Infrastructure Quick Guide

September 2025 | Version 1.0

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MOBILITY REIMAGINED

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INNOVATION & RESEARCH

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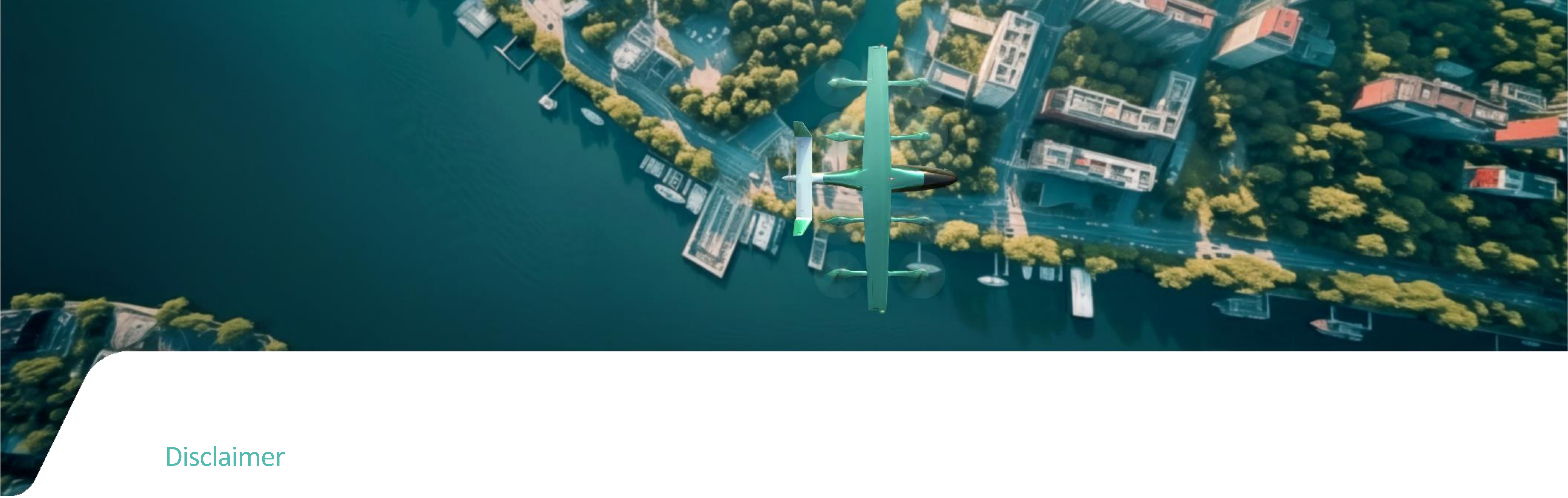
About Eve Air Mobility

Eve is dedicated to accelerating the Advanced Air Mobility ecosystem. We benefit from the best of both worlds: leveraging Embraer’s 55- year legacy of manufacturing safe and high-quality aircraft and having the innovative mindset and technology-oriented vision to challenge the status quo and open new skies. Our outstanding engineering team and a global partner network, including Embraer’s services & support, will help our customers succeed.

At Eve, our focus goes beyond developing and producing an electric vertical take-off and landing aircraft (eVTOL). We take a holistic approach to the market by fostering partnerships that will turn urban air mobility (UAM) into a reality.



Disclaimer

This information reflects Eve’s understanding of applicable practices and regulations at the time of publication. As regulations may evolve, readers are encouraged to consult Eve and/or the relevant aviation authorities to verify the most up-to-date guidance. Future editions will include updates on airspace procedures, data exchange protocols, and regulatory developments.

For questions or suggestions, please contact us at: ecosystem@eveairmobility.com

Message from the VP of Customer Services

Hello and welcome! I'm delighted you're joining us on this journey to shape the future of urban air mobility (UAM). At Eve, we view UAM as more than cutting-edge technology; it's a human-centric solution that will redefine how communities connect.

Designing UAM infrastructure requires the integration of airspace, ground facilities, power systems, and digital networks into a single, seamless ecosystem. This complex and dynamic task demands collaboration among diverse stakeholders, including aviation regulators, city planners, utility providers, and technology partners. By working together to align procedures, wisely site vertiports and plan with market scalability in mind, we can set the stage for safe, efficient and sustainable operations.

Making early and thoughtful decisions regarding airspace integration, electrical capacity, and passenger experience is crucial for success. These considerations are not just technical requirements; they are the building blocks of public trust and commercial success. That's why we've compiled our collective expertise into this Quick Guide, which provides UAM stakeholders with a clear and actionable roadmap for launching and scaling UAM services.

What's inside this Quick Guide

- General design considerations: key factors to evaluate when selecting vertiport locations and supporting systems;
- Land infrastructure: types of vertiport, layouts, equipment and best practices for siting;
- Power systems: charging strategies, energy management and grid integration
- Regulatory references: global Civil Aviation Authority (CAA) guidance on vertiport design and electrical requirements;

Eve is committed to providing you with the insights and tools needed to turn UAM into a reality. Thank you for partnering with us as we work to create a new way to travel in urban environments that is safe, sustainable and efficient.

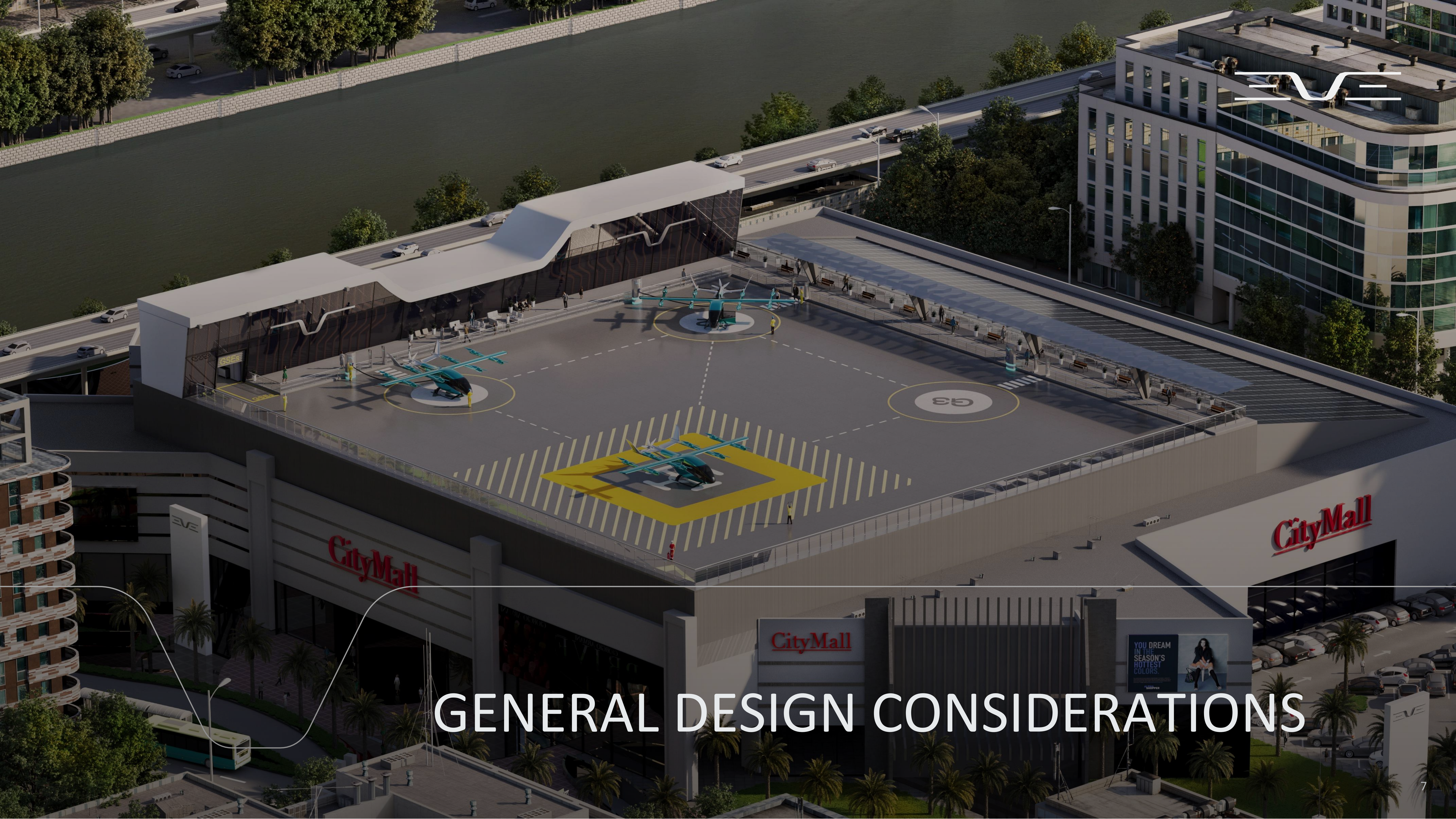
Sincerely,

Luiz Mauad

Vice President, Customer Services Eve Air Mobility

Acronyms & Abbreviations

AC	Alternating Current
ADA	Americans with Disabilities Act
ANAC	National Civil Aviation Agency
ANSP	Air Navigation Service Provider
ARFF	Aviation Rescue and Fire Fighting
ATM	Air Traffic Management
BESS	Battery Energy Storage System
CCS	Combined Charging System
EASA	European Union Aviation Safety Agency
eVTOL	Electric vertical take-off and landing aircraft
DC	Direct Current
FAA	Federal Aviation Administration
FATO	Final Approach and Take-off
GPU	Ground Power Unit
GSE	Ground Support Equipment
ICAO	International Civil Aviation Organization
kW	Kilowatts
MW	Megawatts
NFPA	National Fire Protection Association
PSU	Provide of Services to UAM
SA	Safety Area
TAT	Turn Around Time
TLOF	Touch-down and Lift-Off
UAM	Urban Air Mobility
VAC	Volts AC
VDC	Volts DC
VOA	Vertiport Operations Area
VPV	Vertiport Volume



GENERAL DESIGN CONSIDERATIONS

Siting Considerations and Infrastructural Needs

Airspace Protection
Initial vertiport site assessments must account for the protection of the airspace over the vertiport and ensure safe clearance for approach and departure routes, specifically within the Vertiport Operations Area (VOA) and Vertiport Volume (VPV). These airspace protection requirements are defined by the regulations of the Civil Aviation Authority (CAA).

Zoning Compliance
Approval for vertiport operations must be obtained from local land use and zoning authorities. This process may involve environmental impact assessments and require community engagement to address public concerns and ensure regulatory compliance.

Land Infrastructure
Vertiports will vary in complexity based on factors such as property size, geographic location, local and CAA regulations, and customer demand. Key design features of a vertiport may include:

- One or more Final Approach and Takeoff area(s) (FATO)
- One or more Touchdown and Lift-off area(s) (TLOF)
- One or more Safety Area(s) (SA)
- Apron with Stands (optional) depending on size of the vertiport, available land and layout.
- Passenger Area

Power Infrastructure
Vertiports will require power infrastructure to support safe, efficient, and continuous eVTOL operations. Key requirements include:

- Power supply
- Chargers
- External battery cooling/heating system
- Energy management systems (optional) to manage and ensure power availability

Siting Considerations and Infrastructural Needs

Flight Operations Planning

Vertiport automation enables real-time data exchange between vertiport operators and UAM stakeholders, including aircraft operators, air traffic management service providers, and other vertiport operators. This integration supports aircraft flow management, strategic and tactical resource management, and seamless airspace integration. Such capabilities are essential for effectively managing delays and disruptions inherent to air mobility operations. Accurate and timely data enhances situational awareness regarding resource availability, weather conditions, and maintenance needs, thereby improving operational planning. Ultimately, vertiport automation strengthens safety and promotes the efficient use of both aircraft and ground resources, contributing to reduced operating costs.

Passenger Experience and Accessibility

In high-demand areas, vertiports should ideally be located near multimodal transportation hubs, such as bus terminals, rail stations, ferry ports, and micromobility networks, to enhance last-mile connectivity. Additionally, both infrastructure and digital UAM services (e.g., booking, check-in, and passenger information systems) must be designed to ensure accessibility for people with disabilities, with particular attention to individuals with sensory and mobility impairments.

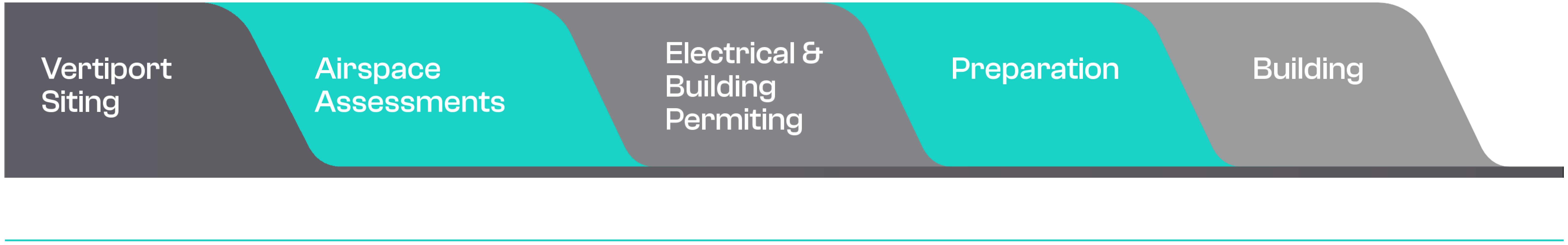
Accessibility is not only a best practice but also a regulatory requirement in many regions. In the United States, vertiports must comply with the Americans with Disabilities Act (ADA) Standards for Accessible Design, while airports and airlines are subject to the Air Carrier Access Act. In Brazil, the National Civil Aviation Agency (ANAC) enforces Resolution No. 280 of July 11, 2013, which outlines accessibility requirements for air transport services and infrastructure. In Europe, Regulation (EC) No. 1107/2006 guarantees the rights of disabled persons and those with reduced mobility when traveling by air. Similarly, in Australia, the Disability Discrimination Act of 1992 mandates equal access to premises, goods, and services, including transport infrastructure. As vertiport regulations continue to evolve, coordination will be essential to avoid fragmented standards and ensure an inclusive and accessible air mobility.

Timelines

Planning and constructing a new vertiport and its supporting systems typically take between 6 to 24 months, depending on the complexity of the project. While adapting an existing helipad may require less time, it still involves steps such as updated airspace evaluations and obtaining power and land use permits.

Infrastructure timelines can vary significantly due to the interdependencies involved. Factors such as government and community support, site readiness, regulatory requirements, power infrastructure development, environmental assessments, airspace and vertiport complexity, and permitting processes all influence the overall schedule.

Figure 1 illustrates a generic example of a vertiport planning timeline, highlighting the need for parallel workstreams. Activities such as airspace evaluations, power infrastructure planning, and land development must occur simultaneously to avoid delays. However, actual durations and processes will vary based on the specific regulations and requirements of each country, region, city, and vertiport site.



6 to 24 months

Figure 1. A Generic Example of a Vertiport Development Timeline

LAND

Vertiport Site Selection & Design Considerations

A vertiport is the designated location where eVTOL aircraft operate, allowing passengers or cargo to board and disembark. These facilities may be designed to support eVTOL and helicopter operations simultaneously.

Federal Aviation Administration (FAA) definition: “Vertiport: An area of land, water, or a structure used, or intended to be used, to support the landing, takeoff, taxiing, parking, and storage of powered-lift aircraft or other aircraft that vertiport design and performance standards established by the Administrator can accommodate.”

European Union Aviation Safety Agency (EASA) definition: “Vertiport means an area of land, water, or structure that is used or intended to be used for the landing, take-off, and movement of VTOL-capable aircraft.”

Vertiport Location

Once a proposed site is selected (defined by coordinates), vertiport builders must consider:

1. Does the site comply with local zoning and land use regulations?

When developing a vertiport in an urban environment, it is important to comply with local zoning regulations and engage with land use authorities. This process typically includes conducting environmental assessments and actively involving the community to ensure transparency and foster public trust. Among the topics raised by the community, noise has been identified as an important area. To address this, it is essential to incorporate thoughtful infrastructure design and flight path planning. Ultimately, a successful vertiport should harmonize with its surroundings by integrating regulatory, environmental, and social considerations from the beginning. This can be achieved by discussing new facilities and operations with the community early in the planning process.

2. Is the existing land infrastructure adequate?

The suitability of the site's land infrastructure must be evaluated to ensure it can support safe and efficient eVTOL operations, in line with the guidelines of the relevant authorities in each country. This includes assessing the dimensions of the Touchdown and Lift-off Area (TLOF), Final Approach and Takeoff Area (FATO), and the Safety Area, as well as verifying the maximum permissible height of objects within these zones and in adjacent buffer or protection areas. It is also essential that the pavement has adequate load-bearing capacity. Additional regulatory and operational requirements must be considered. Furthermore, integration with other urban transportation modes is desirable.

3. Is there sufficient power available at the site?

Consult local utility companies to understand power availability and timelines. If upgrades are needed in the electrical distribution network, the timeline and cost need to be factored into planning. For example, it could take as little as 6 months, depending on factors including the location, availability of power, and electrical substation capacity.

4. Does the proposed site support safe airspace integration?

Vertiports must follow CAA regulations to protect the airspace above the vertiport and along approach and departure paths. An airspace integration study must be conducted with the air navigation service provider (ANSP) as soon as a proposed site is selected.

Vertiport Zoning Compliance

When planning a vertiport in an urban environment, it is essential to align with local zoning regulations and secure approval from land use authorities. This process typically involves environmental impact assessments and early, transparent engagement with the community, which helps address public concerns and build long-term trust and support.

One of the key topics communities care about is noise, and although eVTOL aircraft benefit from electric distributed propulsion, which significantly reduces noise, their integration into dense urban areas still requires careful planning. This includes land use planning that considers factors such as ground traffic, visual integration, energy sourcing, and compatibility with nearby land uses. It also involves designing flight paths that respect sensitive areas and scheduling operations to align with the natural rhythms of urban life, minimizing disruptions and helping to ensure the vertiport harmonizes with its environment. Additionally, incorporating architectural solutions to further soften sound in specific contexts could be an option to enhance comfort for nearby communities.

Ultimately, the success of an urban vertiport depends on a holistic approach that balances regulatory, environmental, and social factors. With this integrated approach, vertiports have the potential to become welcomed and sustainable additions to the city, enhancing mobility, reducing environmental impact, and enriching the urban experience for everyone.

Surface Area Size and Design by Region

Regulators are guiding specifications for TLOF, FATO and SA. These currently differ across regions or countries. These dimensions are calculated using the parameter (D) and (RD) of the eVTOL. As an example, a maximum D of 50 feet and a RD of 47 feet have been adopted. The tables below are dimensions based on the regulatory bodies and regions and are current in August 2025. They are expected to evolve with each CAA. Readers are advised to check with the relevant regulator for the latest regulations.

* **Controlling dimension (D):** The diameter of the smallest circle enclosing the entire VTOL aircraft projection on a horizontal plane, including all possible configurations with rotors/propellers turning, if applicable.

* **Rotor Diameter (RD/D):** The largest length of all the rotors from tip to tip. It can be computed by finding the diameter of the smallest circle enclosing all the lift producing propulsion units, including their propellers, rotors, fans, etc., on a horizontal plane, while the aircraft is in the vertical takeoff or landing configuration, with rotors/propellers/fans turning, if applicable. The RD must also incorporate all landing gear and surface touch points.

United States

Under FAA Regulations:

- SA can extend over water or clear airspace.
- SA must remain clear with no obstructions except for fixed navigation aids.

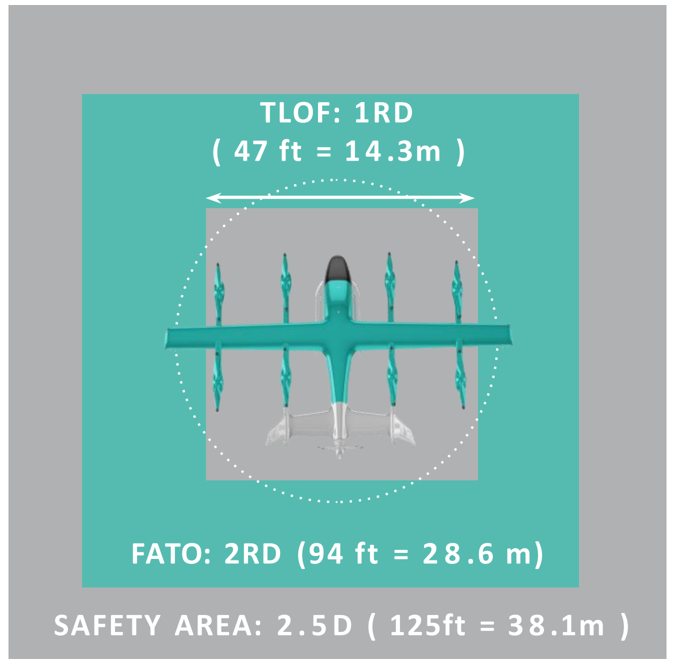
	TLOF	FATO	SAFETY AREA	TOTAL AREA (SQUARE)
RD	1 RD	2 RD	2.5 D	6.25 D^2
VALUE	47 ft	94 ft	125 ft	15,625 ft^2
	14.3 m	28.6 m	38.10 m	1,452 m^2
AREAS				

Table 1. Dimensions for Vertiport Areas for United States

Surface Area Size and Design by Region

Australia, Brazil, India, Japan, UAE, Italy, UK and EASA

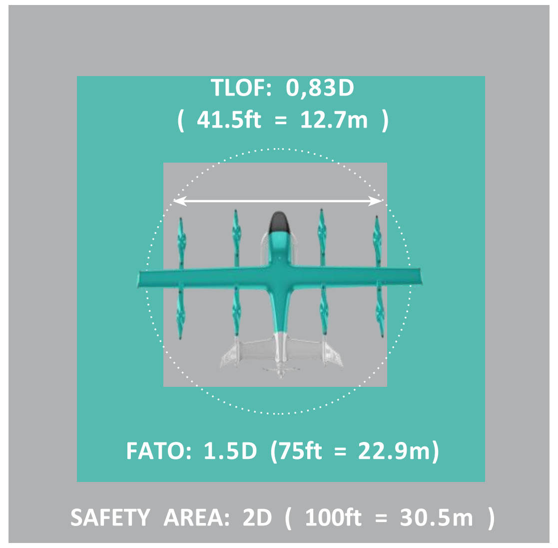
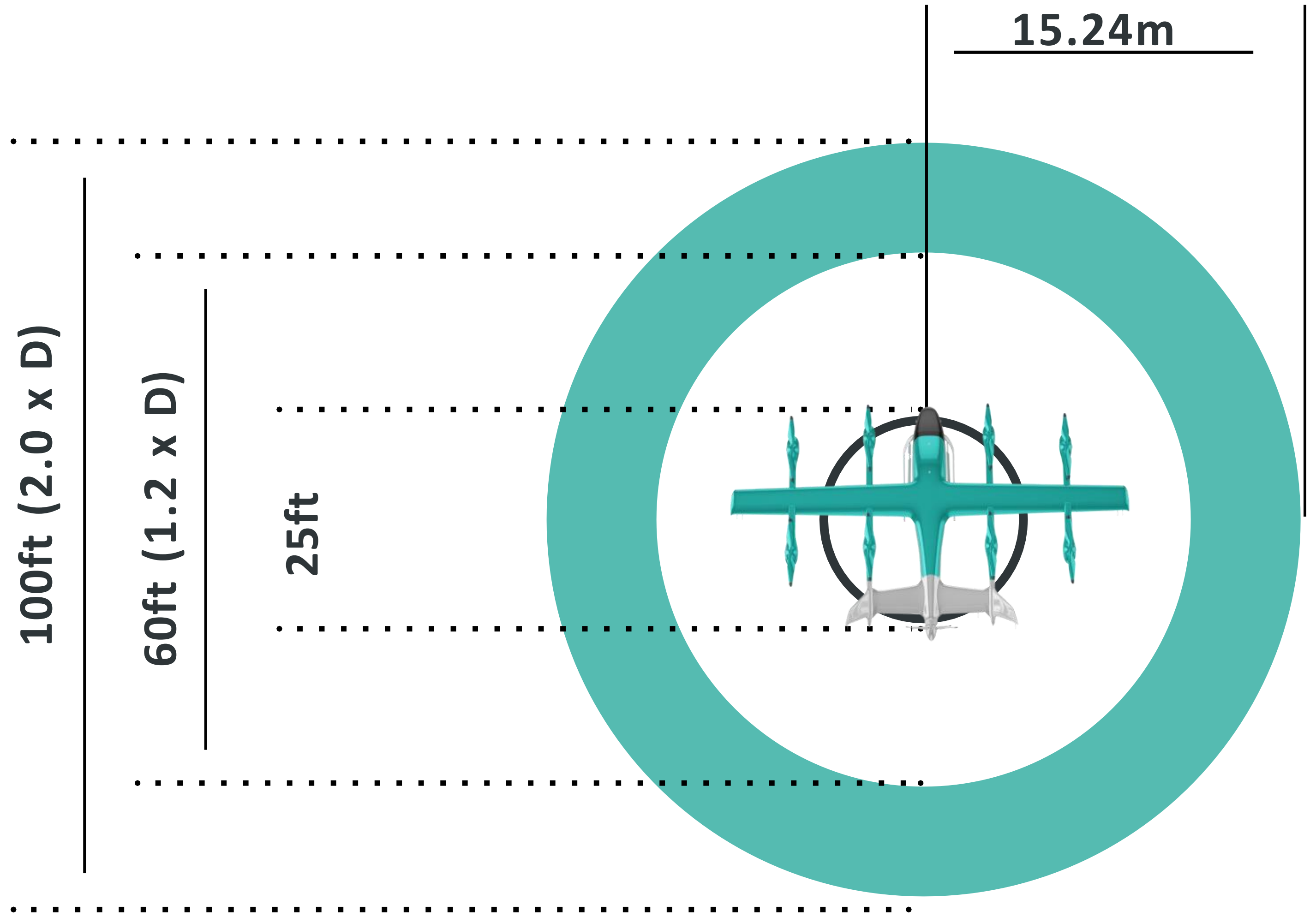
	TLOF	FATO	SAFETY AREA	TOTAL AREA (SQUARE)	REGULATORY AGENCIES
D	0.83 D	1.5 D	3 m or 0.25 D whichever is greater	4 D^2	CASA - Australia ANAC - Brazil EASA JCAB - Japan DGCA - India ENAC - Italy GCAA - UAE CAA - UK
VALUE	41.5 ft	75 ft	100 ft	10,000 ft^2	
	12.7 m	22.9 m	30.5 m	929 m^2	
AREAS					

Table 2. Dimensions for Australia, Brazil, India, Japan, UAE, Italy, UK and EASA



Stand Dimensions

- Stand
- Stand Protection Area

Vertiport Types

Eve expects vertiports to be classified into four main types. The following descriptions serve as general guidelines, subject to regional adaptations.

Vertistop

This is the smallest type of vertiport, with 1 FATO/TLOF (which can also be a stand). Likely to be at low-tempo locations. It has a charger, an external battery cooling/heating system (if applicable) and an optional Ground Power Unit (GPU).
May also have basic GSE and a basic passenger area.

Estimated area required: 929 m2 – 1,452 m^2 (FATO area) up to 3,000 m^2. Depending on the specifications of the passenger handling area to be developed.

Vertistation

Features 1 FATO/TLOF with 1 to 4 stands. Located in urban centers. Basic ground handling and line maintenance could be provided. Offers GSE, chargers, external battery cooling/heating system, GPU, weather sensors and a small passenger terminal.

Estimated area required: 10,000 m^2.
Considering:
- 1 FATO
- 3 stands
- 1 taxiway
- 1 small passenger terminal

Vertihub

The largest vertiport. 2+ FATO/ TLOF with 4+ stands. With services that include ground handling, GSE, chargers, external battery cooling/ heating system, GPU, weather sensors and a passenger terminal.
May offer space to hangar eVTOLs overnight, provide line maintenance is located close to a multimodal hub.

Supercenter

Features 1 FATO/TLOF area, 4+ stands, GSE, chargers, external battery cooling/ heating system, weather sensors and possibly a small vertiport.
Provides space to hangar eVTOLs and perform all maintenance, including heavy maintenance services.
Supercenter vertiports will be most likely in suburban's areas and may function as a completions line, order/delivery facility or TechCare service center.

Vertiport Layout

Factors influencing the layout of the vertiport include:

- Protection of airspace for arrivals and departures
- Downwash / Outwash
- eVTOLs turn radius (if wheeled)
- eVTOLs wingspan
- Proximity to other eVTOLs
- Positioning / repositioning between flights and charging
- Passenger safety and egress
- Ground handling safety, egress and workflow
- Turn-around-time (TAT)

A preferred configuration places taxiways in front and behind the parking stands for greater operational safety, lower battery consumption, and better traffic and passenger flow within the apron. This layout minimizes the impact of downwash / outwash providing the optimal customer experience. (Figure 2)

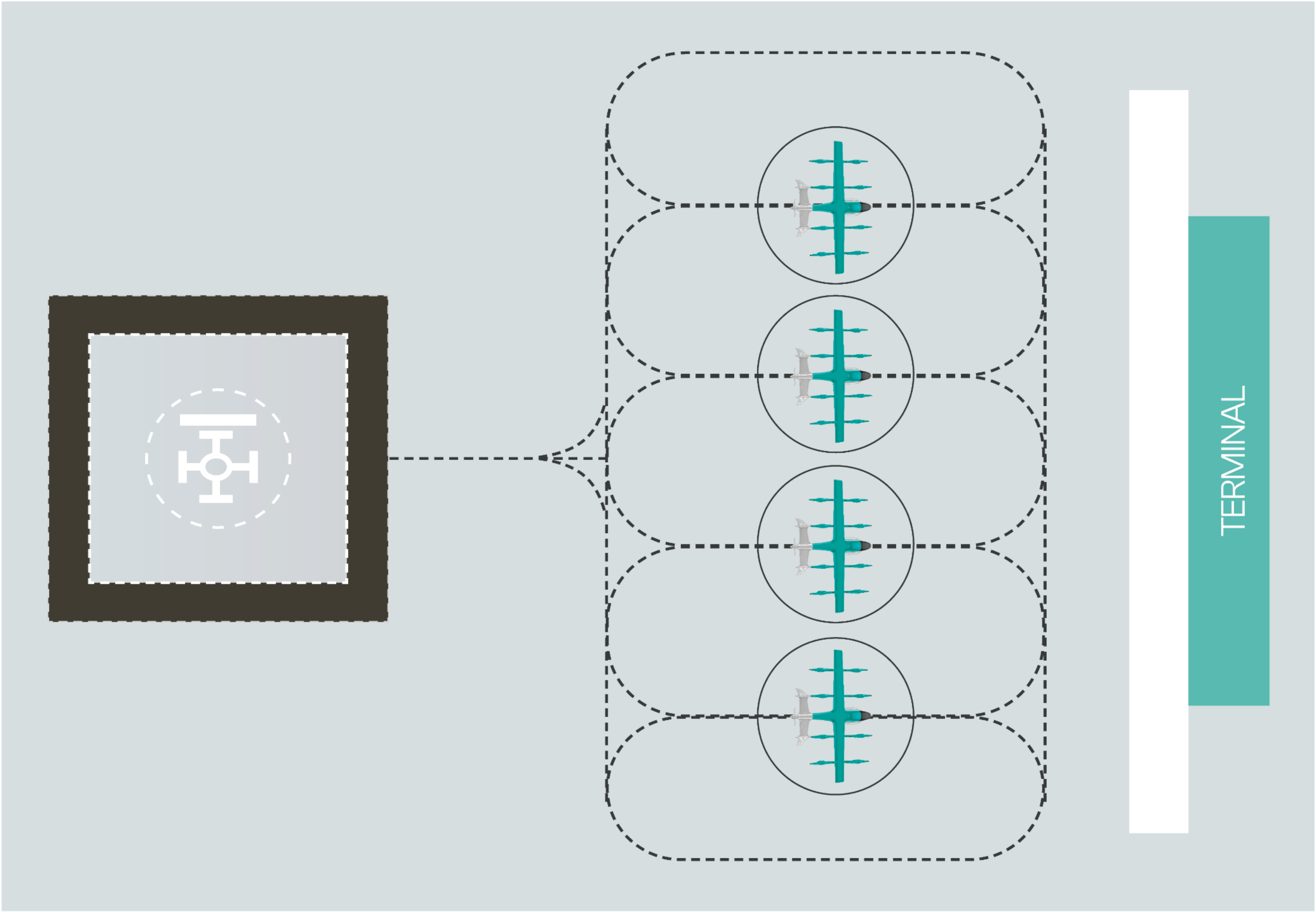


Figure 2. Example of a Layout with Allowances for Wingspan, Passengers and Chargers

Placement and Height of Essential Objects

The International Civil Aviation Organization (ICAO) defines “Essential objects” as “visual aids (e.g., lighting) or others (e.g. firefighting systems) necessary for safety purposes”. EASA explains “Essential objects are visual aids (e.g. lighting or roll-over protection if the vertiport is elevated) or other aids (e.g. firefighting systems) necessary for safety purposes”. Placement of essential objects needs to consider regulatory requirements and surface movements.

Maximum Height of Objects in TLOF/FATO/SA Area

Regulations have not yet released regarding the maximum height of objects in the TLOF, FATO, SA and stand-protection-area for vertiports. Although regulations exist for airports and heliports, refer to the relevant regulating agencies guidance.

Maximum Height of Objects at Stands/Protection Area

For EASA, if essential objects are located at less than 0.75D from the center of the stand, the maximum height is 5 cm. And if they are more than 0.75D from the center of the stand, the maximum height is 25 cm. If we take D=50ft (15.24m), then 0.75D = 37.5ft (11.43m).

Allowance for Movements to/from Chargers

eVTOLs will either need to taxi to the charger (fixed) or a charger (mobile) needs to be delivered to the eVTOL. When installing fixed objects, consider wingspan and wing heights allowances for surface movements.

Eve Recommends: Consideration be given to installing a hatch pit under each stand to allow for the use of mobile chargers and avoid the need to move the eVTOL to a fixed charger (more than 25 cm high). This will optimize TAT. More details on chargers can be found in the Power section.

Vertiport Equipment & Resources

5G / Wi-Fi Communication Networks

- Data networks are needed for the exchange of information between the aircraft and stakeholders including the fleet operator, the Provider of Services to UAM (PSU), the vertiport operator, energy management systems and the chargers.

Weather Information Sources:

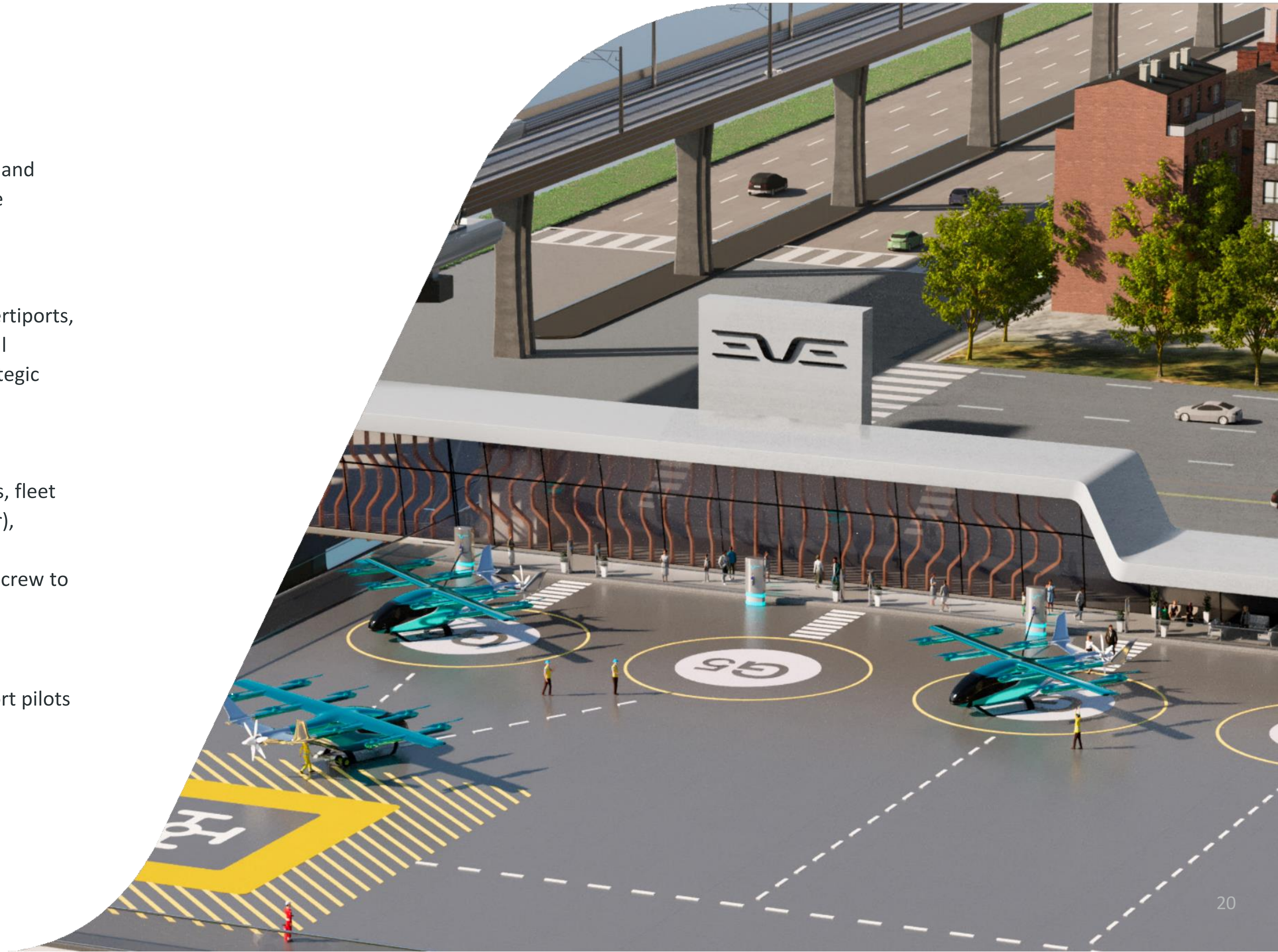
- While regulators have not yet defined the requirement for weather data from vertiports, Eve believes that timely and accurate weather information must be available from all vertiports. Micro weather data must also be available along the route to enable strategic flight planning and mitigate potential safety risks.

Vertiport Automation:

- Vertiport automation systems can exchange data with other automation systems, fleet operator systems and ATM systems, to manage resources (e.g., FATO, stands, power), manage delay & disruption, communicate vertiport status, and support passenger throughput. Automation supports seamless passenger journeys and enables ground crew to support passengers and aircraft as needed.

Visual Aids:

- Perimeter lighting and visual aids (system of lights, markings, and signs) to support pilots navigate safely and efficiently at vertiports. Guidance is issued by regulators.



Vertiport Equipment & Resources

Ground Support Equipment (GSE)
Ground equipment and resources are needed to support safe and efficient eVTOL operations and passenger boarding/deboarding.

- **CHARGERS:**
  Electrical charging stations with Combined Charging System (CCS) connectors in a quantity compatible with the operation of the vertiport. If the charger has a power of more than 350 kW (around), cooling of the cables and connectors may also be necessary.
- **EXTERNAL BATTERY COOLING/HEATING SYSTEM:**
  System to manage battery temperature during charging. Each vertiport must have a quantity of these GSEs compatible with the operation of the vertiport.
- **GROUND POWER UNIT (GPU) (if applicable):**
  Low-voltage equipment to power avionics and other systems while the eVTOL is on the ground without engines running, thus not needing to use power from the aircraft's internal battery.
- **TUGS:**
  If aircraft uses only skids, GSE is needed to move eVTOLs between stands and fixed chargers or hangars.
- **FIRE SAFETY EQUIPMENT:**
  Water and/or other equipment to fight electrical and aircraft fires.

Some vertiports may need energy generation and/or energy storage facilities (e.g., microgrids, battery energy storage system [BESS]) to ensure power is stored and available for:

Energy Storage

- **MICROGRID**:
  Localized energy system that integrates and manages distributed energy resources and loads and can be used to provide backup power during power outages or to improve energy efficiency.
- **BESS:**
  Utilizing BESS can be a potential application for eVTOL batteries second life. This provides a sustainable way to power infrastructure within the vertiport or local community.

Adapting Heliports / Helipads to Vertiports

Land

Current heliports/helipads owners may want to adapt their existing infrastructure for use by eVTOLs. Changes as well as new infrastructural needs will be required.

DIFFERENCES FROM EXISTING HELIPORTS/HELIPADS
Heliport/Helipad owners should consider differences in:

- Regulatory Framework
- Dimensions of Operational Areas
- Pavement Resistance of Operational Areas
- Approach and Take-off Paths and Procedures
- Downwash / Outwash Protection Areas
- Fire Safety Measures Service Plan

Regulatory Framework
CAAs may allow the shared use of an aerodrome for eVTOL and helicopter operations. Vertiport planners should evaluate the requirements to ensure that the necessary operational, safety and environmental standards are achievable.

Dimensions of Operational Areas
CAAs may require vertiports to have different dimensions from those in heliports. It may be necessary to evaluate the availability of additional land. In addition to sizing, changes may be needed to the position of features such as lighting, ground markings, landing zones, and passenger walkways.

Pavement Resistance of Operational Areas
It is necessary to verify whether the current pavement resistance of heliports/helipads will also meet the requirements for vertiports defined by the CAA.

Approach and Takeoff Paths and Procedures
Approach and takeoff surfaces/ramps for eVTOL may be different from those used by helicopters. Consequently, visual traffic circuits and visual approach and takeoff procedures and other procedures may have to be created/changed.

Downwash/Outwash Protection Areas
The design and number of eVTOL propellers are different from helicopters. Therefore, downwash/outwash protection areas will likely be different. Consult with CAAs and vertiport design guidelines or engineering briefs for the latest Downwash/Outwash requirements.

Firefighting Service Plan
Heliports already have an existing regulatory framework regarding firefighting services but due to the use of batteries in eVTOLs, and the use of Li-ion battery in particular, updated firefighting plans will be needed. Regulatory agencies are currently developing recommendations.

Adapting Heliports / Helipads to Vertiports

Power and Equipment

New considerations for supporting eVTOLs include:

- Electrical Charging Infrastructure and Equipment
- Power Supply
- External Battery Cooling / Heating Systems
- 4G/5G and/or Wi-Fi Communication Networks
- Vertiport Automation
- Urban Air Traffic Management Systems

Electric Charging Infrastructure and Equipment
Electrical chargers will be needed to recharge eVTOL batteries. The mobility and flexibility of charger designs can influence operational procedures (e.g., TAT), air traffic control (greater movement of aircraft on the ground - for fixed chargers), as well as the capacity and profitability of a vertiport.

Power Supply
Engage with local power and utility providers to assess the capacity and availability of the regional energy grid, particularly at the heliport site. Additionally, implementing energy storage and management systems may be necessary to ensure operational resilience and provide backup power when needed.

External Battery Cooling/Heating System
An external battery cooling system is required to maintain the aircraft's battery temperature within the recommended range during the recharging process, ensuring safety, performance, and battery longevity.

4G/5G and/or Wi-Fi Communication Networks
Robust data networks are essential for seamless information exchange between the aircraft and key stakeholders, including the pilot, fleet operator, PSU, vertiport operator, energy management systems, and charging infrastructure. Therefore, it is important to verify whether the heliport being adapted offers adequate 4G/5G and/or Wi-Fi network availability and coverage to fully support eVTOL operations at the site.

Vertiport Automation
The battery capability of eVTOLs will require greater predictability and certainty about the availability of a place to land. Vertiport automation systems, in combination with Urban Air Traffic Management systems, support safe and efficient operations by managing ground infrastructure strategically and provide eVTOL flights with greater certainty about access to landing sites and charging facilities.

Urban Air Traffic Management Systems
Upon entry into service, eVTOLs will share the same airspace and follow the same flight rules as other low-level aircraft. Data exchange with Urban Air Traffic Management systems will likely be necessary when operations scale so that traffic flows across an urban area are safely optimized and information about ground resource availability are integrated into flight plans. Considerations will include the use of alternate landing locations for emergency and off nominal scenarios.

POWER AND CHARGING

Power

A reliable power supply is critical to ensuring business continuity, optimizing operational efficiency, and supporting scalability. For most missions, it is estimated that eVTOL batteries will require at least partial recharging after each flight, whether through slow or fast charging, depending on the operator’s preference, and can be fully recharged (up to 100%) overnight.

To meet growing energy demands, substations may need to be constructed. Power planning should begin well before launch, as permitting, zoning, and installation processes can be time-consuming. Additionally, lead times for power infrastructure components are often long, requiring proactive coordination

General usage eVTOL charger system

Power Supply
•Three-phase power: 380, 440 or 480 VAC

Chargers
•Fast Charger Power: Up to 500 kW
Estimated average time to charge : 15 - 30 min.*
•Standard Charger Power: Up to 250 kW
Estimated average time to charge: 40 - 50 min.*
•For overnight and maintenance is recommended a lower power charging: < 100 kW
Time to charge: 2 – 5 hours.*
Extend battery life.
Lower capex and opex.
•Must not obstruct operational areas (FATO, TLOF, SA, Stands, apron, taxiway)
•Operating in the range of 600 – 1000 VDC
•Charging DC cables limited to 7.5 m in length (NFPA/70 – Article 625)
•Liquid-cooled cables (necessary for specific charging conditions and high power chargers)
•Connectors: CCS1 or CCS2, depending on the country.

External Battery Cooling / Heating System
•During charging, the temperature of the aircraft batteries (usually Li-ion) increases. An external cooling system will be needed to keep temperature within recommended range.
•The external battery cooling/heating system can be fixed or mobile. It is estimated that the average power required for this GSE be around 25 kW with a maximum of 40 kW.

GPU (low voltage) – If applicable, primarily intended for maintenance purposes
•A GPU power supply may be required for avionics and other onboard systems when on the ground. It enables the crew to avoid using internal battery power before departure and will be used mainly during recharge time.
•The average power of this GPU is around 25 kW.

*Depending on the charger, battery state of charge (SoC) and eVTOL specifications.

Total Power Required by Stands (example)
Figure 4 presents the energy (power) requirements at stands with fast chargers (with one fast charger, one external battery/cooling system, and one GPU per stand). Each stand will require around 550 kW.

Figure 4: Power (MW) Require For Stands With Fast Chargers.

A stand with a slow charger would need 300kW (i.e., 250kW Charger + 25 kW External Battery Cooling System + 25 kW GPU).

Eve Recommends: For simultaneous operations (simultaneous charging/cooling at multiple stands), we recommend at least one charger, and one external battery cooling/heating system per stand.

Charging protocol for connectors

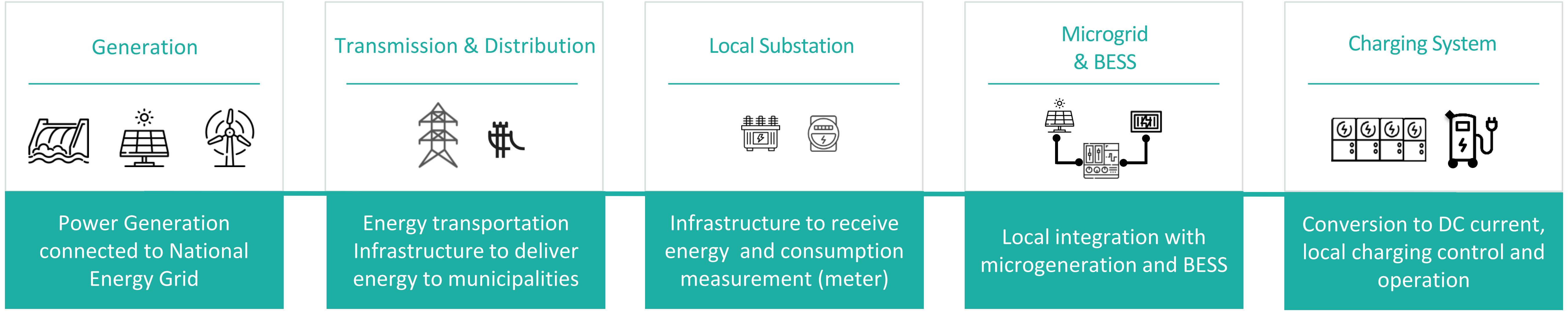
CCS connectors can be either CCS1 or CCS2, depending on the region—CCS1 being the standard in North America, while CCS2 is more prevalent in South America, Europe, and other parts of the world (see Table 3). Similar to current electric vehicle chargers that offer multiple connector options, it is highly likely that eVTOL chargers will also support both CCS1 and CCS2 formats.

This interoperability will allow vertiport operators to adopt a charging solution that is agnostic to aircraft models, helping to reduce capital expenditures and streamline infrastructure by offering a unified connector type compatible with most eVTOLs

REGION	CCS1	CCS2
USA	✓	
BRAZIL		✓
AUSTRALIA		✓
EUROPE		✓
INDIA		✓
SAUDI ARABIA		✓

Table 3. CCS Connector Type Based on Region

Charging value chain



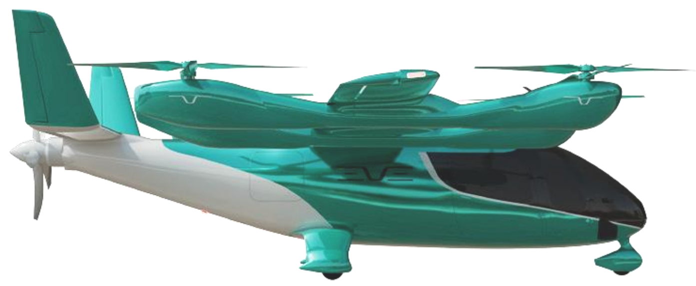


Figure 3. Charging Value Chain

Operation Systems

ENERGY MANAGEMENT & CONTROL

- Dynamic Energy Market Interaction to optimize Energy purchase.
- Controlling for Energy Backup.

CHARGING POINT OPERATOR

- Charging Schedule & Availability.
- User Management and Remote Operation of Charging System.

Charging Value Chain Goals:

Reliability and predictability
Guarantee power availability peak demand.

Optimized electricity tariffs
To know when to buy energy and how much.

Energy and charging services
Solutions for easy energy management.

Charger Configuration

The charger design, degree of mobility, and location will affect TAT. This section compares different types of chargers, installation locations and their influence on fleet operations. All chargers discussed in this document enable CCS connections. Figure 5 illustrates the different configurations currently available to support vertiport charging.

Eve Recommends: Where vertiports have two or more stands, Eve recommends installing hatch pits with mobile solutions that provide fast chargers. These solutions will reduce the need to move eVTOLs between to/from fixed chargers and will improve TAT. Hatch pit with mobile solutions also reduce complexity if cables, aircraft, GSEs and passengers need to move at the same time.

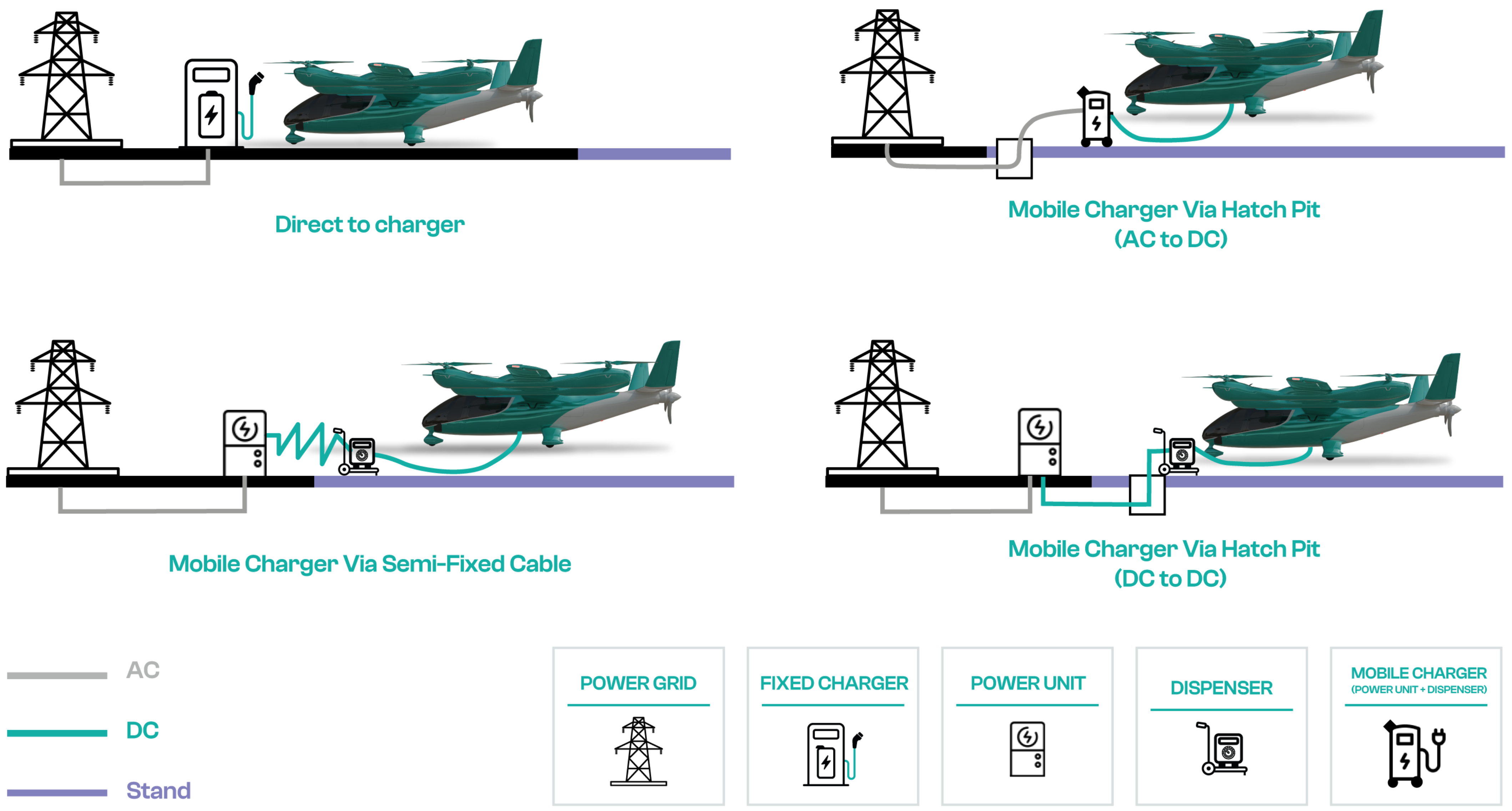


Figure 5. Types of Charger Configurations

	PROS	CONS	
DIRECT TO CHARGER	•Easy and quick to install •Simpler and cheaper than hatch pits	•The eVTOL must tugged/moved to the charger location, which increases the TAT. •It is not possible to move the charger for use in overnight recharging in the hangar.	 Direct to charger
MOBILE CHARGER VIA SEMI-FIXED CABLE	•Agnostic solution that uses a cable management system (which allows cable lengths greater than 7.5 meters). •It's simpler to install	•It can be expensive to install •Depending on the vertiport, it may not be possible to install due to ICAO rules •The articulated components remain on the ground, preventing vehicles and people from moving, impacting also on safety. •Not suitable for overnight recharging in hangar	 Mobile Charger Via Semi-Fixed Cable

Table 4. Comparison of Different Charger Configurations

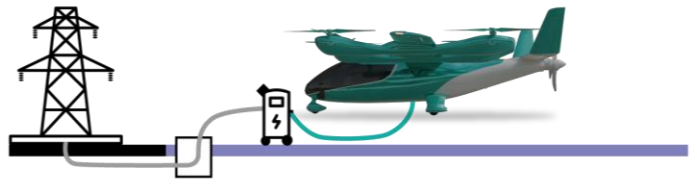
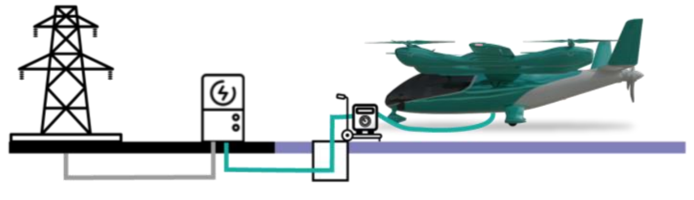
	PROS	CONS	
MOBILE CHARGER VIA HATCH PIT (AC to DC)	• Hatch Pit system with mobile chargers can minimize TAT and enable scalability • Improves safety by removing the necessity of moving the eVTOL to a fixed charger • Because it's mobile, it can be taken to the hangar for overnight recharging, reducing the cost of additional chargers. • AC cable allows for a longer length to the hatch pit	• Hatch pit system requires underground cables and ducts. • It's larger and heavier due to the built-in power units. • Acquisition and installation cost may be higher. • The mobile charger will likely require a tug or be self-towed to the stand due to its weight and size.	
MOBILE CHARGER VIA HATCH PIT (DC to DC)	• Hatch Pit system with mobile chargers can minimize TAT and enable scalability • Improves safety by removing the necessity of moving the eVTOL to a fixed charger • Power units separate from the mobile dispenser, making it easier to move the dispenser (lighter) to the eVTOL • Because it's mobile, it can be taken to the hangar for overnight recharging, reducing the cost of additional chargers.	• Hatch pits can be expensive to install • The cable between the power unit and the hatch pit are DC cables, which may limit the maximum length (up to 150 meters)	

Table 5. Comparison of Different Charger Configurations

Examples of chargers available on the market

CHARGER OVERVIEW	DC VOLTAGE OUTPUT	MAX POWER	NOTES
Fixed with a 50 ft DC cable.	Up to 1000 VDC	320 kW	· 4 ft tall · 50-ft retractable DC cable. · UL (Underwriters Laboratories) certified
· Mobile on wheels. · AC cable up to 30 ft. DC cable from GSE to aircraft up to 15 ft. · Designed primarily for cars and vans.	Up to 1000 VDC	65 kW	Two options available: · 60A · 100A
Mobile on wheels with 50 ft AC cable and 17 ft DC cable.	150 - 1000 VDC	180 kW	· Dual DC plugs to charge 2 inlets · Able to be used as a group to increase power capability
Mobile on wheels with 100 ft AC cable and 5 m (17 ft) DC cable.	150 - 1000 VDC	40 kW	· Available 2025. · Dual DC plugs to charge 2 inlets

FIRE SAFETY MEASURES

Fire Safety Measures

Lithium-ion batteries raise concerns about safety due to fires from thermal runaway.
The National Fire Protection Association (NFPA) defines Thermal Runaway as the “rapid uncontrolled release of heat energy from a battery cell. It is a condition when a battery creates more heat than it can effectively dissipate. Thermal runaway in a single cell can result in a chain reaction that heats up neighboring cells.".

Regulatory bodies and specialized agencies are developing fire safety criteria for vertiports.
The NFPA has developed the NFPA 418 - *Standard for Heliports and Vertiports*. Updated in 2024, it provides firefighting guidelines, including, for informational purposes, "Annex C — Establishing Extinguishing Agent Quantities and Discharge Rates for AFFF Hose Systems," which provides the method for determining the critical fire area and the minimum amount of water and discharge required for a firefighting system. However, firefighting techniques, procedures, and agents for eVTOLs are still unknown and may vary between manufacturers.

Local fire codes and regulations should be observed, and fire life safety plans be created.

MOBILITY REIMAGINED

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