VERTIFIED

A MODULAR AND SCALABLE APPROACH FOR DESIGNING VERTIPORTS

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Innovative Air Mobility (IAM)

Safe, secure and sustainable air mobility of passengers and cargo enabled by new-generation technologies integrated into a multimodal transportation system

EASA IAM Hub, December 2023

Research on IAM at DLR

- Air traffic management
  - Development of U-space services
  - Airport integration for UAVs / eVTOLs
  - Flight rules for all vehicles in airspace
- Ground control station design
- Operations control center
- Vertiport design and management

Research on IAM at DLR

HorizonUAM (2020 – 2023)

- Development of a holistic understanding of Urban Air Mobility (UAM) through the integration of research on vehicles, infrastructure, operations, and public acceptance
- Design and evaluation of future air taxi concepts, including vehicle architectures, safety aspects, autonomy and operational procedures such as flight guidance and vertiport operations
- Demonstration of UAM technologies in realistic scenarios, using simulations and flight demonstrations to assess feasibility and operational concept

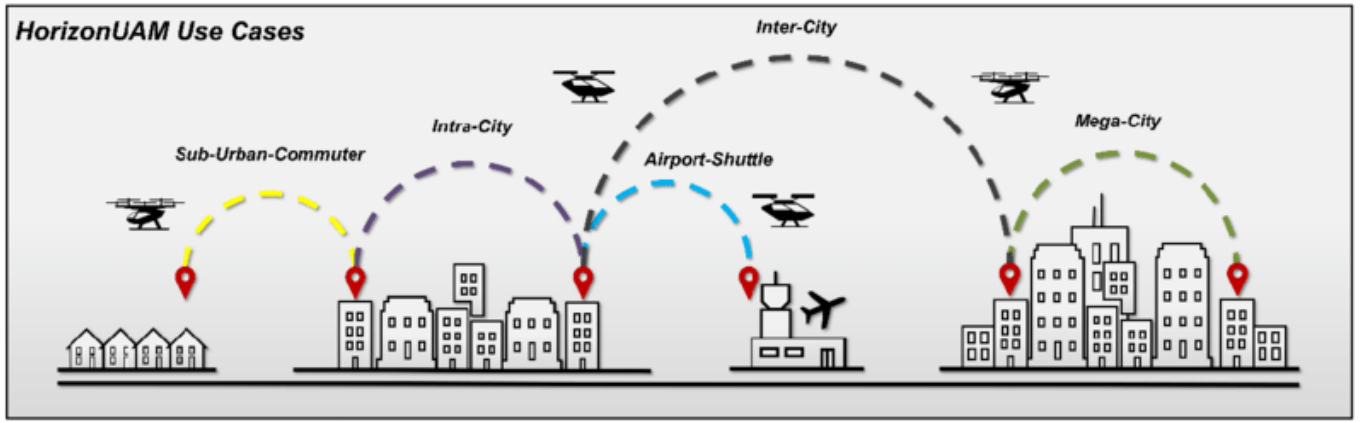

Figure 1: L. Asmer et al., Urban Air Mobility Use Cases, Missions and Technology Scenarios for the HorizonUAM Project, 2021

Research on IAM at DLR

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IAM-OSA
(2025-2027)

Research on IAM transport systems within urban, regional and international transportation networks, building on the previously developed air traffic management system

VERTIFIED
(2024-2028)

Continuation of research on vertiports and the implementation of two demonstrators (design, testing and validation) as a comprehensive real-world testbed with flight trials

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Vertiport Research Infrastructure for Innovation Exploration and Demonstration

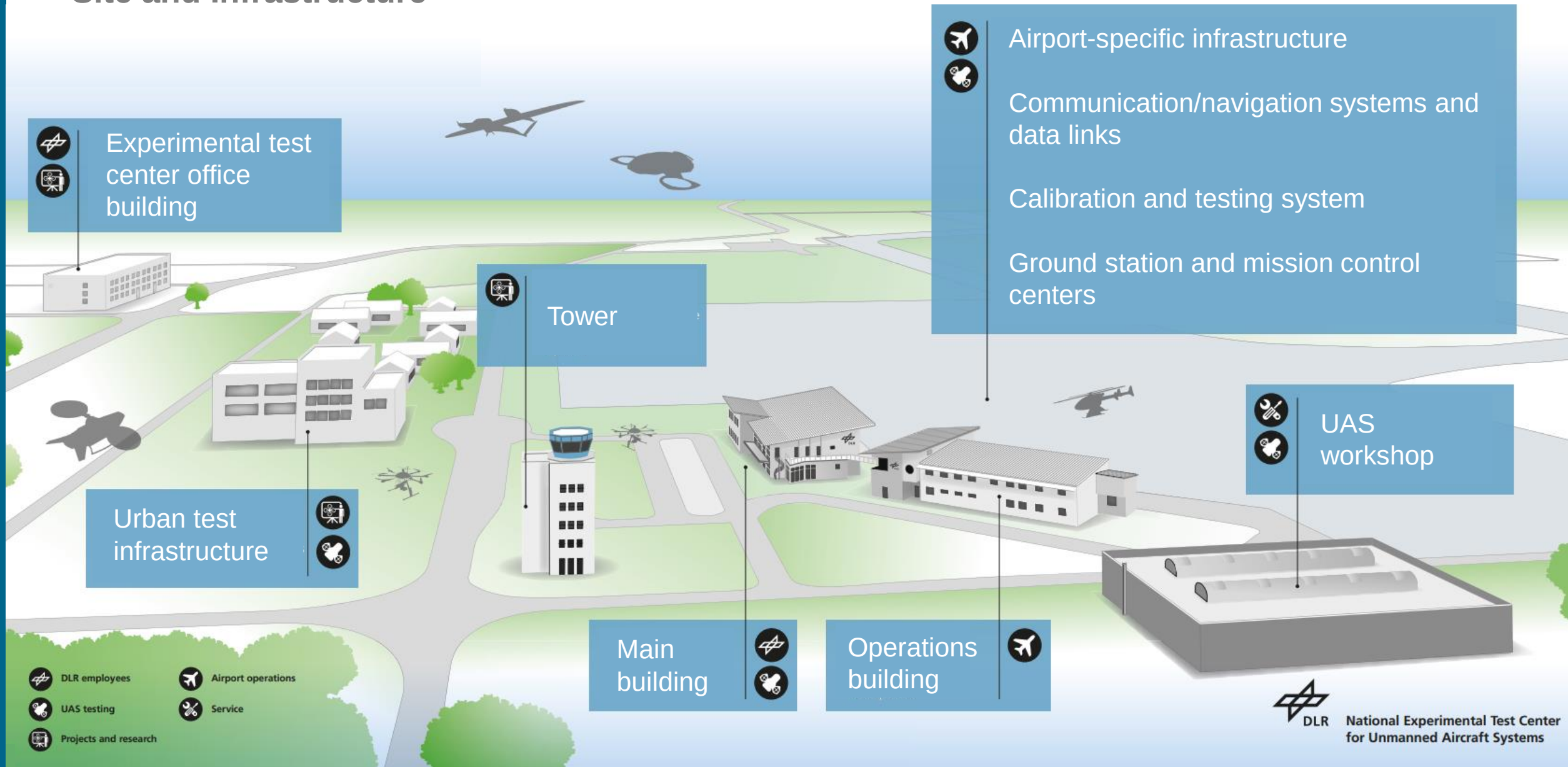
- **Objective**
  Development and implementation of modular and scalable research infrastructure for vertiports
- **Duration and participation**
  07/2024 – 06/2028 (ongoing, 48 months) with participation from 6 DLR institutes/facilities, stakeholder cooperation

  - Requirements engineering and concept development for vertiport prototypes
  - Experimental system for vertical take-off and landing capable aircraft (VCA)
  - Physical research infrastructure for vertiports at DLR site in Cochstedt

Figure 2: Vertiport concept of the HorizonUAM project

National Experimental Test Center

Site and Infrastructure



Vertiport Types and Operational Use-Cases

Vertiport Types

- Urban vertiport
  - Elevated
  - Embedded within a modular model city
- Airport vertiport
  - Integrated near terminal infrastructure and the apron
  - Ground-based configuration

Operational Use-Cases

- Passenger operations
- Cargo operations

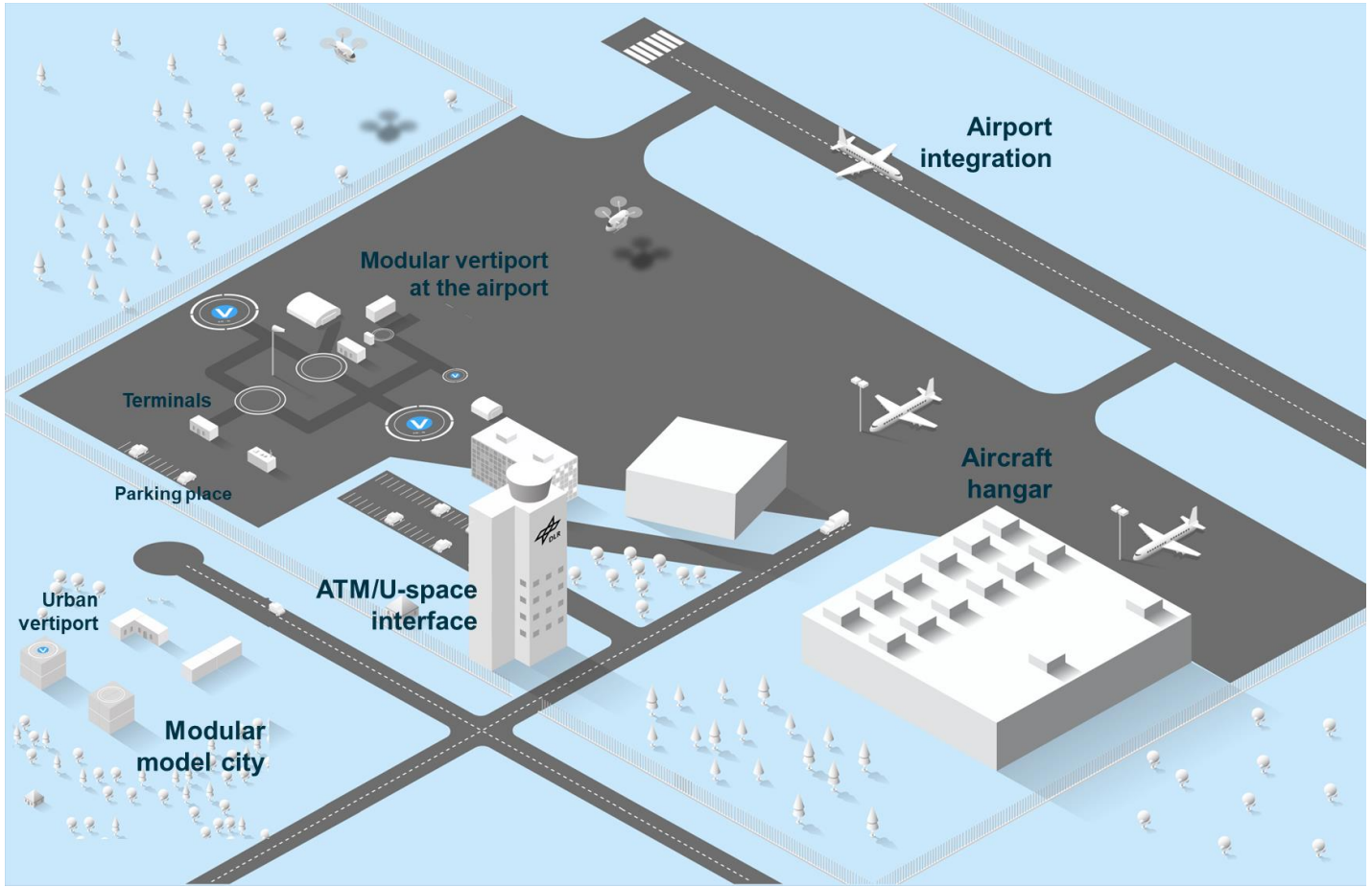


Figure 3: Conceptual planning sketch

Vertiport Research Scope

- Operational concepts
- Ground handling and turnaround processes
- Layout and airside design (FATO, taxiways, stands)
- Integration of U-space services
- Modular and scalable design for diverse users and stakeholders

Modular and Scalable Vertiport Infrastructure

Concept and Approach

A modular and scalable infrastructure enabling flexible and reconfigurable vertiport configurations

Implementation

- Pre-fabricated units enabling rapid assembly and adaptation
- Infrastructure elements are modular, mobile and reconfigurable

Benefits

- Scalable to different vertiport sizes and configurations
- Cost-efficient through modular replacement
- Reusable across different locations

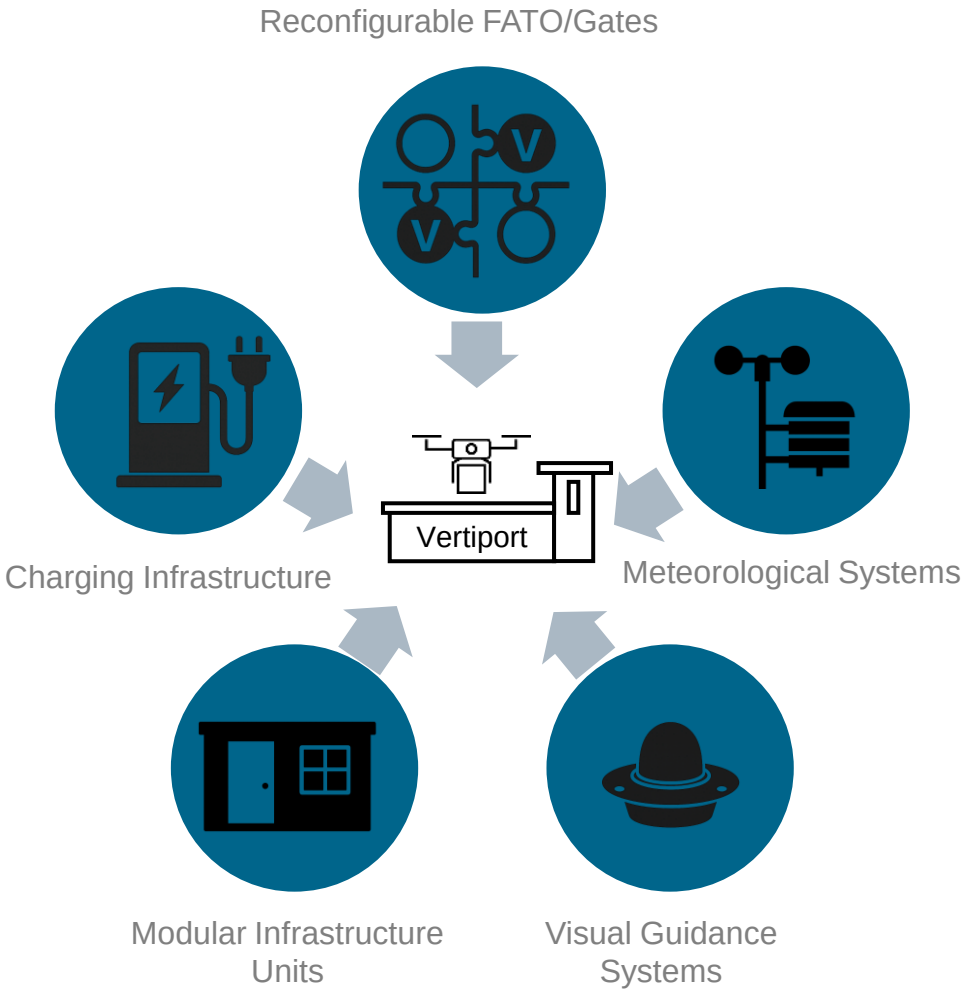


Figure 4: Vertiport System Architecture

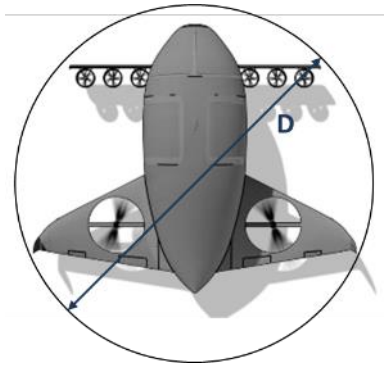
Preliminary Aircraft-Based Dimensioning of Vertiport Areas

Design and dimensioning of landing and take-off areas according to PTS-VPT-DSN [1], based on the aircraft's characteristic dimensions

- Utilization of Eurocopter BO 105 as a test vehicle for passenger use case
- Benchmark based on commercial UAS models (DLR institutes and potential external users)

Eurocopter BO 105

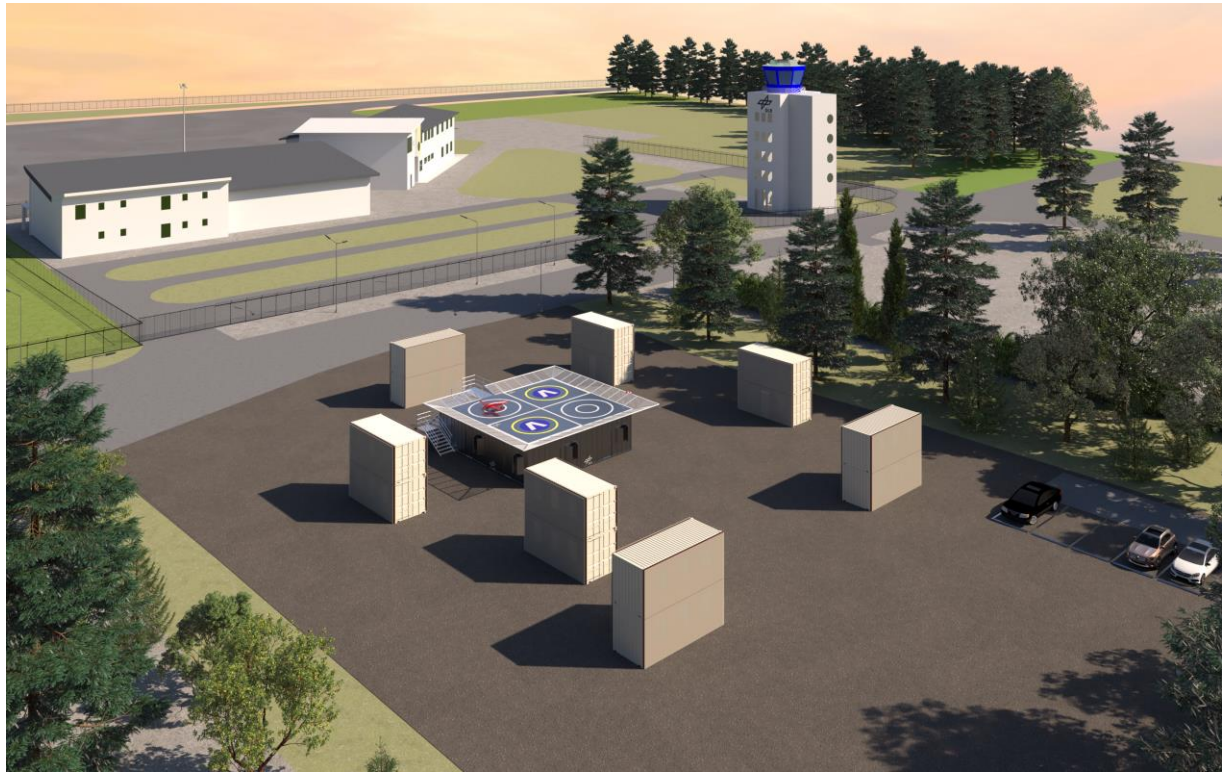
Aircraft	Eurocopter BO 105	UAS (Benchmark)
Char. Dimension (D)	11.86 m	3.2 m
FATO (1.5D)	17.8 m	4.8 m
TLOF (1D)	11.86 m	3.2 m
MTOM	~ 2400 kg	~100 kg

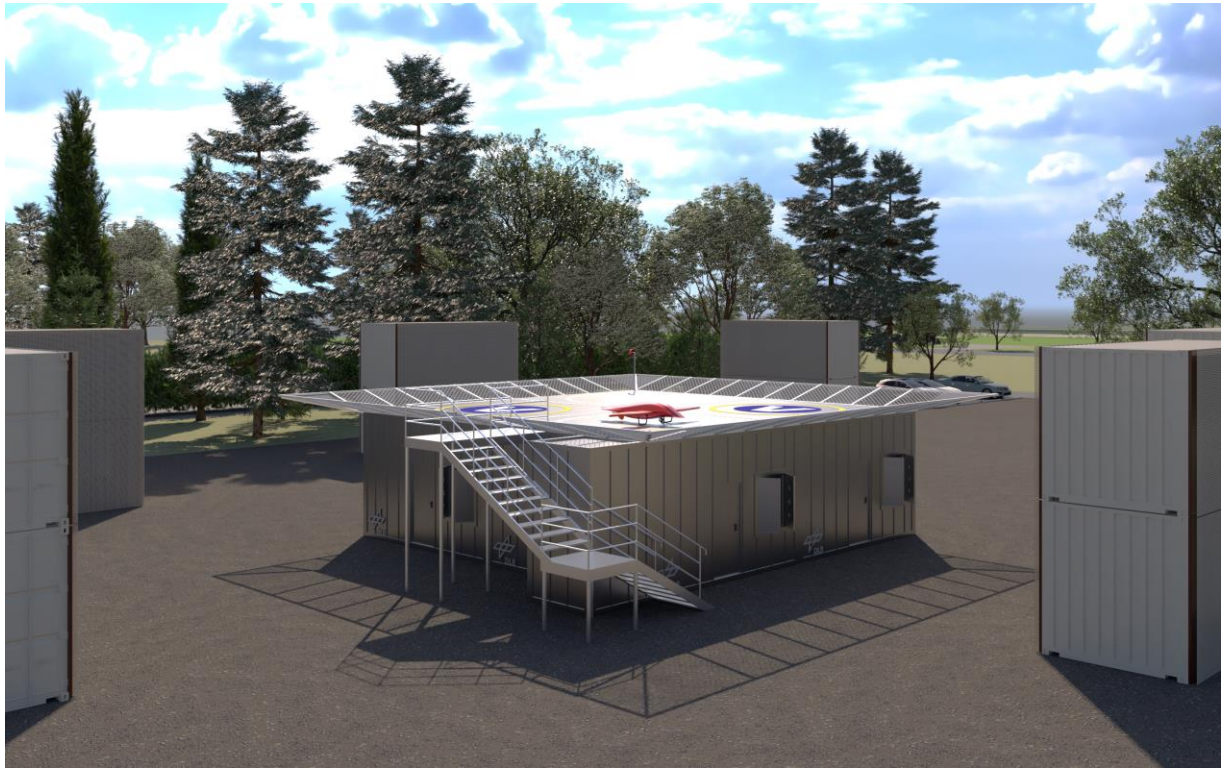


Sketch of the characteristic dimensions of a VCA according to EASA PTS-VPT-DPN [1]

[1] EASA, "Vertiports Prototype Technical Specifications for the Design of VFR Vertiports for Operation with Manned VTOL-Capable Aircraft Certified in the Enhanced Category (PTS-VPT-DSN)", Cologne, Germany: European Union Aviation Safety Agency, 2021.

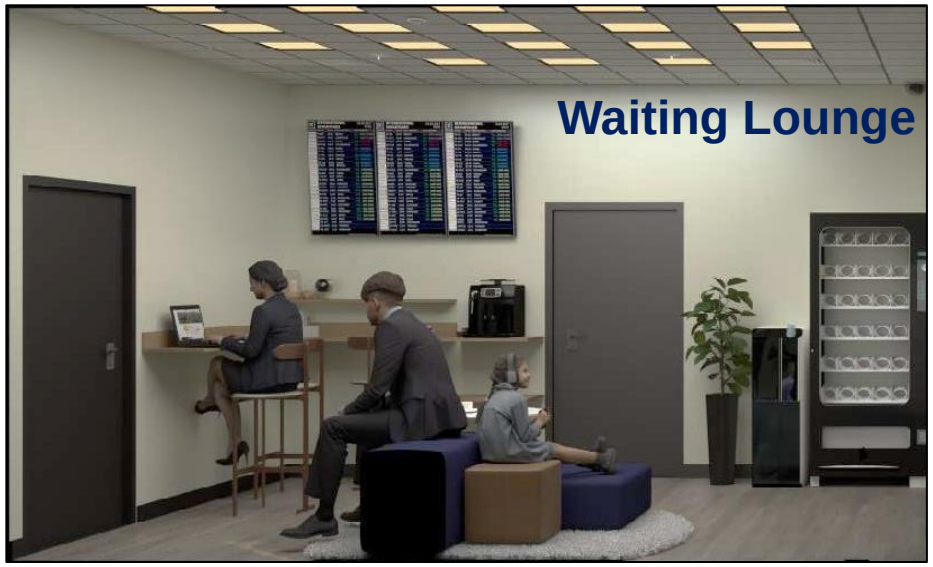
Initial Urban Vertiport Concept

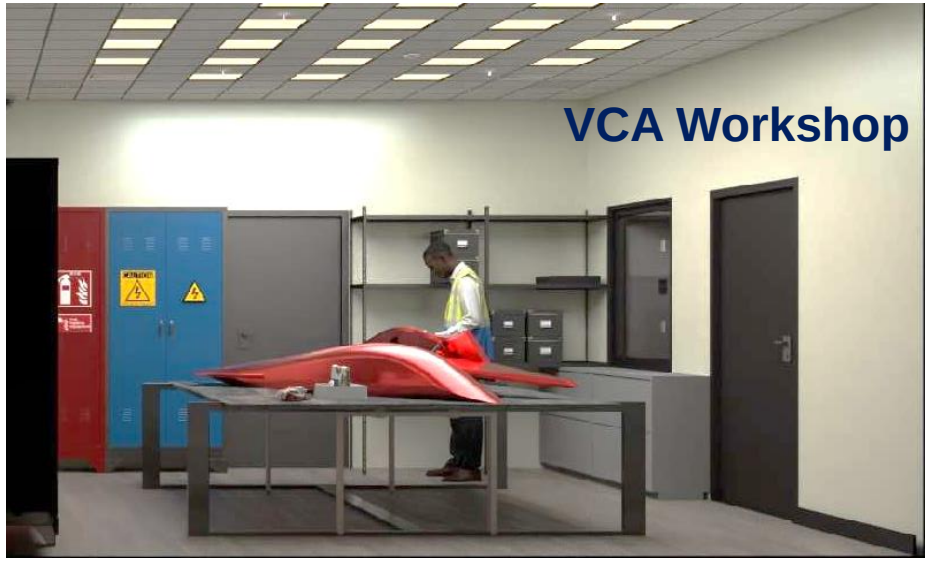




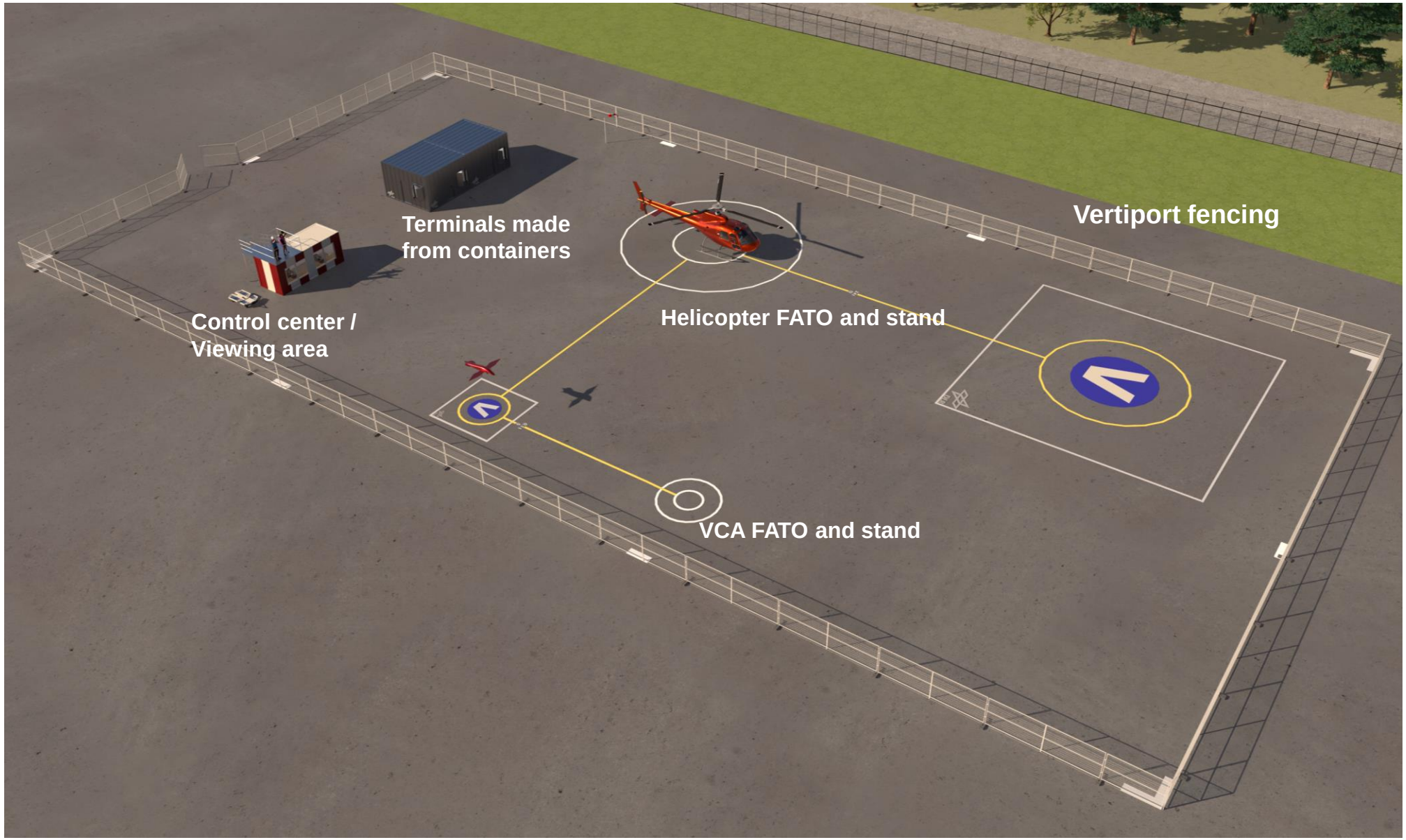
- Elevated vertiport platform
- Scaled flight testing with vertiport UAS
- Consists of various functional modules (e.g., passenger terminal, waiting area, mission control station, UAS workshop) based on containers
- Modular model urban environment based on container units

Initial Urban Vertiport Concept

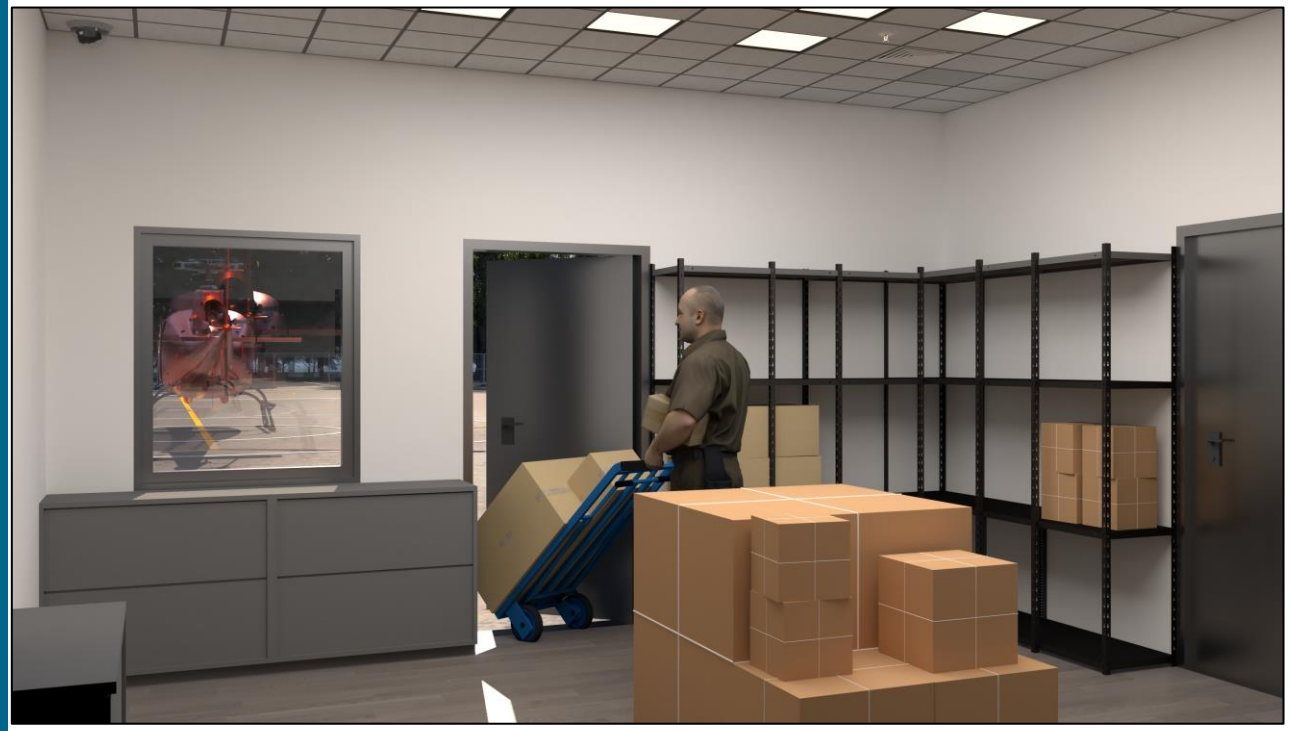




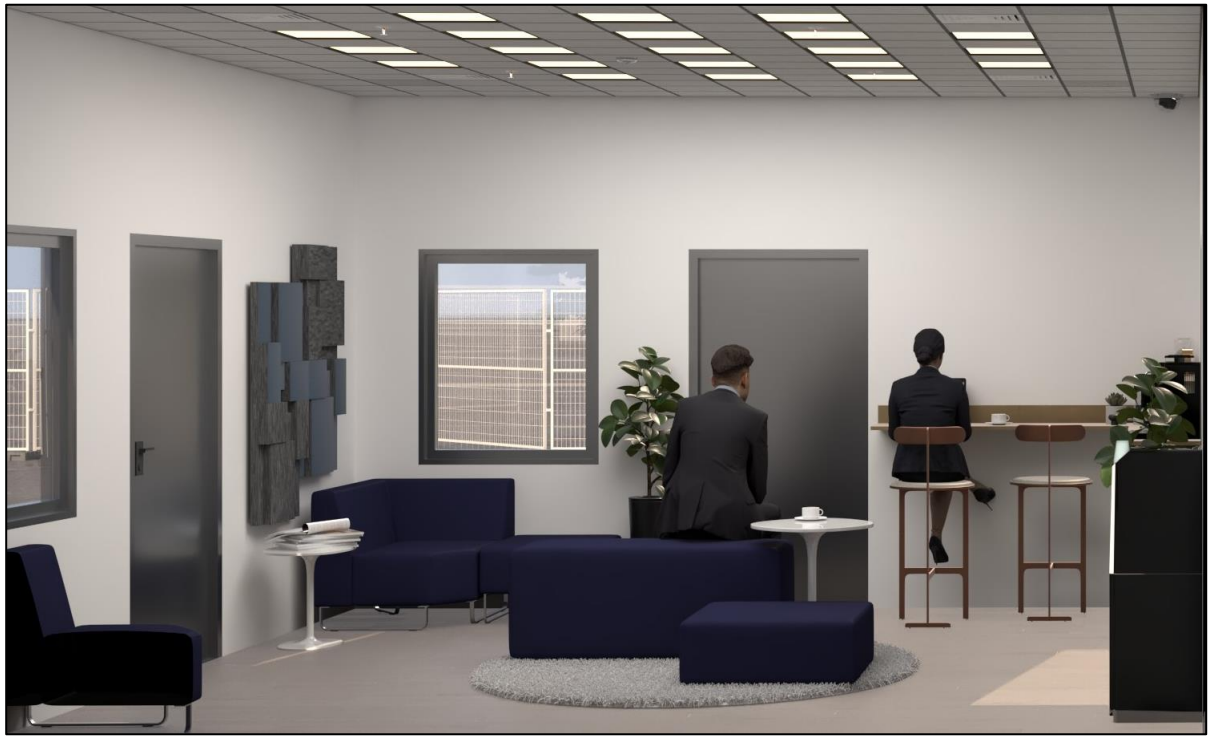
Initial Airport Vertiport Concept



Initial Airport Vertiport Concept



Cargo terminal



Passenger terminal

Conclusion

- Vertiports are a key enabler of future IAM systems, shaping large-scale deployment
- VERTIFIED addresses this by developing a modular and scalable research infrastructure for real-world testing and validation
- The reconfigurable test environment enables systematic investigation of vertiport design, operations and integration under realistic conditions
- This provides a foundation for the practical and scalable implementation of vertiports in future mobility systems

THANK YOU FOR YOUR ATTENTION

Impressum

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