
小鹏 | 汇天
2045 CITY LIFE
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1. Executive Summary

1.1. Brief overview of the project

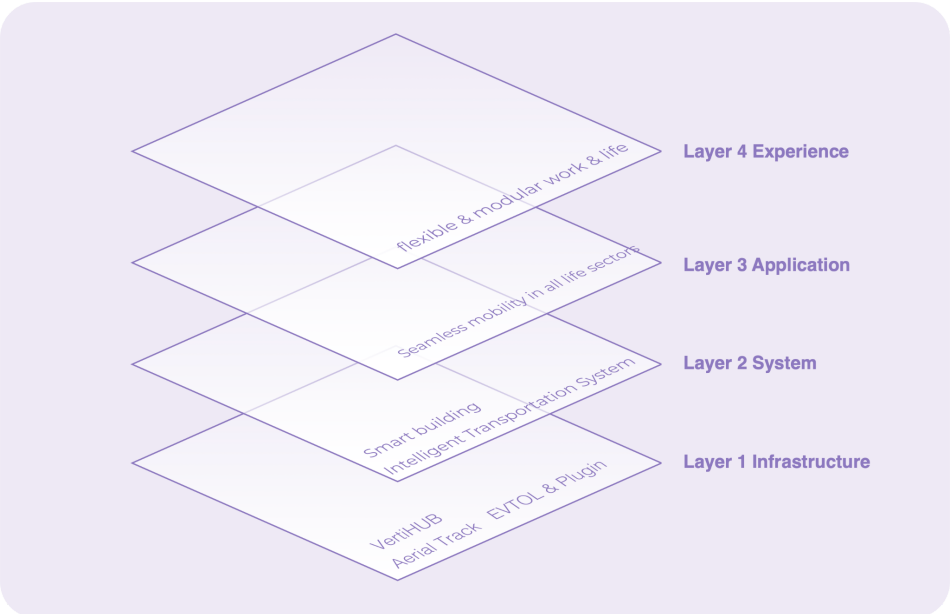
"Imagining 2045: A Futuristic Mobility Ecosystem Powered by EVTOL Technology" is a visionary project that reimagines urban infrastructure and mobility with advanced Electric Vertical Take-Off and Landing (EVTOL) technology at its core. It proposes a new urban ecosystem where EVTOLs become the primary mode of transportation, altering our understanding of time, space, and mobility. With EVTOLs, cities can evolve into more dynamic, efficient, and sustainable living environments, profoundly affecting society, economy, and individual lifestyles.

The project is articulated through a comprehensive design fiction, illustrated by a day in the life of Karen, an individual with various roles living in Dubai in 2045. This narrative showcases the seamless integration of EVTOLs into everyday life, highlighting the potential for improved work-life balance, productivity, and convenience.

The proposal introduces VertiHUBs, innovative infrastructural nodes serving as communal docking stations for EVTOLs. These hubs are customized to fulfill diverse needs, including residential, commercial, business, logistics, healthcare, educational, and recreational, promoting efficient utilization of urban space.

At the heart of the design lies the distinctive modular EVTOL system composed of the Chassis and Rotor , which epitomize the flexibility of ground and air travel. A dual navigation system - the Flight Management System (FMS) and the Ground Navigation System (GNS) - ensures smooth transitions between modes.

This project offers Xpeng a visionary landscape to explore and pioneer future mobility. It also aims to inspire the general public and technology experts to reimagine urban living and transportation possibilities. The design framework is conceptualized in four integral layers (Fig.1):



1. Infrastructure Layer: This foundational layer focuses on the critical components of the design, primarily EVTOLs and VertiHUBs and the Aerial Track System.

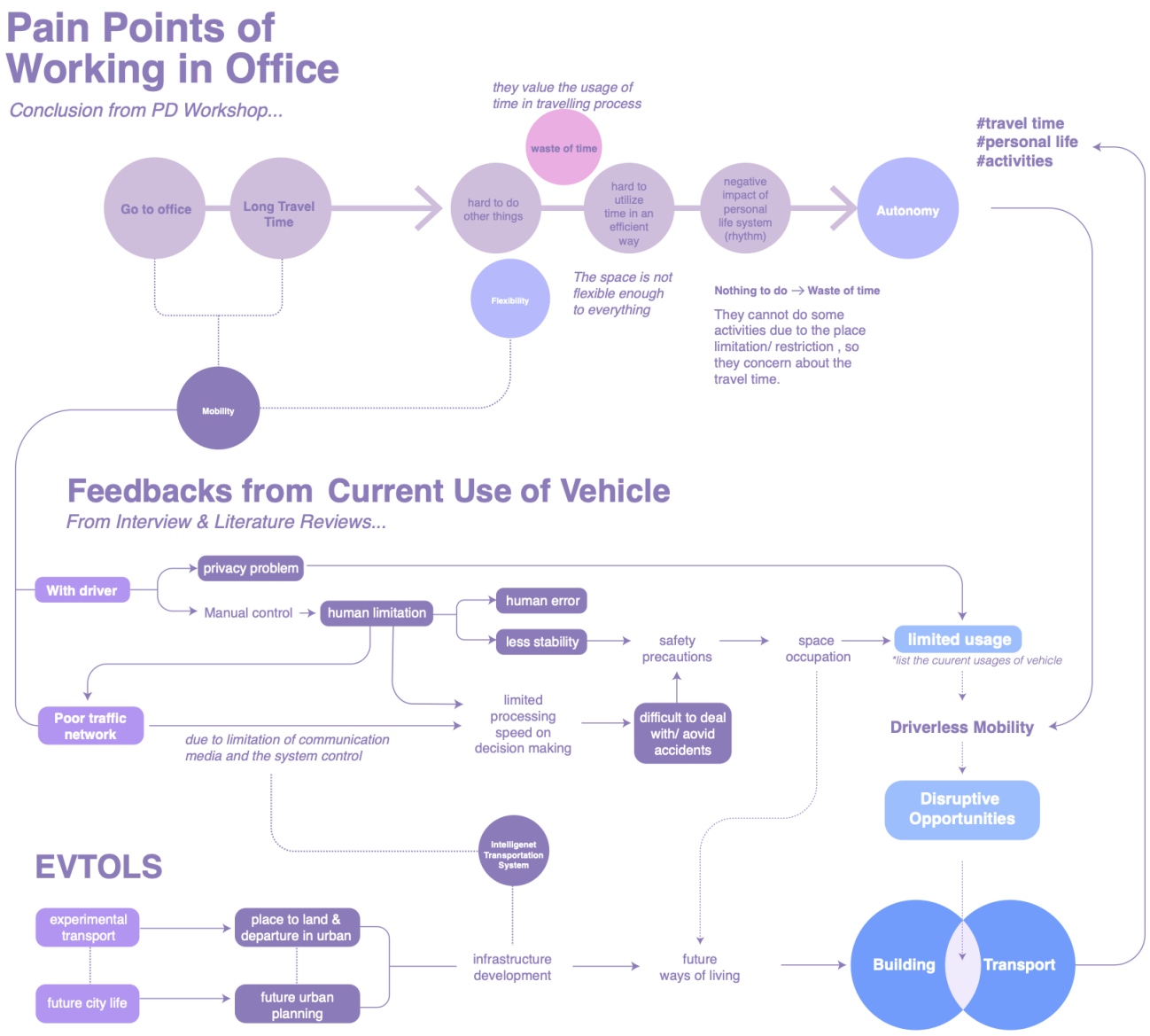
2. System Layer: Building on the Infrastructure layer, this layer elucidates the interconnectedness between the core components, emphasizing the roles of the Intelligent Transportation System (ITS), and its subsystem Flight Management System (FMS) and Ground Ground Navigation System (GNS).

3. Application Layer: This layer discusses the practical applications and functions of the system for users, including the business model intricately interwoven into this layer and how all of these create the seamless mobility in our life.

4. Experience Layer: This topmost layer encapsulates the potential human experiences- flexible & modular work and life offered by the system, delving into potential lifestyle enhancements and the transformative role of the new-age mobility solution.

In essence, this project posits a compelling future where mobility transcends its conventional function as a means of transport and becomes a pivotal element fostering a more integrated, dynamic, and flexible urban lifestyle. The project, therefore, plays an active role in shaping a sustainable, efficient, and enjoyable urban environment.

1.2. Major findings and implications



1. **Autonomy through Flexibility**
   With EVTOLs fostering increased mobility, individuals gain significant autonomy in their lives. The ability to move quickly and efficiently enables greater control over personal schedules, creating a lifestyle defined by individual needs and preferences. This mobility-driven autonomy echoes the essence of human freedom, granting people the power to make choices about how and where they spend their time.

2. **Work-Life Balance Enhancement**
   The integration of EVTOLs into daily life enables a significant increase in time flexibility, contributing to a better work-life balance. With commuting times drastically reduced, individuals can devote more time to personal activities, leisure, and relaxation. This change has the potential to enhance overall quality of life and contribute to mental well-being.

3. **Historical Reflection on Work and Home**
   Prior to the Industrial Revolution, work and home were largely intertwined, with people

primarily working from their residences. The Industrial Revolution separated these two spheres, leading to a rigid structure of fixed working hours and commuting times. The proposed EVTOL ecosystem could reintroduce a certain fluidity between work and home, similar to the pre-industrial era, yet enhanced by modern technology and innovation.

4. **Redefinition of Relationships among Human, Vehicle and the City**

   The usage and speed of EVTOLs could redefine human relationships. With faster, more accessible travel, people can engage in face-to-face interactions more frequently, fostering stronger and more diverse social connections that transcend traditional geographic boundaries. Lv5 autonomous driving

5. **Impact of the COVID-19 Mega-trend**
   The project findings respond to the ongoing effects and lifestyle changes triggered by the COVID-19 pandemic. With the increased demand for personal space and less crowded transport, EVTOLs could offer individualized or limited capacity transport services, promoting a safer and more comfortable traveling experience.

6. **Comprehensive Urban Planning and Integration of Architecture with Mobility:**
   The nascent stage of EVTOL technology presents an opportunity for well-rounded and thoughtful urban planning before its complete implementation. There exists a significant potential for innovation in architecture , such as the proposed vertiport, that can integrate EVTOLs seamlessly into the urban landscape. The thoughtful integration of these mobility services can create an environment fostering privacy, convenience, and a superior user experience. It opens avenues for cooperation with aspects of personal space and privacy (3. Historical Reflection on Work and Home), paving the way for a new environmental setting where mobility is effortlessly incorporated into daily life. This comprehensive approach not only addresses the current challenges faced by EVTOLs but also enhances individual privacy, autonomy, and overall quality of life.

2. Introduction

2.1. Purpose of the project

The purpose of this project is multi-fold. Firstly, it aims to explore and demonstrate the potential of electric vertical take-off and landing (EVTOL) technology as a primary means of transport in the urban landscape of the future.

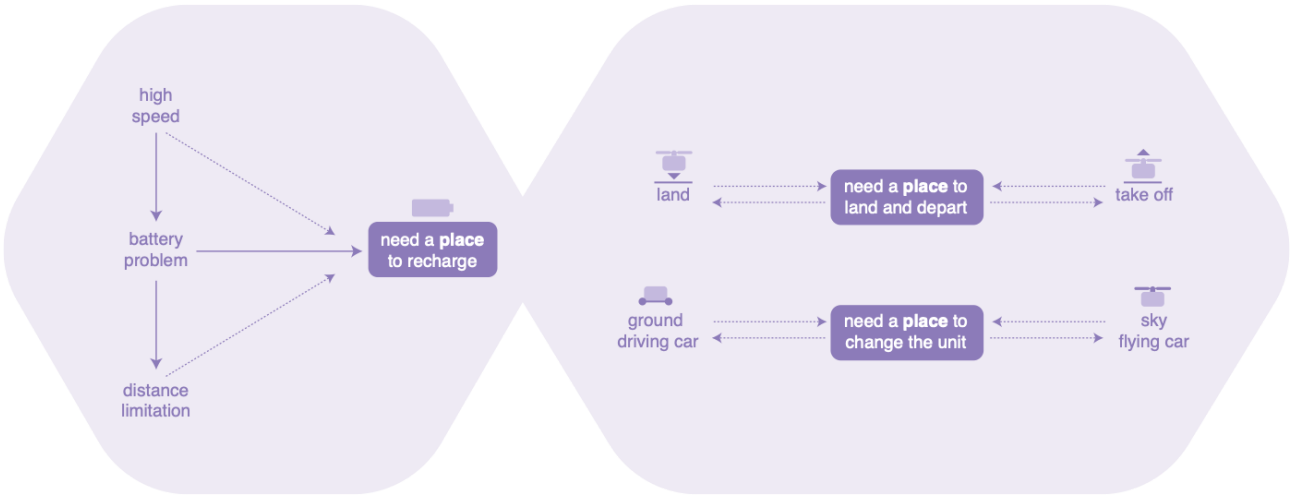
This exploration considers not only the technical aspects of EVTOLs but also the profound impact that this shift in transportation could have on society, the economy, and individual lifestyles. It seeks to paint a vivid picture of a possible future where mobility is drastically redefined, spaces are used more efficiently, and the boundaries of time and geography as we know them today are blurred.

Secondly, the project seeks to stimulate and provoke thought among various stakeholders, from corporations like Xpeng, to technology experts, policymakers, and the general public. By presenting a comprehensive design fiction, it encourages the audience to reimagine the possibilities of urban living and transportation, and consider the choices we make today that will shape our future.

Lastly, the project aims to lay a framework for thoughtful urban planning and infrastructure development to accommodate EVTOLs. It underscores the importance of a well-rounded approach, incorporating considerations of personal space, behavior of travel, and user experience, to ensure the successful integration of EVTOL technology into our daily lives.

2.2. Rationale for the design

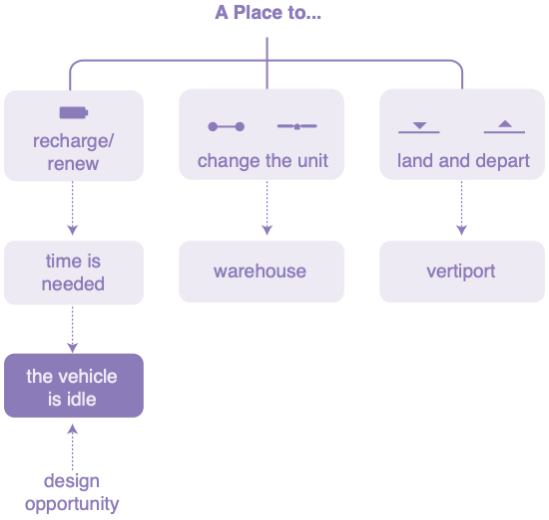
The Design Rationale emanates from an analysis of present-day transportation challenges and technological breakthroughs. With Level 5 (LV5) automation in sight, I foresee a paradigm shift in vehicle space utilization and travel behavior. Fully autonomous vehicles present unique opportunities such as a complete elimination of human safety concerns, offering greater privacy and allowing vehicles to become individual moving spaces.



A prominent advantage of EVTOLs lies in their high speed which can drastically reduce travel time. However, this comes with a drawback in the form of energy consumption and battery drainage. High-speed travel will exhaust battery power faster, thereby limiting the distance covered per charge. Therefore, one of the central problems that need to be addressed is finding an efficient solution and **place** for recharging batteries.

Furthermore, the practical deployment of EVTOLs in urban areas faces the significant challenge of an absence of suitable locations for safe landing and takeoff. The built environment in contemporary cities was not designed with aerial vehicles in mind, and this lack of infrastructure presents a major barrier to the integration of EVTOLs into our transportation networks. Therefore, a **place** for changing the transportation unit is needed.

A potential solution to these issues is to introduce versatile transport units that can be plugged into EVTOLs for different uses, whether on the ground or in the sky. However, this too would require a dedicated space for the exchange and storage of such units.



Taking these considerations into account, it becomes evident that the major constraint in the implementation of EVTOLs lies in the availability and efficient use of space, particularly in densely populated urban areas. In response to this challenge, the perspective of this project primarily focuses on the reimagining and redesigning of urban infrastructure to facilitate EVTOL operations and address their unique requirements. Consequently, the design of spatial elements forms the core of this project, aiming to solve the constraints of EVTOL execution by creating spaces that accommodate various EVTOL activities and promote seamless integration of this technology into everyday life.

3. Project Design and Operation

3.1. Layer 1: Infrastructure

Core components of the project

In this section, the focus is on the critical infrastructural components forming the foundation of the envisaged EVTOL ecosystem: the modular EVTOL units, the aerial track system, and the VertiHUBs.

The EVTOL units introduce a transformative concept of mobility, reshaping how we perceive travel. The aerial track system takes urban planning to a new level by utilizing the vertical space of cities, forming a 3D transport network. VertiHUBs, as key nodes within this network, not only meet the technical requirements of EVTOLs but also cater to various urban functions, contributing to efficient space usage.

Overall, this chapter provides a detailed understanding of the proposed infrastructure, offering insights into its integration into urban landscapes to foster a sustainable future of mobility.

3.1.1.EVTOL

At the heart of the envisioned mobility ecosystem lies the EVTOL module, comprising the central vehicle body, the Rotor, and the Chassis. The central vehicle body is where passengers and cargo are accommodated. It is built to be versatile and modular, with the capability to adapt to different modes of travel.

On top of the vehicle body, there's a dedicated docking mechanism for attaching the Rotor. The Rotor is a separate module equipped with vertical take-off and landing capabilities, enabling the EVTOL to fly when connected. The coupling system for the Rotor is mechanized and incorporates proximity and infrared sensors for precise alignment during attachment. An automatic locking mechanism ensures a secure connection, and a set of diagnostic sensors continually monitor the operational status of the Rotor to guarantee the safety and reliability of the flight.

On the other hand, the bottom of the vehicle body is designed to connect with the Chassis. The Chassis consists of a module with four wheels, enabling ground travel when attached to the vehicle body. The EVTOL can thus transform into a conventional car for ground movement, offering a flexible and adaptable mode of transportation.

Additionally, the vehicle body features an integrated pallet system at the bottom, intended for use within the VertiHUBs. The pallet is a platform that allows the EVTOL to be moved and positioned by the VertiHUB's elevator system. It also enables the EVTOL to be charged wirelessly upon docking at the VertiHUB.

To ensure precise docking and movements within the VertiHUB, the vehicle body is equipped with radio-frequency identification (RFID) and GPS sensors. This technology enhances the automated and efficient operation of the EVTOL within the VertiHUB infrastructure.

This versatile EVTOL design with its modular Rotor and Chassis, coupled with the use of advanced sensor technology, provides a comprehensive solution for the challenges of urban mobility. The unique modular approach facilitates a seamless transition between ground and aerial travel, revolutionizing the way we perceive and interact with transportation systems.

3.1.2. Introduction to VertiHUBs: The new city nodes

3D Overview of the VertiHUB

Overview of the VertiHUB

Core Componets

- a — Rotor
- b — Chassis
- c — Vehicle (Body of EVTOL)
- d — Aerial Track System (Conveyor Belt)
- e — Vehicle & Plugin's Elevator
- f — Pallet

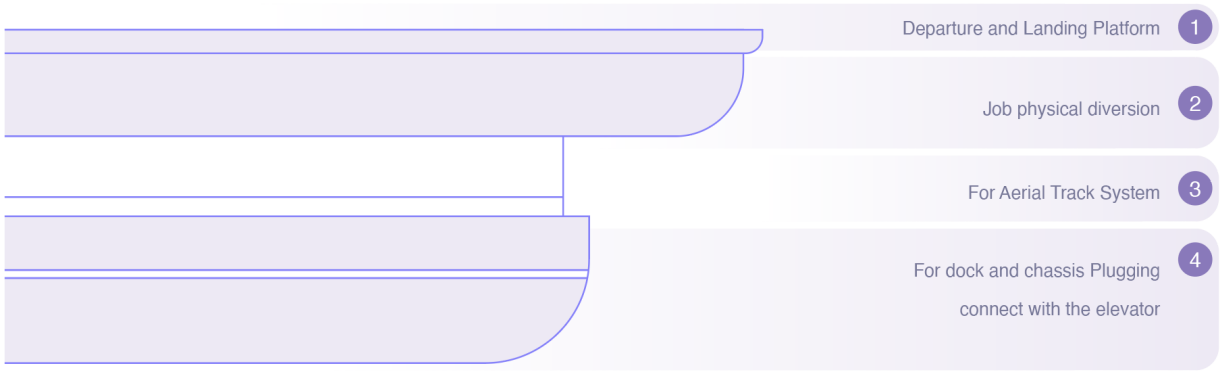
Ways of Transports

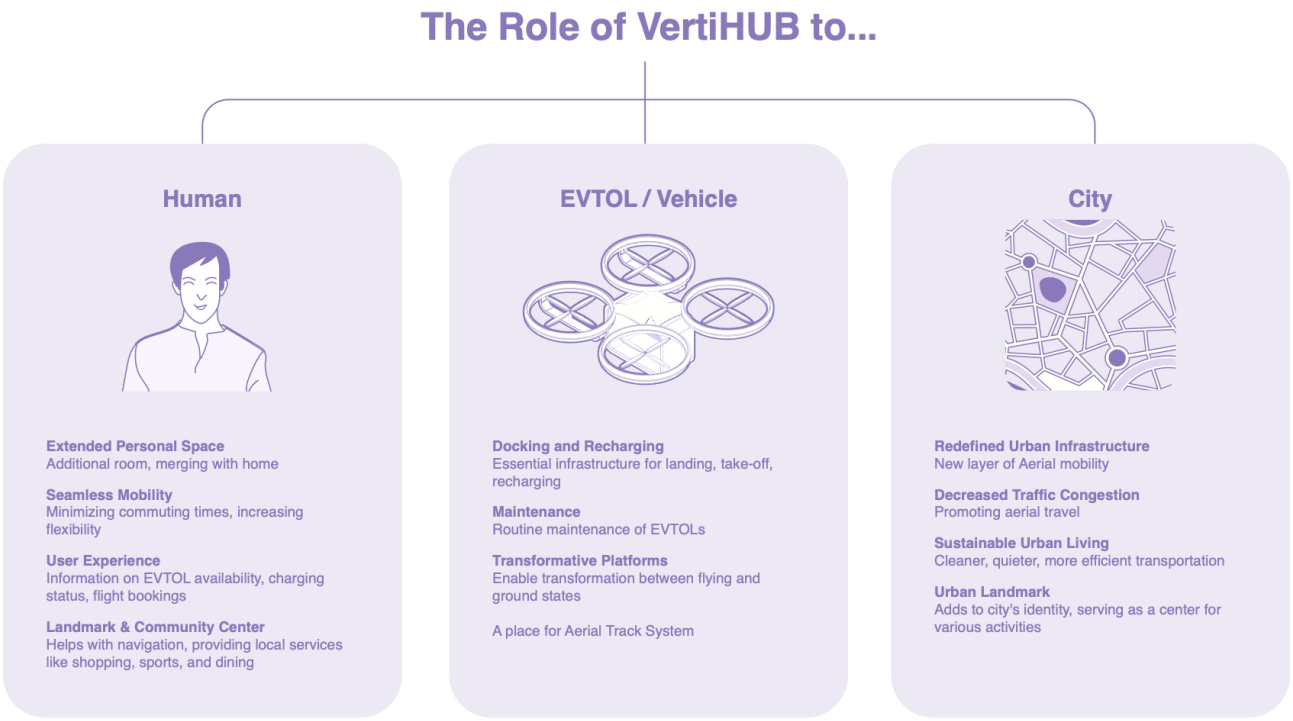
	Transport	Main System	Application	Experience
A	Aerial Track System	*VMS*	cruise cycle	low speed air cruise, quiet atmosphere
B	Dock	*VMS*	Battery Recharge and Extended Space	Modular Moving Room
C	Flying Car	*FMS & ITS*	Flight	High speed, low hinder
D	Ground Car	*FMS & ITS*	FMS & ITS	traditional car, but autodrive

The VertiHUB is primarily segmented into three crucial zones: the top, middle, and bottom, each with distinct functions and contributions to the overarching system.

The upper section of the VertiHUB serves as the primary control and operation center. This is where EVTOLs land or take off, and where the transition of transport units is overseen. The transition can involve converting EVTOLs for the aerial track system, facilitating their integration into the extension of the building as added rooms, or preparing them to attach a chassis at the bottom for ground mobility.

This upper section further comprises various layers to streamline operations and functionality. To ease understanding and lend visual clarity to its composition, this structure has been represented in a 2D format that emphasizes the key structural segments within the VertiHUB.





3.1.3. Introduction to Aerial Track System

The Aerial Track System is a cornerstone in the conceptual framework of EVTOL transportation. It represents a significant departure from the current approach to aerial transportation and offers a new vision for integrating air travel into the urban landscape.

Traditionally, air travel operates on a point-to-point basis, with aircraft traveling from one airport to another. However, in the context of urban EVTOL transportation, this approach is not practical or efficient. Instead, an Aerial Track System allows for a structured, efficient, and safe organization of multiple EVTOLs operating simultaneously in the urban airspace.

Much like a highway system for ground vehicles, the Aerial Track System creates designated 'air lanes' for EVTOLs to travel along. These tracks are defined by a combination of geospatial coordinates and altitude levels, creating a three-dimensional grid within which EVTOLs can operate.

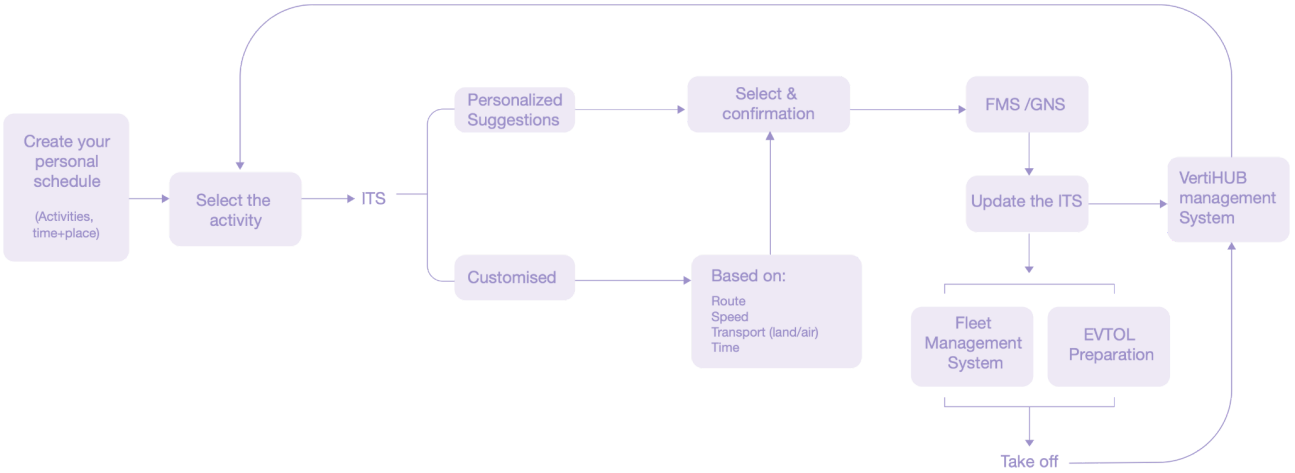
This innovative system allows for the efficient management of aerial traffic, with EVTOLs assigned to specific tracks based on their destination. To prevent collisions and maintain safe distances, EVTOLs within the same track travel at the same speed and direction, whereas different tracks can support different travel speeds and directions.

The Aerial Track System also plays a critical role in managing takeoff and landing operations. EVTOLs are assigned specific tracks for ascending or descending to their destination, ensuring a safe and organized flow of traffic.

In short, the Aerial Track System represents a fundamental reimagining of urban air travel, promising to make EVTOL transportation a safe, efficient, and integrated part of the urban mobility landscape.

3.2. Layer 2: System

User Flow



The journey begins with every autonomous vehicle (ground or aerial) requiring a scheduled route. This scheduling is necessary for system optimization.

Upon deciding to use the EVTOL for a particular activity, users input their schedule into the User Interface System (UIS), which includes activities, time, and place. The UIS then interfaces with the Intelligent Transportation System (ITS), providing personalized route suggestions based on user habits or customized preferences.

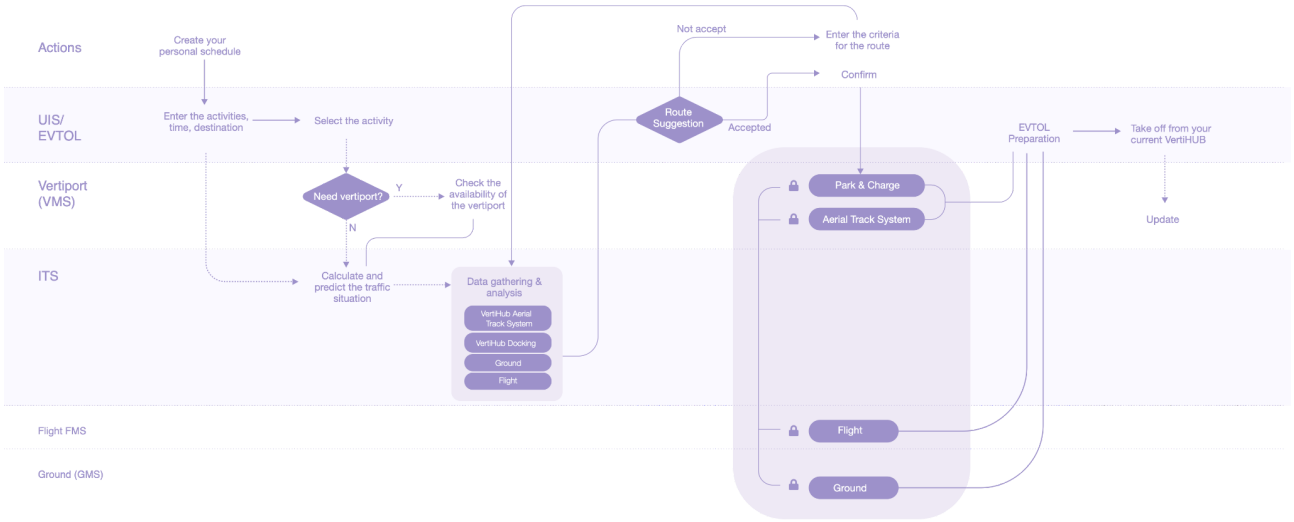
Users then input their preferred route, mode of transport (land/flight), speed, and arrival time. The system subsequently generates several route options, from which the users select their preferred choice. Once the route appointment is confirmed, this information is transferred to the Flight Management System (FMS) and Ground Navigation System (GNS), both subsystems of the ITS, ensuring the larger system maintains an updated overview of all operations.

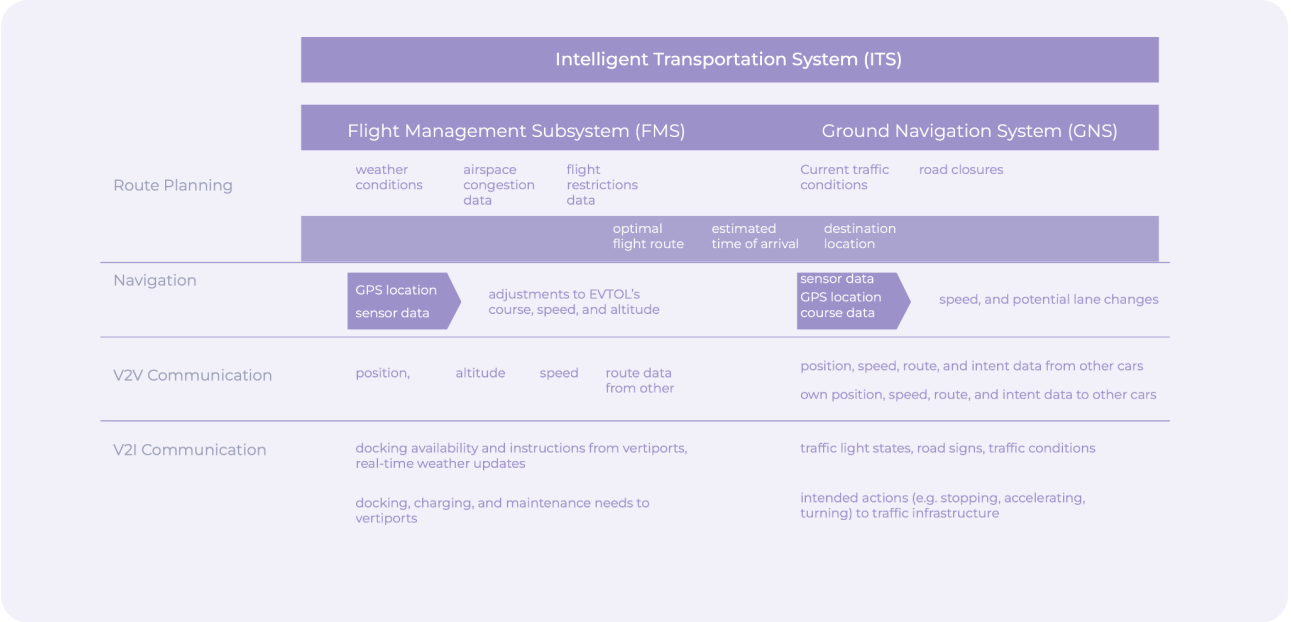
The VertiHUB Management System (VMS) also receives this data, operating under the premise that all EVTOLs dock from VertiHUB. The system initiates the preparation of the appropriate transition unit (chassis or rotor) and oversees its transport to the necessary level within the VertiHUB for attachment.

Simultaneously, the data is transferred to the Fleet Management System (FMS), which interacts with the EVTOL to prepare it for the journey ahead. The VMS is updated once again to reflect the EVTOL's departure status.

The process is characterized by seamless interconnectivity among all systems. As the EVTOL readies for takeoff and embarks on its journey, it continually updates the ITS, FMS, and VMS in real-time. This constant communication ensures the system operates optimally, safely, and reliably, providing a streamlined user experience.

System Flow





3.3. Layer 3 & 4: Application + Experience

The EVTOL and the overall system design aim to provide a versatile user experience that caters to various needs, preferences, and contexts. By creating three distinct layers of experience - passive moving, active moving, and stable - the system seeks to deliver a broad spectrum of interactions that can adapt to the user's desires and circumstances. Each layer has been carefully conceptualized to offer a unique aspect of mobility and personal space utilization, thus making the EVTOL not just a mode of transportation, but a comprehensive solution to urban mobility and lifestyle needs. Here is a deeper look at each layer:

Passive Moving Experience: This experience relates to the use of the Aerial Track System, akin to a cable car service. In this scenario, the users don't necessarily have to have a destination in mind. They can enjoy the aerial cityscape in the comfort of the EVTOL, and move through the city passively, immersing themselves in the tranquility and beauty of the urban aerial view. The autonomous navigation by the FMS ensures a smooth, hands-off experience.

Active Moving Experience: This layer of experience allows users who want to have control over their journey to actively navigate the EVTOL in the air or on the ground. This adds a thrilling and engaging

aspect to the experience, similar to conventional driving but with an aerial dimension. This is an ideal mode for users who enjoy the excitement of manual navigation.

Stable Experience: This involves the EVTOL when it is stationary. When docked at the vertiHUB or parked at a destination, the EVTOL can transform into a personal space for various uses. From being a mini-office to a rest area, the EVTOL offers a flexible, personalized space that can adapt to the users' needs. The vehicle is more than a transportation medium; it is also a mobile, customizable personal space.

3.3.1. A day in the life of a future city resident (Persona Karen)

Karen resides in the bustling, technology-driven world of 2045. This young 24-year-old thrives in the modern 'slasher' culture, juggling various occupations that reflect her multifaceted interests. She appreciates her independence, actively seeks work-life balance, and delights in the autonomy and flexibility her numerous professions grant her. She shares a home with her close-knit family, consisting of her father, mother, and an elder sister who often serve as her sounding boards and unwavering supporters.

Family Background:

Karen's family, the epitome of forward-thinking urban dwellers, subscribe to the Xpeng Aeroht service. They fully embrace the game-changing technology of EVTOL transportation, which offers them rapid, flexible mobility. Their residence in a modern vertiport-enabled building with dual packing areas conveniently connects them with the EVTOL services. This revolutionary setup has transformed their commute and travel experiences, making their journey smooth, hassle-free, and enjoyable.

Job Occupations:

Customer Experience (CX) Designer: Karen harnesses her creative prowess in her role as a CX designer, where she collaborates with her team to craft impeccable customer experiences. This role necessitates various environments - lively spaces for team brainstorming sessions, formal settings for meetings, and a serene, distraction-free zone for focused, intensive work.

Yoga Coach: Embodying peace and wellness, Karen doubles as a yoga coach. She requires an inviting, tranquil area to hold her classes. Catering to intimate groups of 4-6 individuals, she values a spacious activity area that comfortably accommodates her clients while maintaining the personal touch.

1:1 Chinese Teacher: Adding to her professional repertoire, Karen offers individual Chinese tutoring sessions. In this role, she needs a calm, private environment conducive to focused learning. The space should be optimized for one-on-one interactions, creating a supportive atmosphere where her students can thrive.

A Day of a Slasher in 2045 Dubai

This is the story of a day in Karen's life. (For a visual representation, please refer to the second video in the attached files.)

Karen is roused from sleep by the gentle chime of her smart device's alarm clock. She gives a quick glance at her daily schedule, visible on her connected Xpeng transportation app, before reaching for her mobile device. A notification blinks cheerfully, letting her know that her EVTOL is fully charged and capable of supporting a flight duration of 1.5 hours .

Today, her first order of business is a team meeting in the business district. A location set by her company already preloaded into her Xpeng schedule. Selecting the destination, the system computes the optimal take-off time and provides different routes, each accompanied by its arrival time. She chooses a route that will let her escape the early morning sun. With a departure time of 10:05 AM, it's a mere 15-minute flight from her home.

She busies herself with her morning rituals, making sure she's all prepared. Just before climbing into her EVTOL, she grabs the breakfast her mother thoughtfully prepared. Perfect for her short flight, she thinks.

At 10:03 AM, she settles into her EVTOL, awaiting departure. The EVTOL smoothly ascends to the diversion station of her VertiHUB, before lifting onto the roof. A rotor plugs into her EVTOL and they're airborne.

As the city shrinks beneath her, she savors her breakfast. At 10:18 AM, just before arrival, an announcement echoes in the EVTOL and appears on her mobile device. The EVTOL begins its descent, docking with the pallet of the VertiHUB located in the business district. Once secure, the rotor detaches from the EVTOL, retracts into its elevator, and Karen is transferred to her office, docking at her designated spot.

Stepping out of the EVTOL at 10:20 AM, she moves straight to the meeting room, ready to kickstart the day's agenda. A half-hour later, the meeting wraps up. A pop-up notification from Xpeng's app reminds her of the upcoming yoga class at 2:30 PM. She had reserved a small open space at the VertiHUB in the Sports District for it.

With time to spare, Karen decides to grab lunch at the local VertiHUB eatery in the business district. With her lunch in tow, she plots her course for a scenic ground cruise to the Sports District's VertiHUB, aiming to arrive at 2:15 PM. The system, recognizing her preference for ground travel, calculates a leisurely, autonomous driving route through the city.

The system suggests that she also plan the route for her 4:30 PM private Spanish class. Karen opts for an aerial cruise track after picking up her student, cruising until 6:30 PM, by when she should be back home for dinner with her family. Satisfied with her route, she heads off to grab her lunch.

With her meal secured, she hops back into the EVTOL, now transformed into an autonomous ground vehicle, ready for her relaxing journey. During the ride, she multitasks effortlessly, watching a TV show, reviewing meeting notes, and enjoying her meal. The city's dynamic life unfolds around her, providing a refreshing backdrop.

At 2:15 PM, the EVTOL smoothly transitions back to flight mode, landing at the Sport District's VertiHUB, just outside her reserved yoga space. While Karen readies herself for her yoga class, the EVTOL uses the time to recharge.

Her yoga class flies by, and soon it's time for her next appointment. Karen's student, Sophia, is a high-ranking manager at a prestigious company, seeking to learn Spanish from Karen, a native speaker. As the EVTOL alerts Karen it's time to pick Sophia up from her office in the business district, Karen departs.

Arriving at 4:20 PM at Sophia's office, Karen picks up her student, and they embark on an aerial cruise. The private cabin and the tranquil atmosphere offered by the slow-moving EVTOL create the perfect learning environment.

At 6:00 PM, the Spanish class concludes. However, Sophia lives in the same residential district as Karen, so they continue their chat until 6:30 PM, adding a personal touch to the professional encounter.

At 6:30 PM, the EVTOL touches down at the residential district's VertiHUB. Karen bids farewell to Sophia, who exits through the lift to her home. Meanwhile, Karen is whisked away to her home via the EVTOL lift, where her family eagerly awaits her for dinner.

In reflecting upon her day, Karen appreciates the flexible lifestyle made possible by advanced mobility facilities. Following a hearty dinner with her family, she decides on a slow-speed aerial cruise for her sleep, setting her arrival time at home for 3:30 AM.

With the day's tasks complete, Karen spends the rest of her evening engaging with friends on social media until she drifts off to sleep, a moving night view serving as her lullaby.

When Karen opens her eyes the next morning, she's greeted by the promise of a delightful weekend. Another day of dynamic living in 2045 awaits.

3.3.2. Potential enhancements in lifestyle and work-life balance

Enhancements	ETVOL	VertiHUB
Personalized Mobility	• Switchable modes of transportation (aerial and ground) • Individual choice in travel method	• Network of docking and recharging points • Enables personalized travel routes
Flexible Scheduling	• Adjustable departure and arrival times • Choice between fastest or most scenic route	• Integrated system for quick, smooth transfers • Contributes to time efficiency
Seamless Transition between Personal and Professional Spaces	• Can dock at both home and work VertiHUBs • Serves as moving extensions of personal or professional spaces	• Facilitates quick, smooth transfers between home and work • Facilitates F2F activities
Increased Leisure Time	• Reduced commute times • Option to multitask during travel	• Serves as community hubs for leisure activities (dining, fitness classes etc.)
Health and Well-being	• Reduced stress of commuting • Contributes to improved mental health	• Enables a smooth, stress-free commute • Indirect contribution to overall sense of well-being

Personalized Mobility

VertiHUBs serve as central points within a city where EVTOLs can easily dock, recharge, and swap modules. This network of VertiHUBs coupled with EVTOLs' ability to switch between aerial and ground travel modes allow individuals to personalize their mobility. This integrated system presents users with options, allowing them to choose their mode of transport based on their destination, travel time, or even mood.

Flexible Scheduling

The convenience offered by EVTOLs and VertiHUBs enables users to have better control over their time. For instance, Karen can dictate her departure and arrival times, choose the fastest or most scenic route, and even decide whether to drive or fly. This flexibility enables users to schedule their day optimally, balancing work responsibilities and personal activities.

Seamless Transition between Personal and Professional Spaces
EVTOLs, with their capability to dock at both home and work VertiHUBs, blur the lines between personal and professional spaces. They serve as moving extensions of one's home or office, transforming the commute into a comfortable and productive part of the day. VertiHUBs further enhance this seamless transition with their integrated system facilitating quick and smooth transfers.

Increased Leisure Time
By significantly reducing commute times and offering the option to multitask during travel, EVTOLs afford users more leisure time. In Karen's case, her commute time becomes an opportunity for personal activities like enjoying her meal, preparing for work, or simply unwinding with a TV show. VertiHUBs support this by serving as community hubs where individuals can engage in leisure activities like dining or fitness classes, further enriching their daily life.

Health and Well-being
VertiHUBs and EVTOLs contribute to improved mental and physical health by reducing the stresses commonly associated with commuting. The personalization and flexibility of travel, the seamless transitions between home and work, and the additional leisure time all contribute to a sense of autonomy and control, which are linked to greater well-being.

3.3.3. Role Transformation and Space Utilization: Reimagining Mobility

The integration of EVTOL and VertiHUB within city infrastructure allows for a significant transformation in the role and utilization of space, which impacts various aspects of urban life.

From Vehicles to Personal Space
The EVTOL, with its versatility of being a flying car or a ground vehicle, is no longer just a mode of transport. It can be seen as an extended personal or professional space that is mobile. It allows for a seamless transition from home to work or vice versa, and can even be a recreational space, highlighting the change in perception from vehicles as mere transportation mediums to dynamic, personalized spaces.

From Stations to Community Hubs
VertiHUBs, which serve as the docking and charging points for EVTOL, go beyond being simple stations or garages. They become landmarks and community centers, hosting various facilities like restaurants, sports centers, and more. This reflects a shift from static, singular use spaces to dynamic, multifunctional spaces.

Reimagining Roads and Airspace
With EVTOL, both the ground and the sky become avenues for mobility. Roads are not just for ground vehicles anymore, and the airspace isn't just for airplanes. This significant expansion of the mobility network can lead to a reimagining of how space, both on the ground and in the air, is utilized in urban settings.

Revamping City Planning

This new form of mobility and space utilization could have profound implications for city planning and development. It could lead to a more distributed city structure with VertiHUBs serving as new nodes of activity, potentially reducing the concentration of people and activities in city centers and leading to more balanced urban development.

From Passive to Active Transport Management

With the advanced systems in EVTOL and VertiHUB, transport management becomes more active and responsive. Routes can be planned and adjusted based on various factors like traffic, weather, personal preferences, making the transport system more efficient and personalized.

This reimagining of mobility and space utilization opens up new possibilities for a more flexible, efficient, and enjoyable urban life, contributing to the overall well-being of city residents.

4. Project in the Context of Dubai's Vision 2021

4.1. Alignment of the project with Dubai's smart city goals

Dubai’s Smart City initiative is a comprehensive strategy aimed at transforming the city into a fully connected and digitally integrated metropolis. This project aligns closely with Dubai’s Smart City goals in the following ways:

Enhancing Digital Connectivity: The project would necessitate widespread adoption of advanced digital infrastructure, which is a core component of the Smart Dubai initiative. From the Intelligent Transport System (ITS) to the User Interface System (UIS), and the interconnecting subsystems, the project aligns with Dubai's objective of creating a smart, connected, and digital city.

Promoting Innovation: By pushing the boundaries of what is currently achievable in mobility, the project supports Dubai's aspiration to be a global hub for innovation. The concept of combining ground and aerial mobility in a seamless, integrated manner represents a groundbreaking approach to transport, one that fits Dubai's vision of embracing innovative solutions to improve city living.

Emphasizing Sustainable Practices: The project, with its focus on electric vehicles and efficient transport systems, aligns with Dubai's sustainable city goals. By reducing the reliance on traditional modes of transport, the project can contribute to lower carbon emissions and promote environmental sustainability.

Improving Quality of Life: The project's potential to transform the way people commute aligns with Dubai's goal of enhancing quality of life through smart solutions. By significantly reducing commute times and providing greater flexibility, the project can improve work-life balance and overall life quality for Dubai's residents.

Encouraging Public-Private Partnerships: The project’s successful implementation would require collaboration between the government, technology firms, infrastructure developers, and transport providers. This aligns with Dubai’s smart city goals of fostering public-private partnerships to drive the city’s digital transformation.

Overall, the proposed project demonstrates a strong alignment with Dubai's vision for a digitally integrated, sustainable, and innovation-led smart city.

4.2. Consideration of work-life balance in Dubai

Dubai's Vision 2021 underlines the ambition of the city to create a community that facilitates a harmonious and balanced lifestyle for its inhabitants. The city is committed to cultivating a socio-economic environment that promotes happiness and enhances the work-life balance of its residents. This project takes these factors into careful consideration in the following ways:

Reducing Commute Times: One of the main benefits of the project is the significant reduction in commute times that would result from the efficient integration of ground and aerial transport systems. With less time spent on commuting, residents would have more time to engage in personal and leisure activities, thus promoting a better work-life balance.

Increasing Accessibility: The project aims to create an inclusive transportation network that is accessible to all members of the community. This approach ensures that everyone, regardless of their socio-economic status, can benefit from the improved mobility and consequently enjoy a better work-life balance.

Promoting Flexibility: The user-oriented nature of the project, particularly the User Interface System (UIS), gives individuals the flexibility to plan and customize their transportation needs based on their unique schedules and preferences. This personalization can help to reduce stress and improve the overall work-life balance.

Improving Quality of Life: By creating an efficient, reliable, and user-friendly transportation system, the project contributes to improving the overall quality of life in Dubai. The innovative transportation system can make everyday tasks more convenient and less time-consuming, thus allowing individuals to spend more time on activities they enjoy, contributing to their overall happiness and well-being.

In these ways, the project is designed to support Dubai's ambition to create a city that promotes happiness, well-being, and a balanced work-life lifestyle for its residents.

5. Conclusion

5.1. Key takeaways from the project

Interdisciplinary Collaboration: The design and execution of a multifaceted project such as this underline the importance of interdisciplinary collaboration. Drawing upon knowledge from various fields such as civil engineering, mechanical engineering, architecture, and design has shown how different disciplines can collectively contribute to innovative solutions.

User-Centric Approach: The project reaffirmed the significance of a user-centric approach in designing solutions. By prioritizing the needs, preferences, and behaviors of the users, we were able to create a

system that is personalized, intuitive, and accessible, thereby enhancing user satisfaction and engagement.

Impact of Technological Innovation: The use of EVTOLs and advanced digital systems demonstrated the transformative potential of technological innovation. Such technologies can revolutionize traditional systems, in this case, urban mobility, leading to more efficient, sustainable, and enjoyable experiences.

Resilience in the Face of Challenges: This project presented numerous challenges, from managing high expectations and limited resources to dealing with personal complexities. Navigating these difficulties underscored the importance of resilience, tenacity, and adaptability, key qualities that will continue to be invaluable in future endeavors.

Potential for Sustainable Urban Development: The project highlighted the potential of integrating advanced transportation technologies in urban planning and development. Such integration can lead to sustainable, efficient, and livable cities, aligning with global goals for sustainable development.

comparison of 2020s vs 2045

	2020s	2045
Mobility	Limited by traffic congestion and travel times difficult to balance multiple jobs or roles	Mobility reduces travel times and eliminates congestion, creating more time for various roles and jobs.
Workspace	Mostly defined by physical locations, requiring travel and a dedicated space.	Workspaces are flexible and can be anywhere, thanks to the private space in EVTOLs and shared office spaces in VertiHUBs.
Scheduling	Physical travel constraints and limit the number of tasks or appointments one can schedule in a day.	Optimized routing and travel speed, combined with flexible EVTOL scheduling, allow for more appointments and efficient day planning.
Leisure	Planned around work schedules and limited by travel time and availability	EVTOLs and VertiHUBs offer a variety of leisure activities, like scenic routes and open spaces for yoga or other classes. Leisure can be scheduled seamlessly within the day.
Living Environment	Living, working, and recreational spaces are often segregated, requiring individuals to travel between home, work, and places of leisure.	The VertiHUBs integrate residential, work, and recreational spaces, enabling individuals to live, work, and engage in leisure activities in one area, thus minimizing long commutes and streamlining daily routines.
Quality of Life	Balancing work, leisure, and personal time can be challenging due to travel times and inflexible schedules.	Thanks to EVTOLs and VertiHUBs, individuals can effectively balance work, leisure, and personal time, leading to better work-life balance and overall quality of life.

5.2. Implications for the future of urban mobility

This project paints an optimistic and forward-thinking picture of what the future of urban mobility might hold. Some key implications for the future include:

Advanced Technological Integration: The integration of advanced technologies, such as EVTOLs, AI systems, and smart connectivity, can profoundly impact urban mobility. They offer opportunities for seamless, efficient, and highly personalized transportation experiences, transforming the way people move within cities.

Sustainable Mobility: The shift towards electric-powered EVTOLs and efficient transportation management systems could significantly reduce carbon emissions and traffic congestion, contributing to sustainable urban development. This aligns with global efforts to combat climate change and create more livable, environmentally friendly cities.

User Experience at the Forefront: The future of urban mobility will likely focus more on the user's experience. This project demonstrates how intuitive interfaces and personalized routes can make urban transportation more user-friendly and enjoyable. As technology advances, this user-centric approach is expected to become the norm.

Interconnected Systems: The project showcases how interconnected systems can optimize urban mobility. Whether it's the connection between different modes of transportation (EVTOLs, aerial track systems, autonomous cars) or between different digital systems (User Interface System, Flight Management System, Ground Navigation System), these integrations can lead to more efficient, streamlined services.

Versatility and Adaptability: Future urban mobility solutions will need to be versatile and adaptable, as shown by the EVTOL's ability to switch between aerial and ground modes. This flexibility can help cities better manage and respond to diverse transportation demands and challenges.

In essence, this project sets a precedent for how urban mobility might evolve in the future, moving towards more sustainable, efficient, and user-centered solutions. The insights gleaned from this project can help guide policymakers, city planners, and tech innovators in designing the future of urban transportation.