable future. [Fig 04, 05] Based on forecasts regarding passenger demand and feasibility studies a Hyperloop route connecting Amsterdam, Frankfurt and Berlin seems plausible. Aviation remains the dominant transport mode between continents. Consequently, cities with a Hyperloop and important aviation connection will grow into 'gates to Europe'. They collect intercontinental commuters, to then disperse them throughout Europe via the Hyperloop system. The demand for short haul flights is therefore drastically decreasing. [Fig. 03a, 03b] Therefore, it is important to investigate how intercontinental flights connect -and how passengers transfer -to the European Hyperloop network. This research focusses on that aspect.

Current studies and design proposals that try to answer these questions however, mainly focus on the conventional idea of integrating transport modes in a hub or hub-like structure, stuck in the conventional idea of a (train) station, characterised by their long platforms and linear appearance. This is not a problem in itself however, because it is very well possible that those concepts work perfectly fine. On the other hand, they do not challenge or facilitate potential that comes with the development of the Hyperloop system, leaving the

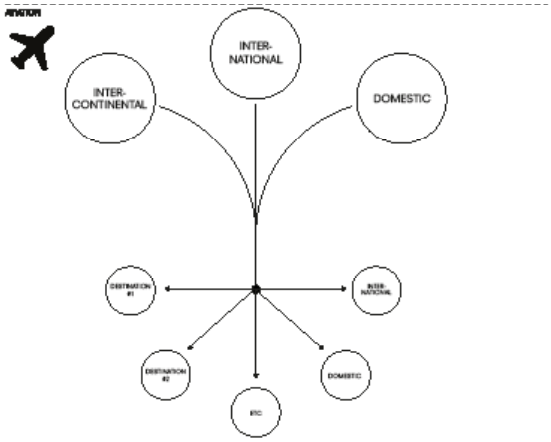

FIG 03a: SCHEMATIC VIEW CURRENT DISTRIBUTION INTERCONTINENTAL COMMUTERS

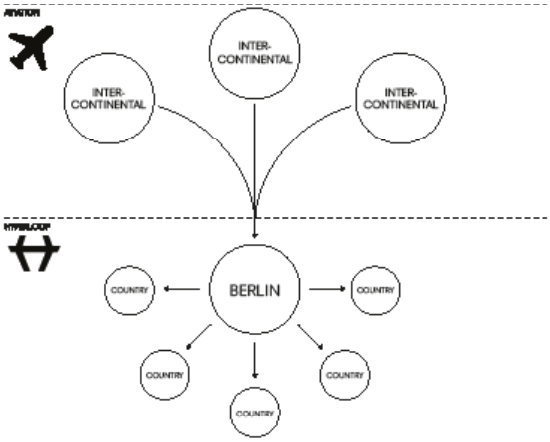

FIG 03b: SCHEMATIC VIEW FUTURE DISTRIBUTION INTERCONTINENTAL COMMUTERS WITH HYPERLOOP

way to innovations cluttered. We have come so far in making the impossible possible regarding technology, physics, feasibility and many other aspects. Where does the discipline of architecture and spatial planning position itself in that context? [Fig. 06]

This research addresses three relatively unexplored hypothesises. In the first one, the 'aviation to Hyperloop' connection requires a new type of building, other than transfer buildings as we know them. Secondly, upcoming research shows that adoptions to the existing infrastructure suffice to facilitate passenger transfers. There might be additions or other architectural interventions necessary, but we cannot speak of a new building type. A final hypothesis states that combining both other scenarios results in the most desirable outcome.

The framework opts to form a base on which future research is based, resulting in a graduation project that presents a valid architectural design intervention explaining why and how those three scenarios could be implemented. Hereby, Berlin Brandenburg Airport is currently its case study. By doing so, the gap in current literature and studies regarding aviation to Hyperloop connections shrinks.

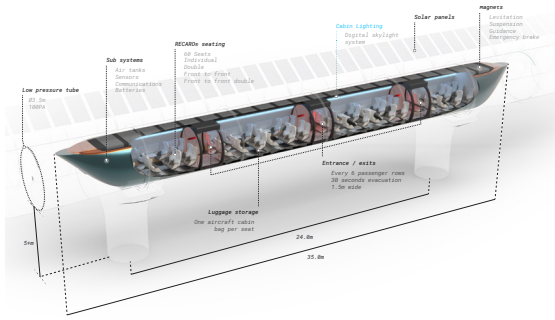

FIG 04: SCHEMATIC VIEW HYPERLOOP POD IN TUBE BY HARDT

FIG 05: POSSIBLE ROUTES START EUROPEAN HYPERLOOP NETWORK BY HARDT

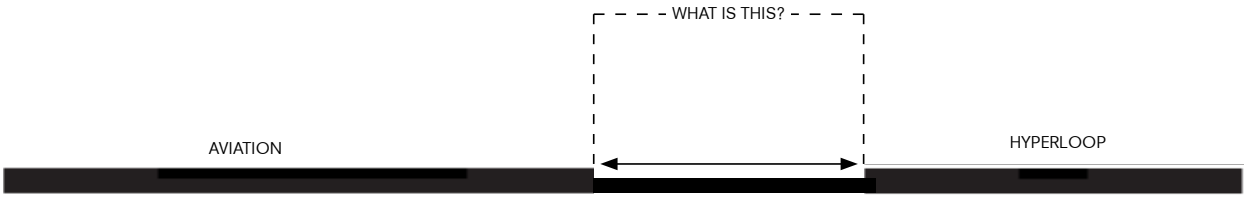

FIG 06: OUT-OF-VEHICLE TIME BETWEEN AVIATION AND HYPERLOOP. UNKNOWN 'TERRITORY'

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RESEARCH METHODS & JUSTIFICATION

This paper focuses on three main topics: firstly the program, secondly the site and lastly the client. Now follows a description and motivation of the proposed research methods.

The expected program and its approximate size are estimated by analysing case studies to allow for benchmarking. Literature review will support or oppose expectations and conclusions drawn from these methods. Historical mapping and further literature reviews support the site choice: by looking at previous airport locations and situations, this research extrapolates information to choose possible future locations. Possible clients for the future project and their role are derived from literature on both Brandenburg airport and Hyperloop. The recently finished airport project helps understand the client better, since many critiques and studies were published close to and after its opening.

As the Hyperloop system is non-existing, neither are the connections from and to airports. In order to form an idea about programme and its size, the following two methods give insight. Firstly, the conduct of case study analyses provides information about minimal program needs and their approximate size, which subsequently leads to the second method: enabling benchmarking.

The case studies are:
1. Schiphol Airport (Amsterdam, Netherlands) and a corresponding concept study 'Implementation Hyperloop in Schiphol airport', by Hardt Hyperloop.

The qualities looked for during the analyses of Schiphol airport are sought in its plaza: Schiphol Plaza is quite unique in terms of bringing commercial functions in between the 'secured' airport area and the public space. It hereby combines a train station, making the connection from and to commercial functions, station area and airport more fluent than seen in other airports.

More importantly, there is already valuable research conducted about the implementation of the European Hyperloop system into Schiphol airport. This resulted in a rare conceptual study and architectural intervention about what the space facilitating the exchange of passengers between aviation and Hyperloop looks like, making it a very valuable source and method.

2. Malpensa airport:
The passenger handling numbers of Malpensa Airport (Milan, Italy) is currently more comparable to the case of Brandenburg with respectively 28.000.000 and 34.000.000 expected yearly passengers traveling through, compared to the 72.000.000 travellers at Schiphol airport. Where in terms of size both airports are quite similar, this is not the case for how they combine commercial areas with airport and train station as Schiphol does. At Malpensa airport the station nor commercial areas are integrated near or in the departure- and arrival

-halls. This helps to characterise the fundamental differences between an airport with and without those properties.

Since the goal is to design a facility that allows for exchange of passengers between aviation and Hyperloop, it is interesting to unravel why and how those airport differ so much on their integrative characteristics. This information helps with the conceptualisation of the future Hyperloop connection.

3. Brandenburg airport:
Initial literature review studies and personal preference indicate that Brandenburg Airport Willy Brandt (Berlin, Germany) is a likely possible location (and thus case study) for combining Hyperloop and aviation. Expectedly, this airport is the case study in which the graduation project is contextualised. Therefore it is important to understand its functionality, program and size. To prevent a too biased approach, depending on the research and new insights the location might change. If so, a new case study should be adopted and analysed.

The scope of the project's location is limited to the proximity of Berlin, Germany, as defined by the graduation brief. Within this context however, the scope still is unmanageably broad. Undertaking a series of steps helps to efficiently narrow down possibilities.

Firstly, archival material and literature review provide the basis for mapping out previous and current airport locations in the proximity of Berlin. As a starting point, these locations prioritise themselves over any other seemingly possible site locations. A selection of 21 locations is the result. To further narrow down a suitable project location, (old) airport locations that are not within a reasonable proximity are eliminated. The following matrix organises and helps recognise the main characteristics of the remaining possible locations. Compared to literature reviews and personal preference this matrix forms the basis for the narrowed down options. [Fig. 07]

The five main defining characteristics that are compared:,
Proximity to the city of Berlin
- Availability of space for extra terminal(s) and or air strips
- Availability for expansion
- Density of the urban fabric and obstructions
- Connectivity to urban fabric, aviation and public transport

The next step is to thoroughly analyse the chosen site location on two different fronts: externally and internally. [Fig 08a] Firstly externally; its position in the context of urban fabric regarding connectivity (roads, public transport), placement (how and where is it positioned in the landscape) and existing infrastructure (terminals, runways, other airport specific facilities) determines the basis of the design task.

Secondly, the analyses focusses on the internal characteristics which regards the precise placement of the future design intervention within the site itself. At the centre of this

	SAARMUND	BRANDENBURG	TEGEL	TEMPELHOF	STRAUSBURG
PROXIMITY	-	+	+	+	-
AVAILABILITY SPACE					
TERMINAL	-	+	+	-	+
LANDINGSTRIP	-	+	+	+	+
AVAILABILITY EXPANSION					
TERMINAL	+	+	+	-	+
LANDINGSTRIP	-	+	-	-	+
NEED	-	+	-	-	+
OBSTRUCTIONS	+	-	-	-	+
POSSIBILITY	+	+	+	-	+
EXPANSION					
POSSIBILITY	+	+	-	-	+
NEED	-	+	-	-	-
OBSTRUCTIONS	+	-	-	-	+
DENSITY					
ENVIRONMENT	+	+	-	-	+
SOUND	+	-	-	-	+
OBSTRUCTIONS	+	-	-	-	+
CONNECTIVITY					
RAILS	-	+	+	-	+
AVIATION	-	+	-	-	+
GRID					
URBAN	-	-	+	+	+
EUROPEAN	-	+	-	-	-

FIG 07: COMPARISON CHART LOCATION VS CRITERIA

analyses are two main points divided in three options targeting the location within the airport site itself:

1. The future project is an extension or addition to the existing airport facilities, thereby making direct use of the current terminal buildings. [Fig. 08b]
   a. The Hyperloop connection is completely separate from the terminal building, but connects directly to it. [Fig. 09a]
   b. The Hyperloop connection positions itself in or near the gates of the existing terminal .[Fig. 09b]
   c. The Hyperloop connection positions itself directly in the terminal building of the current airport. [Fig. 09c]

2. The future project is a separate building that does not need the current terminal buildings in order to function properly. [Fig. 08c]
   a. The Hyperloop connects with the underground railway station at the airport, thereby creating a connection to the terminal building(s). [Fig. 10a]
   b. The Hyperloop is positioned in an existing building other than the terminal somewhere within the entire plot of the airport [Fig. 10b]
   c. The Hyperloop connection is placed adjacent to or closely to the current or additional runway(s) of the airport. [Fig. 10c]

Complex Projects graduates are classified in different groups, each with their own focus and themes. Combined with the students own vision, this results in different project types and locations. The hypothesis is that students can exchange information, allowing to incorporate elements from other projects to complement their own design brief.

Fig. 08a: BRANDENBURG WILLY BRANDT AIRPORT

FIG. 08b: OPTION 1, USING THE EXISTING TERMINAL BUILDING

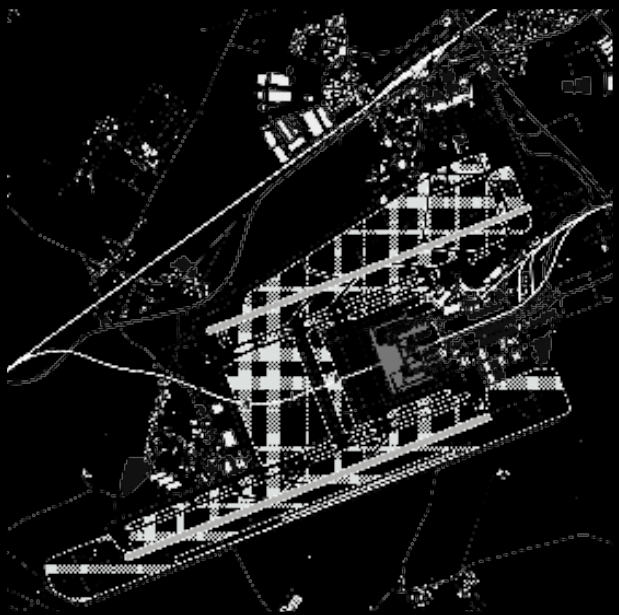


FIG. 08c: OPTION 2, NOT USING THE EXISTING TERMINAL BUILDING

Some themes, such as public transport (connections), future visions, design goals or functions might be similar and comparable. In- studio discussions and brief analyses of those topics make way for a mutual future vision for Berlin. One of the projects will complement the Hyperloop - Aviation system by taking over an inefficient operational range.

The vertiport is expected to make its way into public transport, just like the train and now the Hyperloop did. The vertiport drones operate up to 500 km: the Hyperoop is only efficient from about the same distance to larger distances up to 1800 km. Any distance greater than that will be taken over by aviation.

OVERVIEW LOCATION

In order to understand passenger experience- and flows, the paper suggests a descriptive research method, that tells the story of three different passengers using the possibility to change to the European Hyperloop network.

One fictive person will change from an intercontinental flight to the European network, whilst another arrives at BER by train and then continues their trip by Hyperloop. Lastly, one person is 'followed' during their exchange from an European flight to the Hyperloop network. Even though the graduation project focusses on passengers connecting from intercontinental flights to the European Hyperloop network, the other flows cannot be ignored and are an integral part of the final design solution.

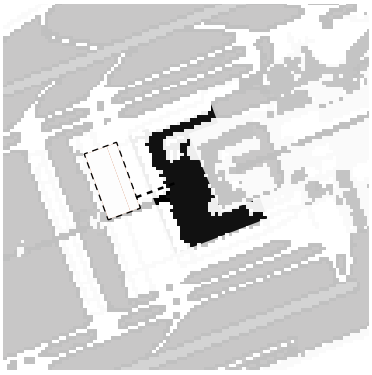


FIG 09a: OPTION 1, PLACE NEAR CURRENT TERMINAL

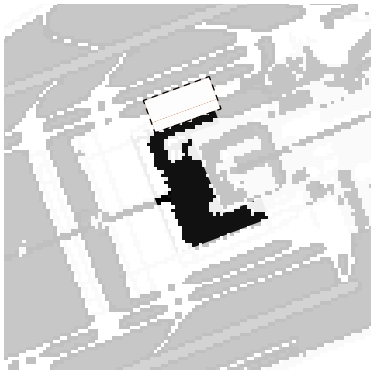


FIG 09b: OPTION 2, PLACE NEAR CURRENT GATES

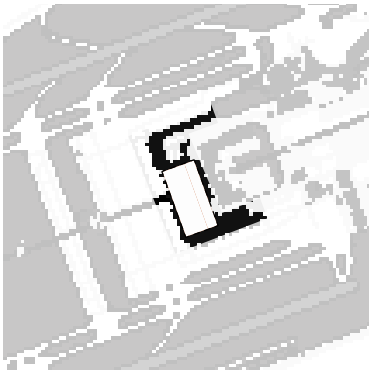


FIG 09c: OPTION 3, PLACE IN CURRENT TERMINAL

FIG 10a: OPTION 1, CONNECT WITH RAILWAY

FIG 10b: OPTION 2, PLACE IN OTHER BUILDING

FIG 10c: OPTION 3, PLACE NEAR RUNWAY

DESIGN BRIEF

The project location is Brandenburg Airport Willie Brandt. Within its borders the project positions itself between two to-be-build extensions of the existing terminal T1. The lot size is approximately 175.000 m^2 and the building gross floor area 25.000 m^2.

The biggest advantage of positioning between the two extensions is the possibility to create a stronger connection between the future and existing structures. A second consideration is the low proximity of the (dis)embarkment area's of the Hyperloop relative to the gates of T1.

An approximate 17.500.00 passengers will use the terminal on a yearly bases. Therefore, an approximate of 20 Hyperloop vehicles shall move through every hour.

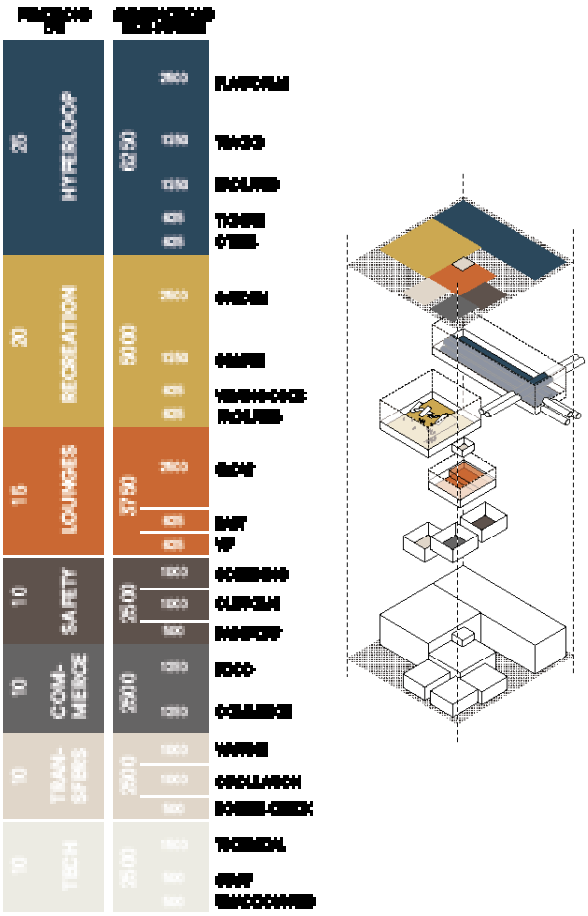
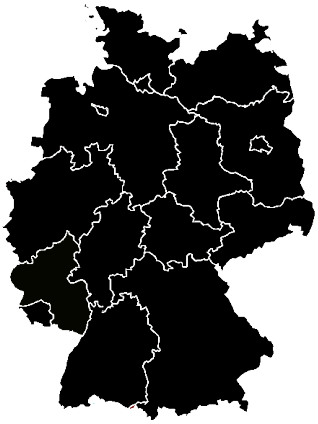
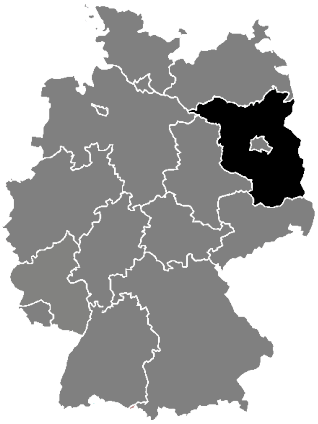


FIG 10: PROGRAM BAR & INITIAL SPATIAL ORGANISATION



Federal Republic of Germany

FIG 11a: OVERVIEW CLIENT SHARE F.R.G.



State of Brandenburg

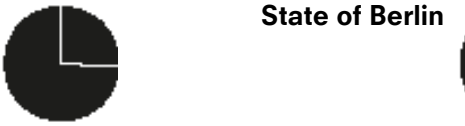


FIG 11b: OVERVIEW CLIENT SHARE BRANDENBURG

State of Berlin

FIG 11c: OVERVIEW CLIENT SHARE BERLIN

The most important functions of the project considered:

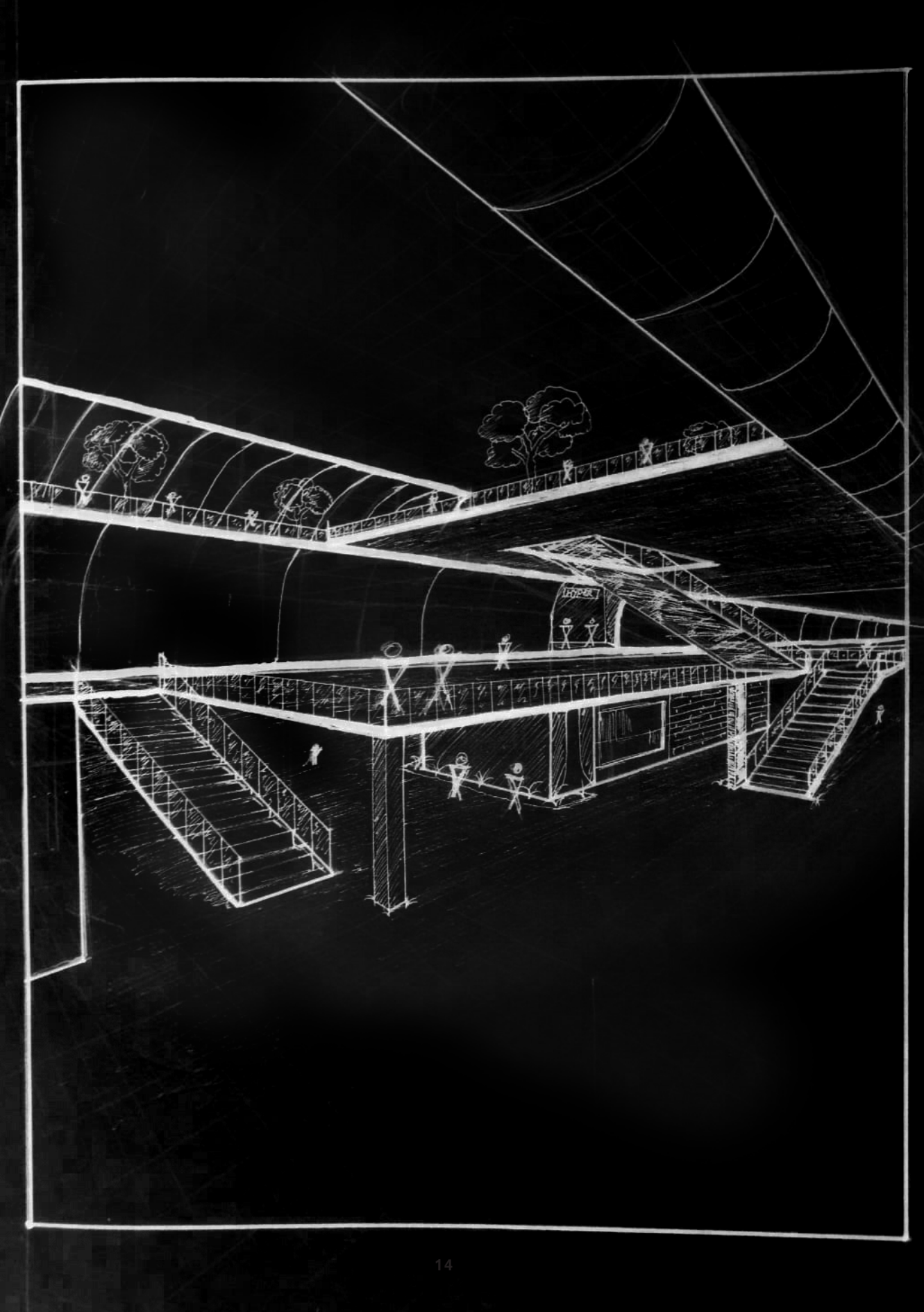
A fast, smooth and effortless exchange of passengers from one pod to another. (<30 min)

A comfortable, pleasurable stay for transferring passengers from or to long haul flights. (>60 min). Opted to achieved by an 'indoor communal garden', viewing platform and recreational area's.

Both type of passengers shall require a different kind of transfer space, lounge, commercial area and circulation area's. Thereby Schengen and non-Schengen travellers may not mingle due to security reasons. The building should account for this.

In order to accommodate the passengers, a total of 4 platforms with each one Hyperloop tube needs to be realised. They connect with 3 different kind of lounges (Intercontinental <--> EU (slow transit) / Schengen <--> Schengen (fast transit) / Non-Schengen <--> Schengen (fast transit)

The federal Republic of Germany, the State of Brandenburg and the State of Berlin are the most influential clients and provide for the gross sum of the investment money. (fig 11)



TU Delft

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COMPLEX PROJECTS
REFLECTION PAPER

Student
Bas Roijers [4643763]

Tutors
Marija Mateljan
Yagiz Soylev

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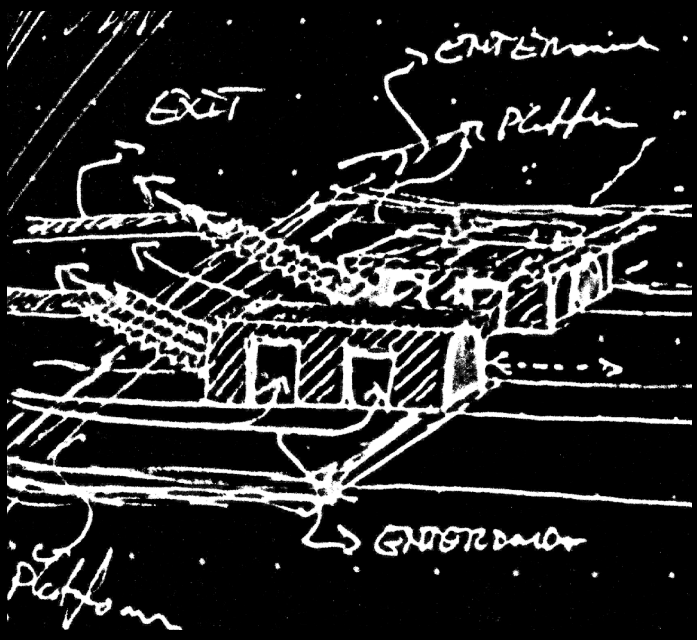
REFLECTION

PASSENGER TRANSIT: FROM PLANE TO POD

A SPATIAL DESIGN PROPOSAL INVESTIGATING THE EXCHANGE OF PASSENGERS BETWEEN AVIATION AND HYPERLOOP AT BERLIN BRANDENBURG AIRPORT, 2040



REFLECTION

Approach and its value:
A gap in knowledge on personal, academic and practical levels regarding the Hyperloop system, moved me to gather large amounts of general information, to then later narrow down. I mainly did so by looking at case studies, such as existing airports, train stations and Hyperloop(hub) proposals.

Analysing those case studies proved to be fruitful because I quickly learned about approximate sizes and organisation of functions, additional functions specific to Hyperloop, typical spatial arrangements in airports and general layouts of Hyperloop system proposals.

I took a different approach regarding location choice. The idea was that historical mapping and literature reviews support the site choice so I could quickly move on in the design and research process. I mapped out possible site locations by looking back in history to see what used to be classified as eligible locations for airports and large public transport buildings. What do they have in common? To find out, I started analysing all those sites, but drowned in the amounts of information and number of locations. This would have been fine, were it that I'd drawn useful conclusions from it. The confusion caused by the overload of information however, prevented me from finishing many of the analyses.

After contemplating I decided to restrict my 'choices' of possible locations to within or very near the city boundaries of Berlin. This left me with 6 options, who were put in a criteria table described in the design brief.

I realised that with those fewer options, more progress was made in a shorter period of time.

In the design focussed phase, I again struggled with the same issue. I started out very broad and wanted to explore as many options as possible. Literature reviews, sketching, analysing, modelling and mapping were happening all at the same time. The amount of information I gathered was large, but not coherent.
On one hand the broad start greatly helped me to expand my horizon and

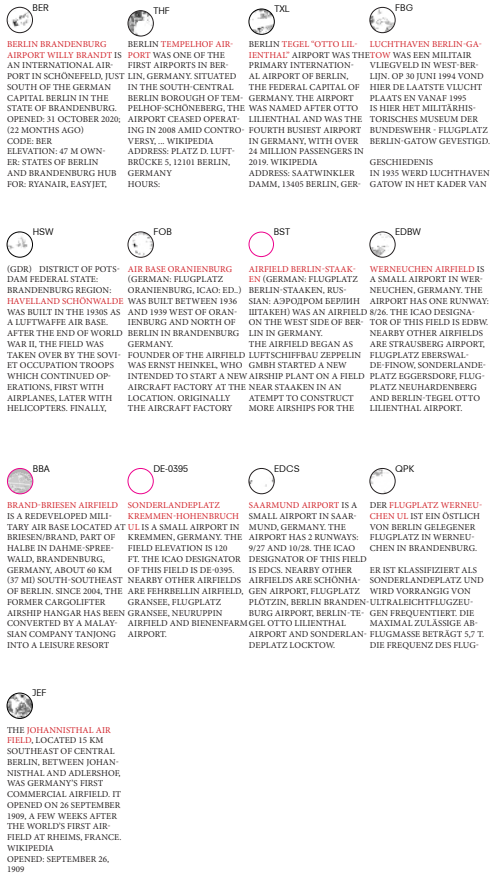


FIG 1: OVERVIEW BASIC INFORMATION FORMER AIRPORTS BERLIN

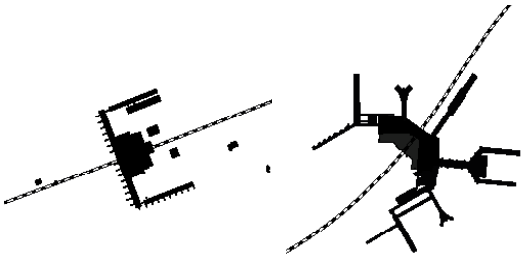


FIG 2a: BRANDENBURG AIRPORT **FIG 2b:** SCHIPHOL AIRPORT

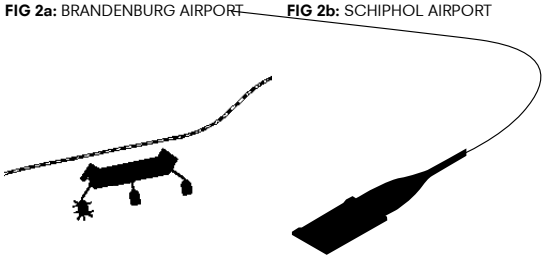


FIG 2c: MALPENSA AIRPORT **FIG 2d:** HYPERLOOP TERMINAL (HARDT, UN-STUDIO)

to not start out too biased or stuck into limited ideas. On the other hand, it slowed the process down due to the lack of in depth and completeness of required products.

So how do I assess the value of my way of working?

Even though a broad approach and lingering in variants and choices has slowed me down sometimes, I also see that it is a great source of inspiration and a good way to learn about new things. I've found out new types of materials, new ways of structuring a building, or learned about things I didn't even use in the (final) design. It keeps me motivated and interested in whatever it is that I am doing. My biggest challenge is to find moderation and thus a good balance between 'lingering' and focusing on details versus choosing and moving on.
The historical mapping at the start of the graduation phase is a good example of taking on too much. I could have noticed earlier that this approach was not the most efficient, especially since my tutors warned me about this at the time already. In the future I would narrow down the amount of options much earlier in the design process.

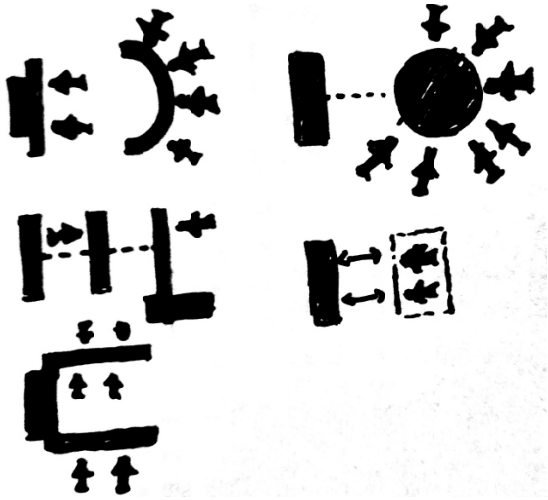


FIG 3: OVERVIEW BASIC INFORMATION FORMER AIRPORTS BERLIN

Feedback:
I was very happy with the concise and clear feedback I received from both my tutors and from guest lecturers.

One of the biggest takeaways from the feedback is to focus more on growing my confidence in making choices and to not linger in masses of options. It was never the lack of idea's, but mostly the choosing between them that caused by biggest hold ups during the graduation process. Honest feedback made that much more insightful for me. I think its important to remember this in the future: I sometimes didn't realise I was lingering between choices, but my tutors made me aware by 'simply' putting the idea's concisely together as we talked about them. Clarity and oversight are the keywords here.

Mapping personal travel experience

Diagram xx shows my personal travel experience divided into different steps, flying from Amsterdam, The Netherlands, to Melbourne, Australia with a stop over in Doha, Qatar. Analysing and mapping out those steps provided me with a better understanding of where I wanted to make changes in the travel process.

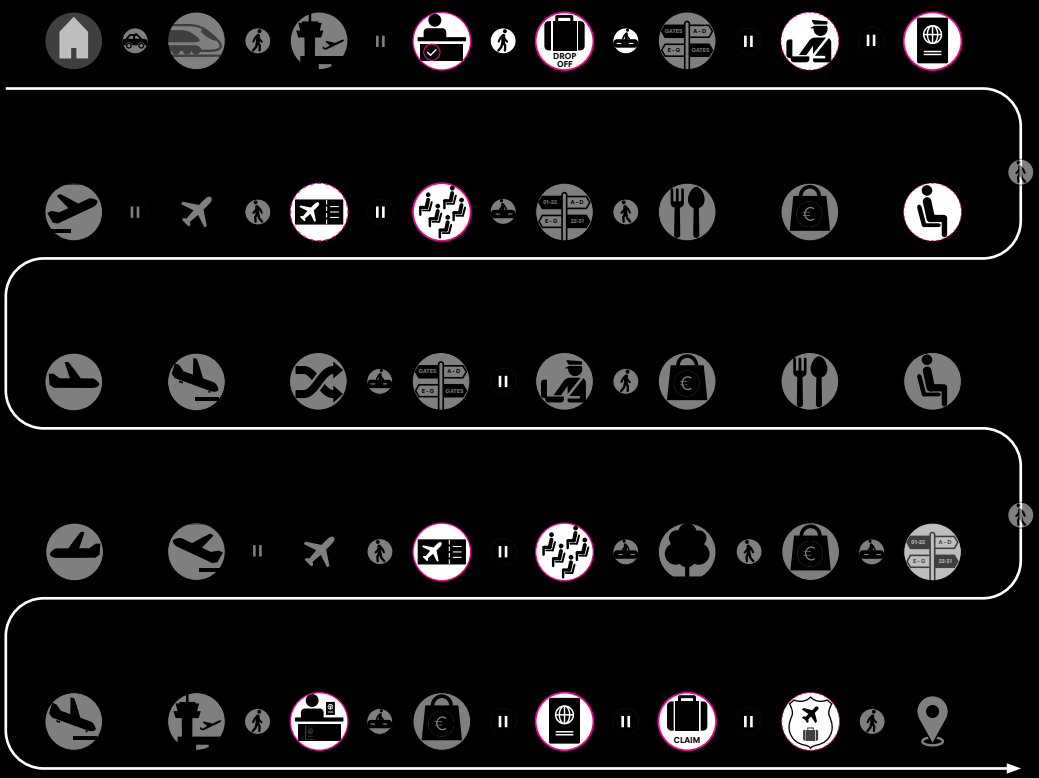


FIG 4: STEPS OF AN COMMUTE PER AIR PLANE WITH LAY OVER.
Small symbols indicate waiting, walking or walking on travelator

I took feedback very seriously and was not afraid to make big changes in the design process or the design itself if I agreed with critique. Big changes do cost time of course, but I think in the end it helped developing the final result in a positive way: I'm happy about the result. In other words, it shows that investing time in redesigning, rethinking or redeveloping paid off.

This should be considered different from 'lingering' between choices. I may have made a choice that I needed to get back from later, but at least that means progress. By not daring to choose, a standstill is almost guaranteed.

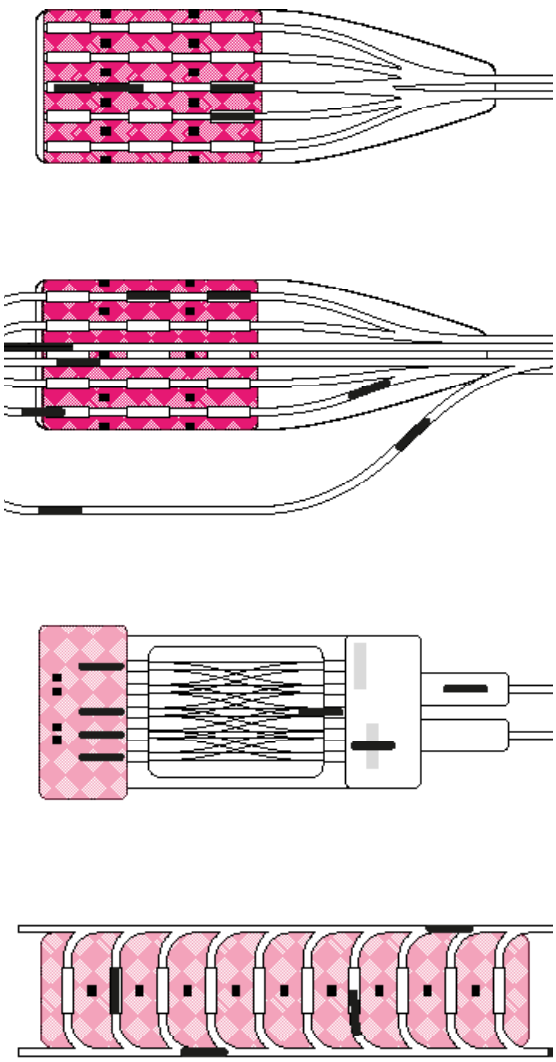


FIG 5: FOUR EXAMPLES OF HYPERLOOP PLATFORM OPTIONS.
The first option on this page had mhy preference.

How does this reflect in my work?

I have made significant changes in the routing and organisation of the functions compared to what I expected it to look like based on before receiving feedback. The commerce and retail area for example were relocated at the exact opposite side of the building. I came up with many variants to integrate airport like security into the Hyperloop station, but decided to move this function into the existing terminals based on feedback. Technical and staff related functions are situated around the main functions of the building, whereas before they were mixed in with the rest. Testing suggestions proved to be a very effective method helping me decide between choices. The encouragement of growing confidence in making intuitive choices by my tutors, allowed me to explore a specific platform 'type'. I greatly doubted between four different options, but had a strong preference for one. I could not rationalise why it was that one option that drew my interest so much.

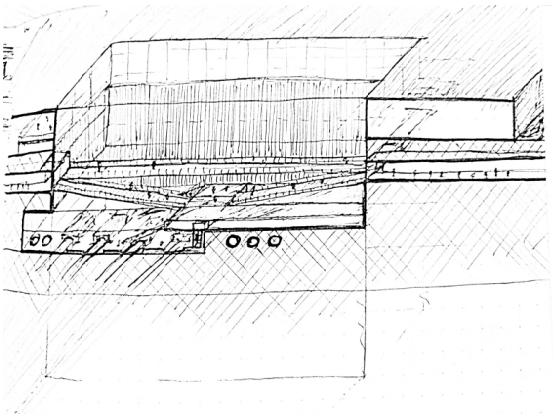
The feedback of lingering too long on different options, dared me to make a choice. Even if it was the wrong one maybe, but I persuaded myself to go 'with my guts'. It quickly became apparent that my preferred option was indeed full of potential, making me very happy with the result.

The influence of research on design and de effect of design on research: learnings from my own work.

The main conclusions from the research were about the sizes of functions, the needed type of functions, the possibilities when it comes to boarding and disembarking the Hyperloop pod and the location. Choosing the type of disembarking method that I have, was 100% a result of the research, as I had never seen of heard of this before.

Learning more about security measures and general security methods in the future (assumed is 2040) made me decide to not include an extra security unit for passengers in the new 'terminal'. (In combination with tutor's feedback)

The open character of the design and the recommendation to implement this open, free flowing and visual connection between functions as a typology in airports and Hyperloop stations is a direct result of the conclusions from the case studies.



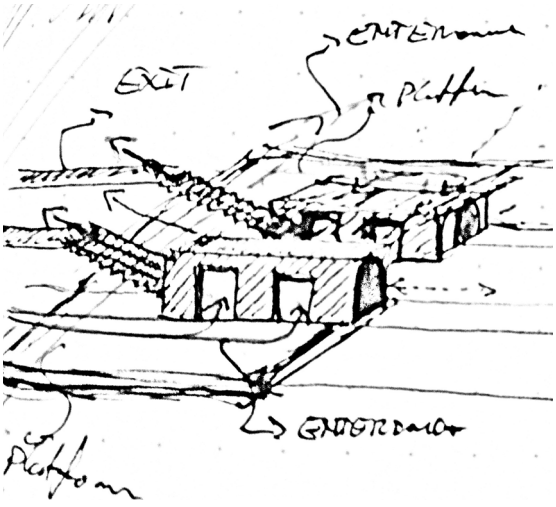


FIG 7: PRELIMINARY SKETCH INVESTIGATING BOARDING OPTIONS

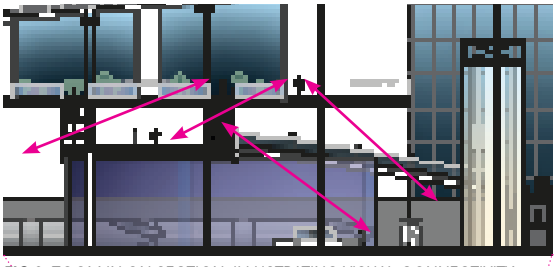


FIG 8: ZOOM IN ON SECTION, ILLUSTRATING VISUAL CONNECTIVITY

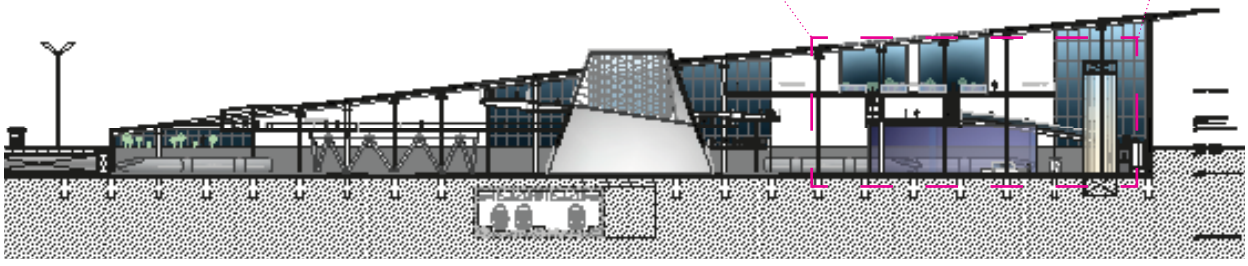


FIG 6: SECTION OF THE DESIGN PROJECT

Learnings from own work

The learnings from my own work can be divided into two categories: firstly, awareness and insight in the personal design process. Secondly, practical and concrete knowledge.

I realised that much of the graduation process took place in my own head, rather than drawing or writing it out. Therefore, it could be hard to exactly explain what I wanted to say and thus to receive accurate feedback. I did get the feeling that the tutors realised this, and tried to understand what my thought process was even though it wasn't always obvious to myself yet. I've also come to understand that

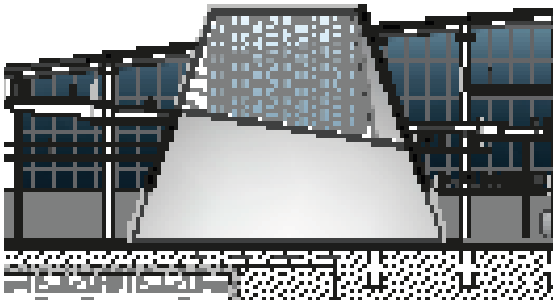


FIG 9: ZOOM IN ON SECTION ILLUSTRATING THE CONE WITH HELIX

sometimes more is possible than what I initially thought. Regarding the structure of the building for example; I eliminated some ideas because I ruled it not feasible or not strong enough. Such as the structure in the centre of the building with the helix wrapped around. I wanted to use the cone itself as a stability core but I ruled it too fragile. Hence, I did not bother drawing it out. Much later, when discussing it verbally with my tutor, it seemed perfectly plausible. I wouldn't have gotten stuck on this part, had I drawn it instead of kept it to myself.

I've learned that communication of idea's, even if those idea's do not seem like the 'right' ones at that time, might pay off nonetheless.

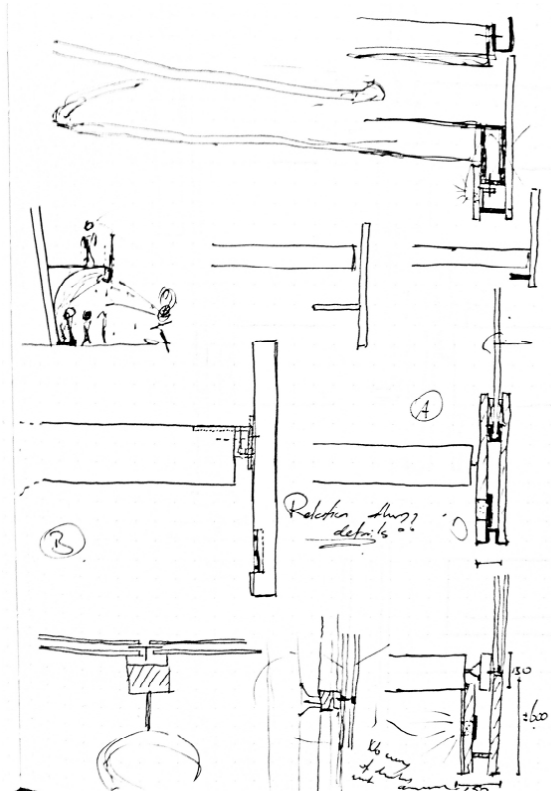


FIG 10: SOME SKETCHES PRECEDING DETAIL DRAWINGS

Relation topic, master and programme

I believe the field architecture is not just meant to design buildings of which we know for sure they will be build. The the element of prediction and speculation can be used as a research method or design tool. By doing so, I found a proposal on how to facilitate a reversible embarking and disembarking module. By making research supported assumptions I also found very specific properties and characteristic of techniques used for the Hyperloop system as a design concept. For example: the rotating

Space-syntax & Grasshopper

In an attempt to create order and clarity regarding spatial dependencies of the hosted functions, I tried organising them in different ways. It quickly became apparent that mapping out all the relations between the different functions was cumbersome and without useful conclusions.

This led me to try out algorithms within Grasshopper to generate diagrams in Rhino. The input provided consisted out of the size, type and connections between all the functions. The output is a figure that connects those functions in a weighted diagram. White spheres indicate well connected functions, darker spheres indicte the less connected ones.

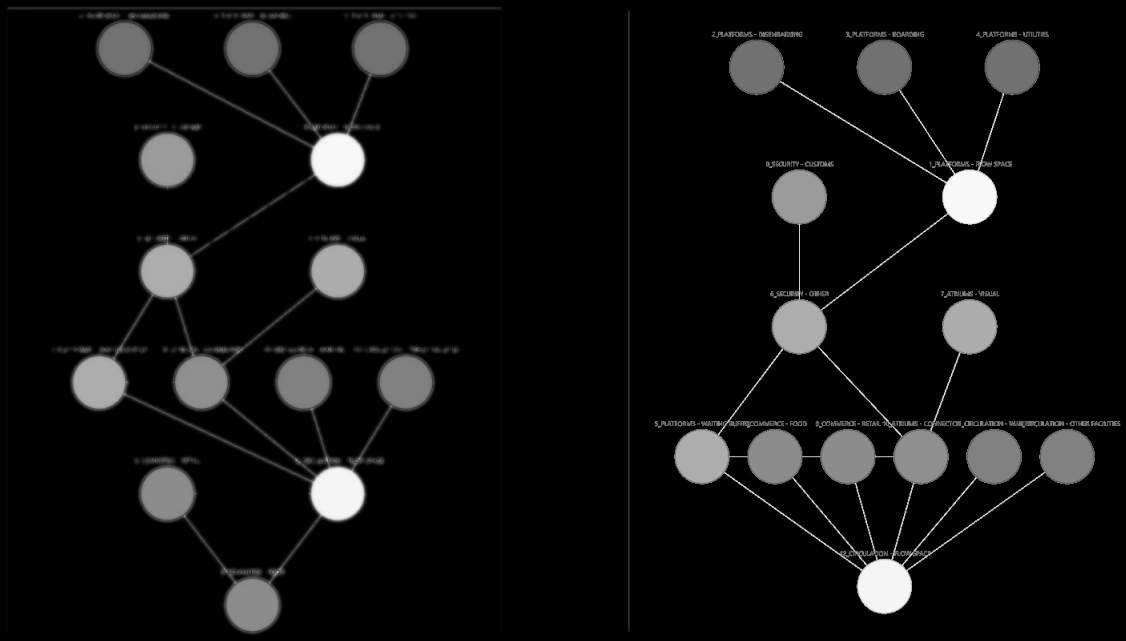


FIG 11: WEIGHTED DIAGRAMS AS GENERATED BY GRASSHOPPER IN RHINO
Both diagrams represent the exact same functions with their connections, but are organised differently

It proved inefficient. Contrary to my expectations, the rather clear diagrams did not help me to form a spatial representation of my idea's. Only the moment I started to design, sketch and draw, the relations I was trying to organise actually dit get organised. It was informative to experiment with new programmes, and fulfilling to try something new, but in future projects I will opt to start organising by sketching and designing so I can try and find out things as the project goes.

tables used for sorting passenger pods, is not a tested method yet. However, by showing how architecture can respond to it I hope to spark interest and show that new transport systems offer new design solutions and ways of thinking.

A very specific part of the Hyperloop system (the rotating tables) became an important design feature in the building. Those recommendations are a direct result of research supported speculations. To me, architecture tries to answer questions by presenting a spatial design, rather than by text or word.

So besides only focussing on the spatial and organisational fields, I related research and design much more to each other than I've ever done before. I (unexpectedly) enjoyed that very much.

The combination of research and spatial planning resulted in a very open and visually connected space, which is what I envisioned for this project. Intersecting research, spatial aspects and organisation of functions reaches both a very theoretical and practical domain. To me, that is what the MSc AUBS is about: intersecting those domains to gain knowledge and to come to design solutions that enable realising your vision.

Transferability

The project in itself is quite specific to its location, but there a couple of main principles that are potentially useful in the case of general airport and Hyperloop design:

The project showed that by breaking up a tunnel and the principle of 'hallways' can result in a very spacious design that is both visually

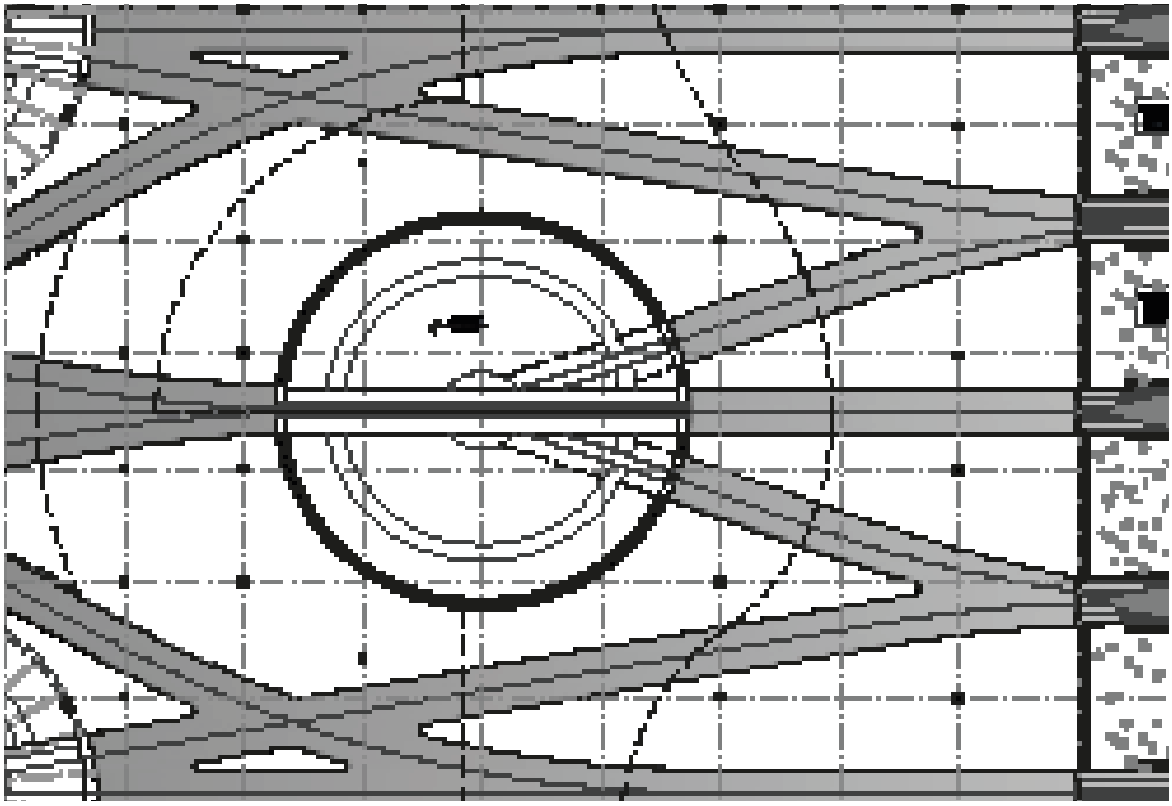


FIG 12: EXTRACT FROM A FLOOR PLAN ILLUSTRATING THE TRACKS ENTERING ONE OF THE TURN TABLES

and spatially connecting with (most of) its functions. The seemingly free flow of people might look inefficient, but upon closer inspection one will see that there actually is a very clear routing, 'forcing' people to spaces where you wan them to just as much as other comparable projects. People still pass security, commerce, retail, ticket checks and all the other necessary elements. It is just less apparent for the commuter, giving them the idea of 'free choice', which I believe can contribute greatly to a better user experience.

Another strongly present principle is the constant visual connection with all the steps commuters would go through, making it an more interesting yet clearer commute, thereby preventing the typical 'airport ambiance'.

The visual principle is very well transferable as a design concept, and can be divided into two main topics:

Firstly, it connects the literal process steps of the Hyperloop system, making people understand how this new technology works. Secondly, it makes explicit (most of) the transfer steps that commuters have to go through, allowing for easy navigation and clarity.