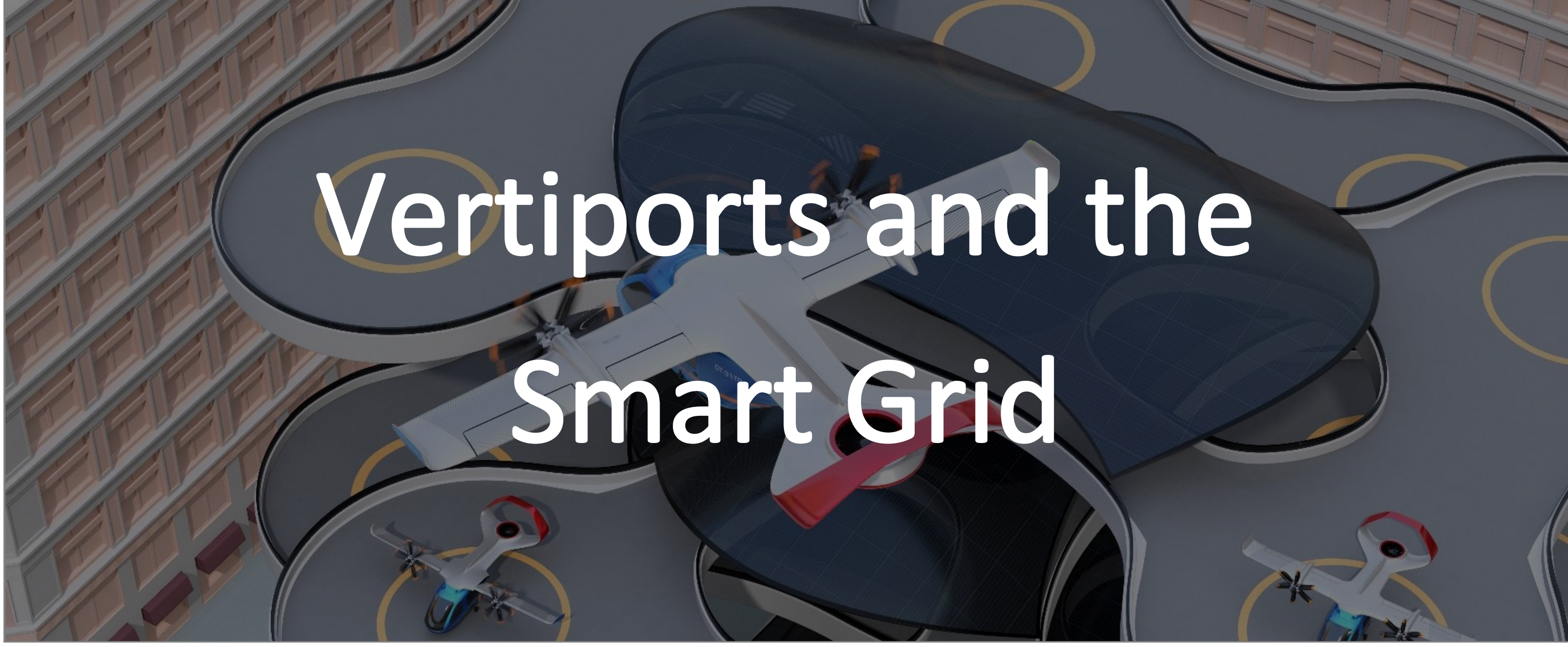


Vertiports and the Smart Grid

DETAILS

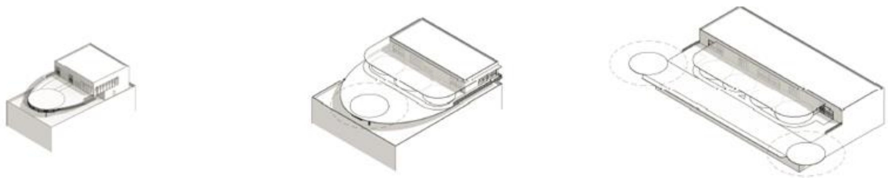
SECTOR | Transport and Energy

STAGE | Operations

TECHNOLOGIES | Unmanned Aerial Vehicles, Sensors

SUMMARY

"Vertiports" are platforms used by electric aerial vehicles *(see also the Unmanned Aerial Vehicle for Passenger Travel use case)* for vertical take-off and landing. They are designed not only as stations, but as part of larger multi-purpose hubs for renewable energy, data, and public amenities.



Vertiports are composed of an operational platform for rotorcraft manoeuvres and a connected building for associated technical equipment (such as charging infrastructure). There are various types of vertiports ranging from former heliports, which are retrofitted with electricity charging devices, through to purpose built rotating vertiports. In the images above, three types of rotating vertiports are shown: for a single vehicle and single reception zone on the left, for a single vehicle with three reception zones in the middle (enabling higher capacity), for two vehicles and four reception zones on the right (again, for higher capacity).

Vertiports are designed to form part of existing or as part of completely new hubs. For existing hubs, the vertiports can be integrated without adding significant additional stress to the existing infrastructure. They can be integrated with rail or bus stations or airports *(see also the Smart Stations and Smart Airports use cases)* to complement or complete the transport chain or added to schools/universities, healthcare facilities and businesses, etc. without requiring additional ground infrastructure to be built (e.g. no rail tracks).

Potential benefits of vertiports vary according to the country/city their existing or developing transport networks:

- In developing countries, in cities that have less established public transport networks and where new building infrastructure is being developed, there is an opportunity to develop vertiports that connect remote neighbourhoods and provide transport links to areas underserved by rail and road routes. Remote premium urban areas with limited mass patronage needs could also be connected by air without the need for expensive mass transit infrastructure like rail corridors or road upgrades, and to avoid any congested or indirect road transport alternatives. The development of vertiports in this scenario could be easier than in developed countries, as there would be fewer constraints imposed by the existing buildings and less competing transport options.

- In developed countries, the integration of vertiports into the urban environment is viewed as an additional mode option to increase the catchment area for mass transit hubs, as well as offering a premium alternative for businesses or users who need to travel from one area of a city to another quickly or for airport links (especially in cities with no fast transport connections between the city and the airport). Supported with the right data analytics and technologies, they can provide demand-responsive services, and be a strong enhancer of customer experience.

In both cases, unmanned air transport would offer a select service to a portion of the population, enabling them to quickly reach a destination and avoid congestion. In that sense, the vertiports would not require additional extensive infrastructure works to be developed and could offer an additional transport link.

Vertiports rely on the principles of shared services using existing assets to operate. They represent an opportunity to develop connected services by integrating energy and transport in urban areas. Therefore, they need to be designed in a way to be implemented within existing and new building structures. In the future, they could directly integrate with any new essential service facilities being built (schools/universities, healthcare facilities, businesses, etc.).

VALUE CREATED

Improving efficiency and reducing costs:

- Enable a cost-effective, less infrastructure-intrusive solution compared to a road link, for example, as it does not require significant infrastructure, and it will use existing energy shared by connected grids.

Enhancing economic, social and environmental value:

- Vertiports would attract new user categories, usually choosing private cars, such as:
  - Tourists: enabling them to visit more sites in less time, making the region more attractive. Scenic views, will probably be a luxury mode worth taking for the experience.
  - Business travellers: connecting airports and key locations in a faster and more convenient way
  - Emergency services providers
- Provide the service to complete that experience with, for example, luxury retail services, restaurants, viewing decks, post, etc.

POLICY TOOLS AND LEVERS

Legislation and regulation: Most countries have strategies but not developed regulations to integrate vertiports, from an aerial point of view or from an energy perspective. Specific governance must be developed to address UAV urban air travel regulations and the resulting vertiports operations regulations and safety standards.

Effective institutions: Building services and management would need to consider new safety standards linked to vertiport operations. Specific maintenance requirements would be required for the vertiports and would need to be accredited.

Transition of workforce capabilities: Building management and safety requirements would require staff to be trained for vertiport operations and to support passenger assistance and safety orientations.

Funding and financing: Investors are likely to be attracted by the vertiport revenue model, and their development could be privately funded by the operating urban air travel companies and by the property developers of the buildings. For essential and public facilities, a shared model with the public sector and the operating company could be developed.

IMPLEMENTATION

Ease of Implementation 	Given the need to develop adequate regulations for urban air travel, the implementation of vertiports will be linked to regulation development. Most countries have strategies but not developed regulations. As such, vertiports will be more easily implemented once the regulations are in place. From a technological point of view, the infrastructure and the existing grid is ready to be integrated with vertiports in most advanced countries as no linear infrastructure is required and the grid is already developed, usually oversupplying power.
Cost 	Implementation costs of such solutions are going to be relatively high to retrofit existing buildings and ensure the proper connection to the grid, while not disrupting the buildings operations. For new development, the implementation costs could be less significant. Revenues and operations are likely to offset the initial investment costs. It could be an interesting added value to attract investors in new assets development, like property and building development (museums, cultural precincts, malls, etc.), as they would generate additional revenues from the operation of the services they host.
Country Readiness 	Most advanced countries are technologically ready to implement these solutions, however, the regulations and permits need to be developed and approved to enable the operations of urban air travel and as such, the vertiport operations.
Technological Maturity 	The technology is ready, however, it can be improved to provide further battery charging efficiency leveraging on real-time supply/demand for the smart grid.

RISKS AND MITIGATIONS

Implementation risk

Risk: Air congestion and conflicting movements (helicopters, drones for monitoring) could cause an issue to the implementation of vertiports. It will be difficult to minimize interaction with uncontrolled space (birds, personal drones). The utilisation of the grid for energy supply and of the communications networks must be planned in a way to ensure a sustainable lifecycle footprint.

Mitigation: Government regulation is essential. Vertiport operations will need to be approved and will be highly dependent on the operation model of urban air travel being regulated and proven as safe and fit for purpose.

Social risk

Risk: The community might not feel safe to use the mode nor to accept the visual and noise impacts brought about by vertiport operations.

Mitigation: Clear communication on the services provided and on the added value of the vertiports to the urban areas should be developed.

Safety and (Cyber)security risk

Risk: Safety standards would require a significant body of evidence that vertiports support safe methods of transport operations, more specifically regarding their locations and ability to power the aircrafts. Additionally, the exchange of data to utilise the power supplied by the smart grid should be protected.

Mitigation: Regulations should be addressed in the short term. Several organisations would have to be consulted such as aviation regulatory bodies.

Environmental risk

Risk: Noise pollution and power consumption are the main environmental risks of vertiports.

Mitigation: Continue developing the technology and make sure it complies with environmental targets and standards.

EXAMPLES

Example	Implementation	Cost	Timeframe
Skyports	UK ground infrastructure developer Skyports is preparing to open what it describes as "the world's first vertiport for electric vertical take-off and landing [eVTOL] aircraft" in Singapore. Skyports is seeking to develop a network of eVTOL landing sites across Asia, Europe and the USA with several aircraft manufacturers.	It is suggested that the Urban Air Mobility (UAM) business model will launch more quickly in places that are more accepting of new technology and have a higher tolerance for risk. Through scalability, the price of UAM transport can be reduced.	The Vertiport opened on 21 October 2019. Live flight trials will begin soon after with Volocopter's 2X prototype
MVRDV and Airbus	Architecture firm MVRDV has collaborated with aircraft manufacturer Airbus to develop the Urban Air Mobility (UAM) City Integration report that researches how vertiports could become part of transportation networks in future cities. They looked at how vertiports could integrate aerial and terrestrial transport links in cities around the world including Shenzhen, Jakarta, Sao Paolo, Los Angeles, and San Francisco.		In 2017, Airbus was appointed to lead the Urban Air Mobility Initiative of the wider European Innovation Partnership on Smart Cities and Communities (EIP-SCC) that is supported by the European Commission. The report was published in 2019.
UberAIR Skyports	Uber unveiled the six prototypes for the "UberAIR Skyports" at its second annual Elevate summit in Los Angeles in May 2018. The designs were developed in response to the Uber Elevate Skyport Challenge, which called for architecture and engineering firms to develop vertiports for UberAIR.		Uber plans to develop the infrastructure for the takeoff and landing hubs with real-estate investment company Sandstone Properties and is expecting to begin tests for the service in Los Angeles in 2020, and subsequently Dallas, Fort Worth and Frisco. They plan to launch a fleet of UAVs to the public by 2023.

CONTACT INFORMATION

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