

REFLECTION PAPER

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COMPLEX PROJECTS GRADUATION STUDIO**

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PROJECT DESCRIPTION

Modern aviation manufacturers and operators are moving towards a more sustainable and clean way of flying. Prototypes of electric flying taxi drones, among other experiments, are now being tested. The goal is to be able to implement a new form of urban air mobility in the future to minimize or eliminate the use of emission-causing means of transport. The Berliner L-Bahn is a project that will house this new form of urban air mobility in a vertiport. The research question of the graduation project is as follows: *how can a new mode of air transportation be designed to facilitate the increasing demand in transportation of people and goods?*

I. WHAT IS THE RELATION BETWEEN YOUR GRADUATION TOPIC, THE MASTER ARCHITECTURE TRACK AND YOUR STUDIO PROGRAM?

In the Complex Projects Graduation Studio student are given a specific lens through which their project should be focussed on. In my case the given theme is digitalization this academic year. A new typology is therefore being designed around the development of autonomously controlled vehicles. Developing a new building typology is a complex challenge in itself because there are no existing examples of it and therefore complexity must be predicted. The master track architecture is looking for innovative solutions for modern problems surrounding the built environment. My graduation project aims to provide an approach to a sustainable solution to an urban problem. The vertiport concept is an answer to the need for innovation in aviation, by developing a new type of building using scientifically researched information. This research on the design of this particular project addresses the reasoning and solutions for a more sustainable and cleaner alternative to be applied in cities and habited rural areas.

II. HOW DID YOUR RESEARCH INFLUENCE YOUR DESIGN / RECOMMENDATIONS AND HOW DID THE DESIGN / RECOMMENDATIONS INFLUENCE YOUR RESEARCH?

This year, the research at the Complex Projects studio was guided by the design brief. This includes generic and specific conditions for the design of the building. The research is divided into the themes: site, program and client. Through the research into the linking of these themes to the building, a number of core conditions have been concluded and put into the design.

SITE

The location of the vertiport had to be chosen strategically. The idea of a network of taxi drones connecting to an existing network is a challenge in a dense city where an extensive public transport network already exists. To get an idea of the new vertiport network and thus determine a location, I worked through a hypothesis study. With the help of this study, the network itself has emerged as a growing system, with the base of the network connecting the city's distinctive polycentric structure. In future scenarios, the network will expand depending on demand. This is where the core value of the project arose, that it must be set up flexibly so that it can accommodate future expansion of the network. The location of the vertiport was therefore chosen with the condition that there are growth opportunities. Researching a fitting site was less challenging. The construction requirements of a vertiport are logical, rational and specific. The task was mainly to find a suitable location that offered the opportunity to expand. Important conclusions that were drawn from the research into the chosen location in relation to the design are:

1. That the gate structure should follow the platform for optimal user flow.
2. A central main entrance that faces the Hauptbahnhof and has a certain connection.

3. A platform deck built over the train tracks for modular expansion options.

PROGRAM

The Vertiport program is based on and derived from a number of case studies of small airports in Germany. The program is almost entirely consistent with each other, making it a reliable benchmark. The conclusion from the comparison with the case studies is that the vertiport must have a main hall and a terminal area. The two should be connected with separate routes for departures, arrivals and employees. In the research part of the final year I thought that with this benchmarking I could easily get an outline for a design. This turned out to be more complicated. It is difficult to make a good estimate of the required facilities in a building that will increase in human occupancy in the future. The solution was to maintain a flexible design in the terminal area.

CLIENT

The clients have overarching interests, namely stimulating sustainable development and achieving high reliability. In addition, the desire is to realize a climate-neutral building that is capable of sustainable growth. Until the design process began, the client's interests were clear and aligned. While developing the design, I discovered that there were also conflicting ambitions from the different clients. For example, building over a train track is a huge gain in terms of space use, but the distance from the transfer point increases. And applying a satellite structure is a modular solution, but inconvenient for a possible change in the network method. Making concessions was hard but crucial.

III. HOW DID YOU ASSESS THE VALUE OF YOUR WAY OF WORKING (YOUR APPROACH, YOUR USED METHODS, USED METHODOLOGY)?

A working method has been presented in the studio and provided through a weekly briefing. Students are expected to work

within the rational grid of this system. Since the projects of other students were very different and collaboration was required, it was sometimes difficult to deduce the essence of this method. I noticed that in previous design studios I preferred a more personal working method. Not necessarily individual, but more focused on the how each student's design value is applied to their best capacities. This graduation studio there was more emphasis on rationalizing. Although this could have hindered my process at times, the (half) P-moments have forced me to approach the research in a structured manner and to produce a lot. After the semester change, I had the impression that the design could be sketched immediately, but here too, following the devised system was leading. Partly because I became quite ill, I lost a bit of an overview of what exactly the intention was with the mass studies in relation to the design assignment. I think I might have felt the essence more if I had let go of the conflict within myself of wanting to design earlier. After the P2.5, I focused entirely on applying the knowledge from the research to developing a logical design. Here I discovered that intuitive design is less suitable for complex assignments such as an airport with a limited plot of land with significant restrictions. I have discovered that making rational choices is necessary for buildings with complicated internal logistics.

IV. HOW DO YOU ASSESS THE ACADEMIC AND SOCIETAL VALUE, SCOPE AND IMPLICATION OF YOUR GRADUATION PROJECT, INCLUDING ETHICAL ASPECTS?

The design is a conceptual implementation of an addition of new infrastructure in the city of Berlin. This requires enormous support from the city and its residents. To achieve this, goals are needed. The main goal is to reduce polluting means of transport in the city and thus create a better living environment. The implementation of electric flying vehicles opens a new era of clean flying. Secondly, the commute time of two distinct remote parts of the city will be greatly reduced, which

will benefit local economies. In addition, the reliability of the digitalization of functional processes is high and the safety of an applied urban air mobility network can be better guaranteed than that of the autonomous car-oriented system used. In a progressive city, the implementation of more sustainable alternatives is a meaningful development. But it should not be forgotten that such a project requires enormous effort and great investment. Perhaps more than other societal problems that would be better to solve first. The humanity of a society must always stay central and be prioritized

V. HOW DO YOU ASSESS THE VALUE OF THE TRANSFERABILITY OF YOUR PROJECT RESULTS?

The research into the design of the vertiport program and the aprons is not location-specific, but a closed system. The integration of the fragmented building elements is location-specific. The design is determined by the lack of space on the ground. The design of the graduation project is therefore an application of the program at this chosen location, paying attention to different drone network methods. The design has been developed in such a way that the separate satellite platforms could function autonomously or work together. In the second case, a specific part would be allocated for only departing flights or arrivals. Because the typology does not exist, this had to be taken into account. The project can therefore be applied in several places in the city, provided there are at least two platforms.

VI. WHAT RECOMMENDATIONS WOULD YOU PROVIDE TO FUTURE STUDENTS CONSIDERING A CONCEPTUAL TYPOLOGY?

The most enjoyable aspect of designing something conceptual is the level of imagination and creativity involved. I highly recommend considering innovative forms of transportation and what type of building such a concept would get. However, the most challenging part of this experience is the

absence of examples. Especially regarding program and building design. I derived it from known transport flows, but I believe the ideal design requires more research. I would advise to explore this into more depth to obtain the exact components of what the concept requires and what exactly is needed for it. When subjects lack scientific knowledge I would suggest to also conduct a hypothesis study, so that you can properly substantiate why you could expect a certain development or effect.

VII. TO WHAT EXTENT DO YOU CONSIDER THE DESIGN TO BE REALISTIC AND ACHIEVABLE?

Regarding the construction aspects, the building is entirely feasible. The design of the routing is also logical and achievable. My primary concern is about the size I designed the building to be. I have included a system of use that can already accommodate a large number of passengers, derived from the hypothesis. It is however difficult to estimate the exact number of passengers that will actually use a single vertiport. Fortunately, the building is prepared for adaptability. In these situations, reductions or expansions can be made to address this uncertainty factor.



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