SAFE INTEGRATION OF VERTIPORT OPERATIONS IN CONTROLLED AND UNCONTROLLED AIRSPACE

Marzia Corsi

German Aerospace Center (DLR) Institute of Flight Guidance

2025 K-UAM Confex, Incheon, South Korea

Table of Contents

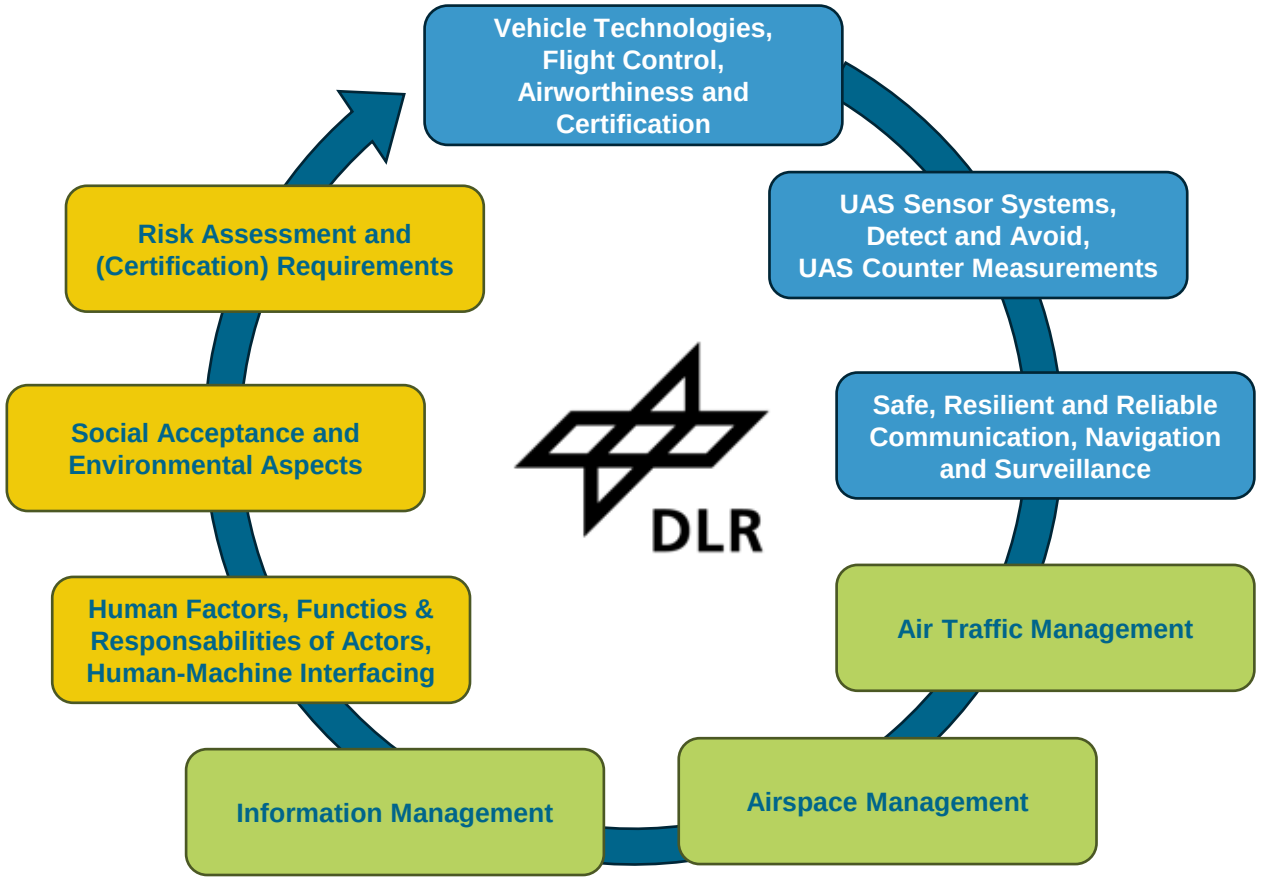
Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

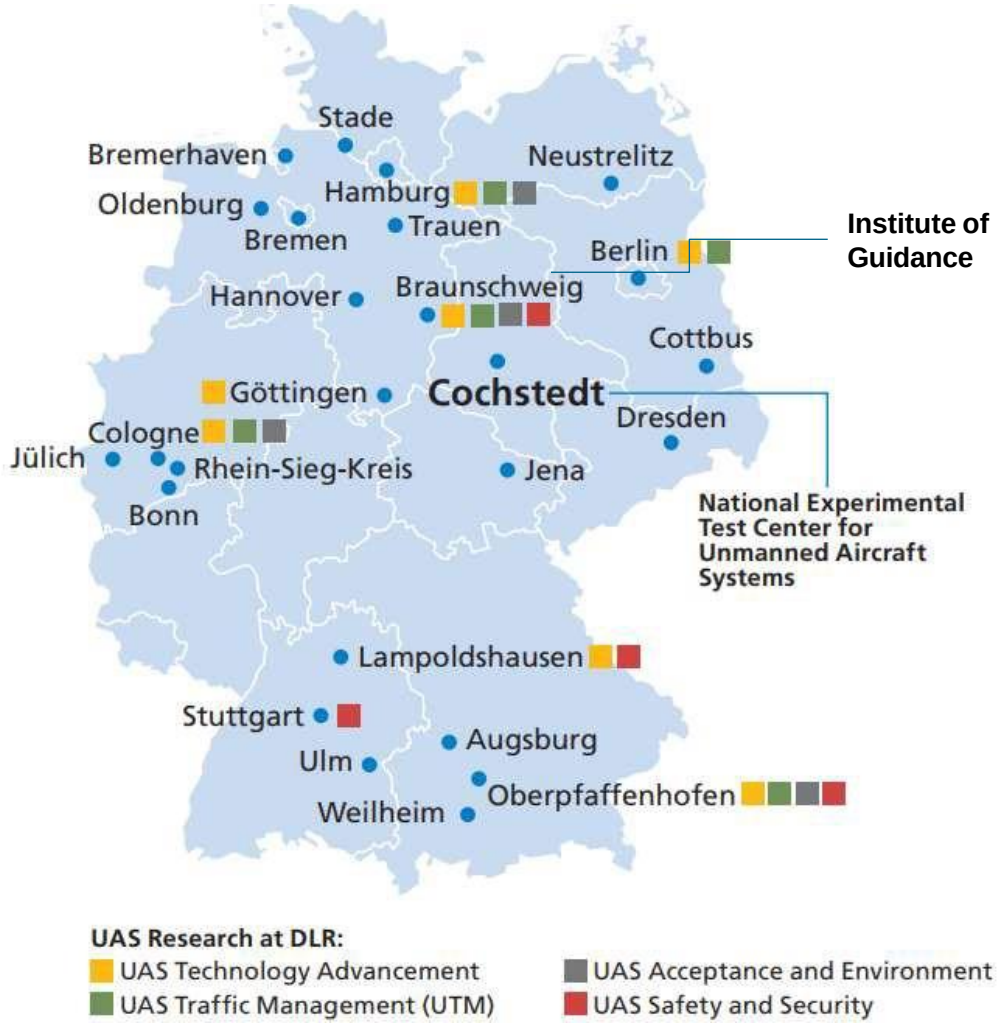
- National center for aerospace, energy and transportation research of Germany
- Founded in 1969 and headquartered in Cologne
- 35 locations throughout Germany
- 54 research institutes with more than 11,000 employees
- **Mission** is to research and develop technologies for a sustainable future, contributing to a strong German economy and finding solutions to societal challenges.
- Research Fields:

1. Space Research and Technology
2. Transportation
3. Energy
4. Aeronautics
5. Security
6. Digitalization

DLR Institutes addressing UAS research topics

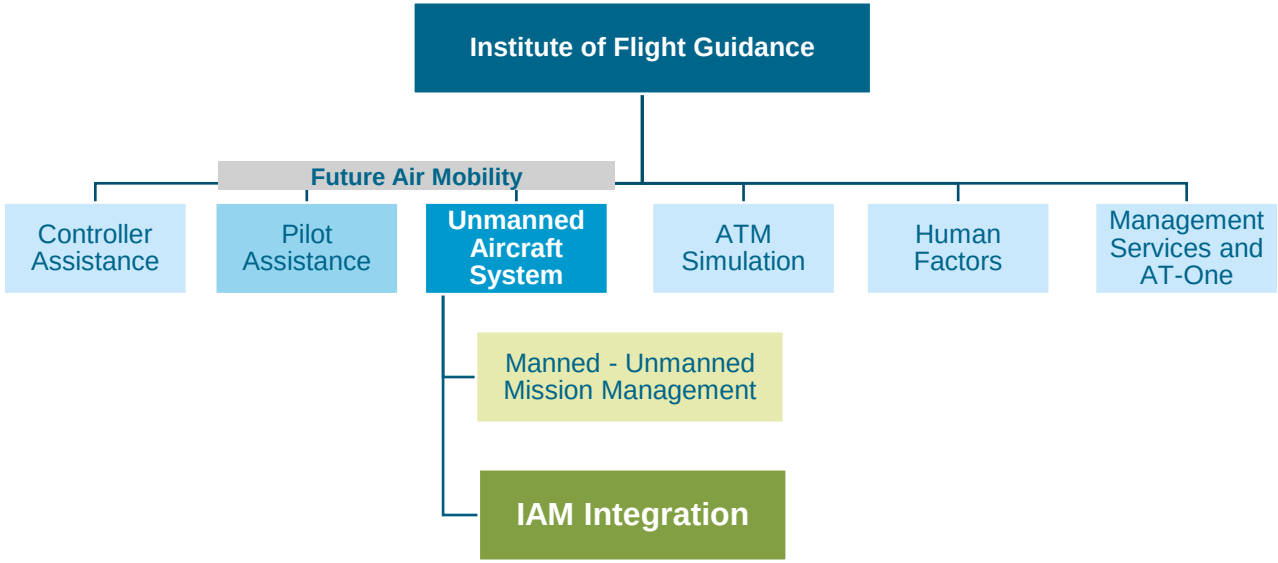
Unmanned Aircraft Systems (UAS) Research





DLR – Institute of Flight Guidance

- The Institute of Flight Guidance is a pioneer in the **research** and **evaluation** of **new mobility concepts for passengers and cargo** and enables the **integration** of diverse **airspace participants into existing and newly established airspaces**, in particular **U-space**.



UAS Department – IAM Integration Group

- **Development of knowledge, methods, and procedures** for:
  - U-space services for Innovative Air Mobility applications
  - Vertiport concepts
  - Control centers for remote operation of drones
  - Assistance systems for passenger drones
- **Goal:**
  - Consolidate and expand existing IAM competencies
  - Enable safe and sustainable integration of IAM into airspace, airports, and intermodal transport systems

UAS Department - Testing facilities

UAS Lab	Drone Cage	National Experimental Test Center for Unmanned Aircraft Systems
		

New procedures and technologies for UAS regularly tested and evaluated in collaboration with experienced end-users. Initially, this is carried out in the secure simulation environment of the **UAS Lab** (DLR's Air Traffic Validation Center). In a further step, flight tests with research aircraft and drones and the UAS Lab ground control station can be carried out in the **DLR Drone Cage** and at the **National Experimental Test Center for Unmanned Aircraft Systems** at the airport of Magdeburg-Cochstedt.

Projects

- EUREKA

  2023-2026, SESAR JU, Coordinator: Eurocontrol

  U-space Services for Vertiports

- VERTIFIED

  2024-2028, DLR-internal, Coordinator: DLR Institute of Flight Guidance

  Vertiport demonstrator

- IAM-OSA

  2025-2027, DLR-internal, Coordinator: DLR Institute of Flight Guidance

  Sustainability and technology assessment of IAM

Innovative Air Mobility and U-Space in Europe

Innovative Air Mobility (IAM): the safe, secure and sustainable air mobility of passengers and cargo enabled by new generation technologies integrated into a multimodal transportation system. [Source: EASA IAM Hub]

IAM in Europe demands **safe, scalable** and **interoperable integration** into legacy and emerging **airspace structures**.

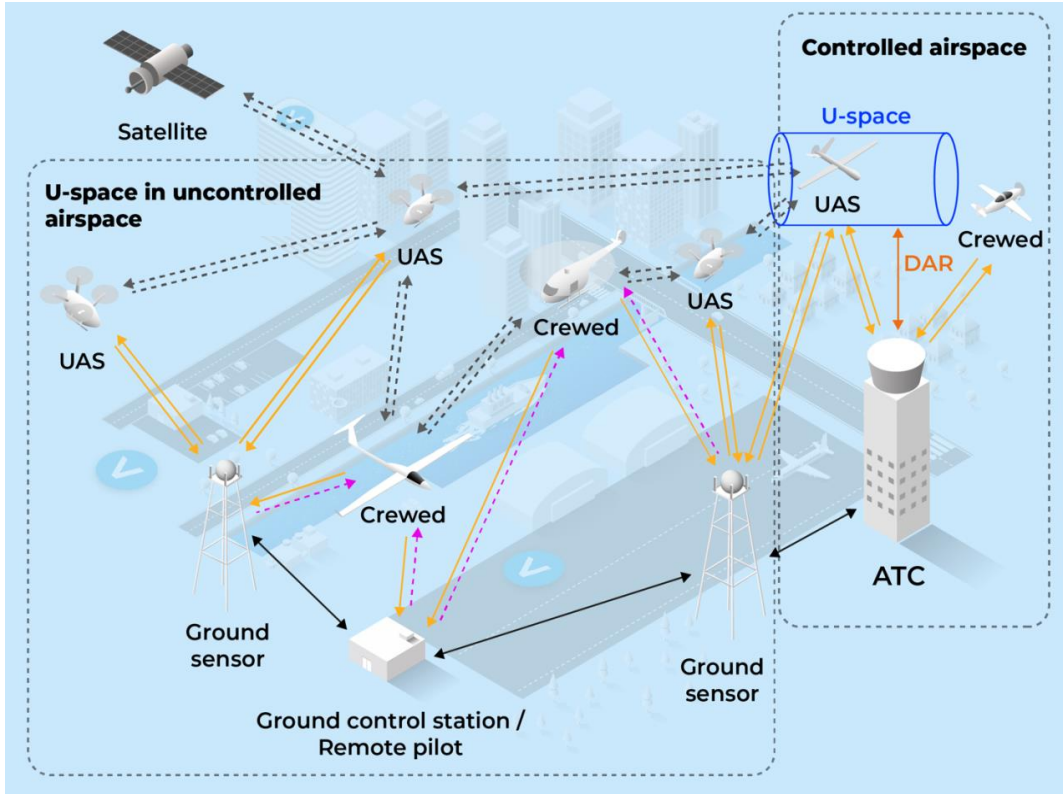
U-space: Set of specific services and procedures designed to ensure safe and efficient access to airspace for a large number of airspace users such as drones or air taxis.

ATM and **U-space** provide the regulatory backbone **but leave a gap** between **500–3000 ft AGL**, where IAM will be most active.

IAM operations must **respect existing responsibilities** or **establish new ones**, raising questions about the **applicability** and **interoperability** of **ATM** and **U-space** frameworks.

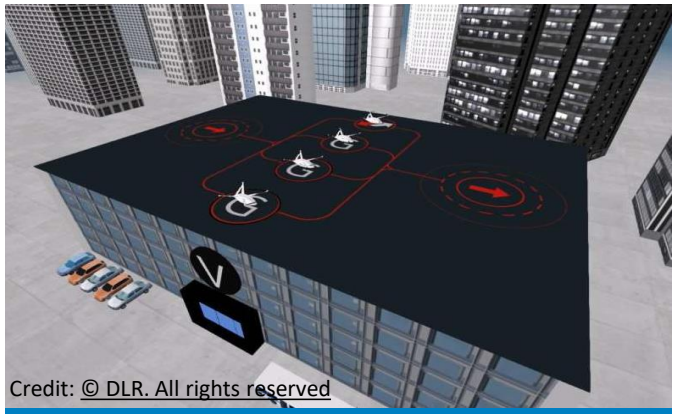
Emerging stakeholders currently part of the IAM discussion:

- Common Information Service Provider (CISP)
- U-space Service Provider (USSP)
- Vertiport(s) managing entity



Vertiport

- **Vertiports** → Central ground infrastructure elements for VTOL-capable aircraft (VCA) connecting the urban airspace with the ground.
- To be **integrated** into the **urban landscape** and **airspace** in a **safe and sustainable manner**.
- Different configurations to accommodate different **use cases and traffic volumes**.
- Ground and airspace design recommendations, **processes and procedures** adaptable to **different operating environments**.
- Real-time operating **status of the Vertiport** to be shared among all users → **Critical information** affecting all VCA flights phases.
- Vertiports **key stakeholders** in ATM and U-space ConOps and related U-space Regulatory Framework.



Motivation & Objectives

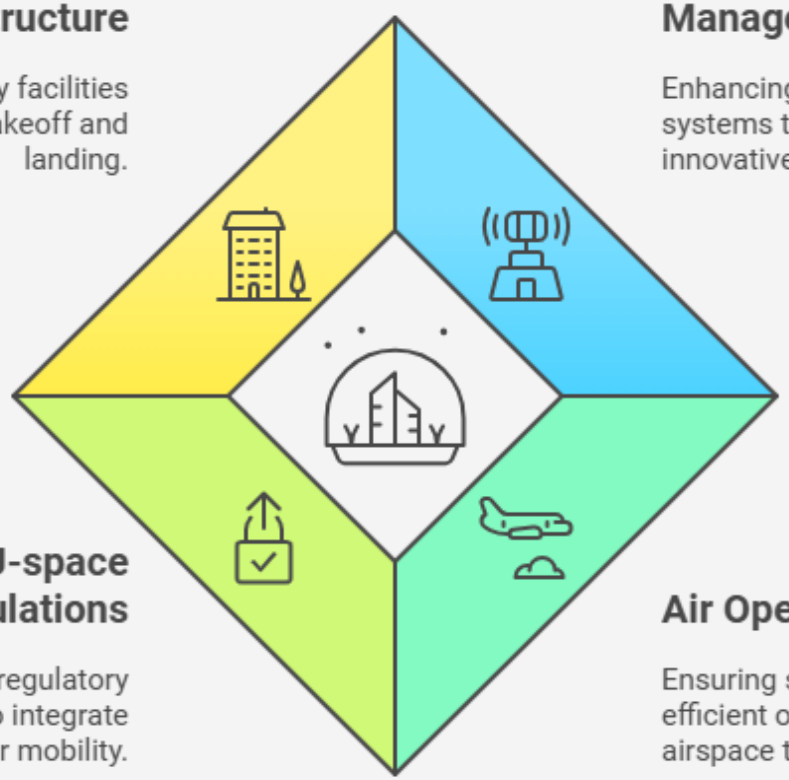
Balancing IAM operations with existing ATM/U-space frameworks.
Addressing responsibilities and interoperability gaps.

Vertiport Infrastructure

Developing key facilities for vertical takeoff and landing.

Air Traffic Management

Enhancing current systems to support innovative air mobility.



U-space Regulations

Extending regulatory frameworks to integrate new air mobility.

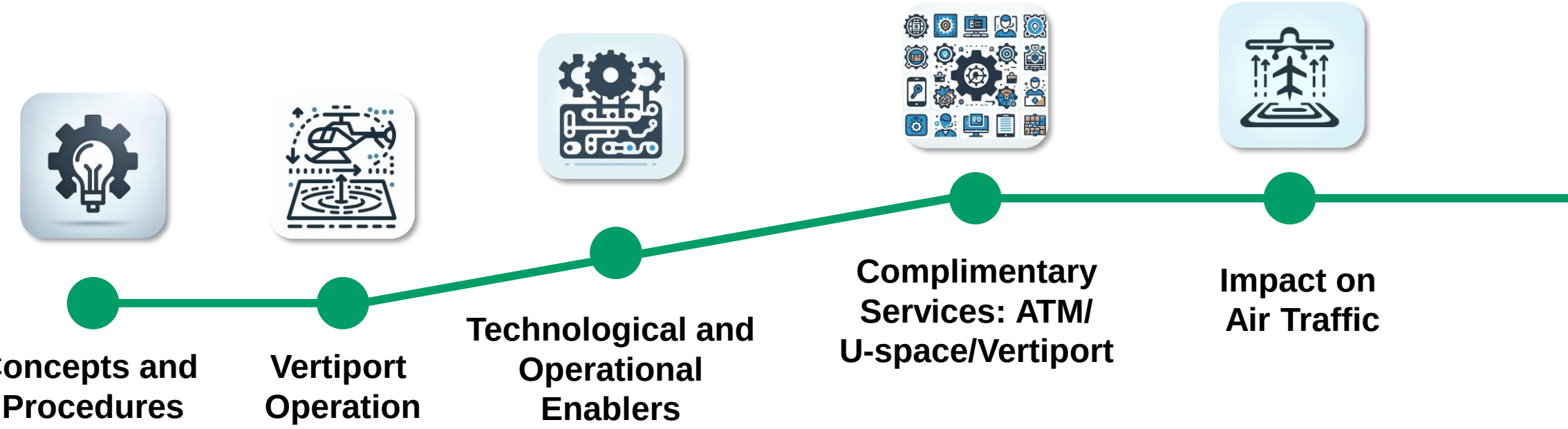
Air Operations

Ensuring safe and efficient operations in all airspace types.

EUREKA

EUREKA European Key Solutions for Vertiports

The EUREKA project aims to enable the Innovative Air Mobility (IAM) accommodation in Europe and safe and autonomous UAM operations in all types of airspace with a special emphasis on a key enabler for the UAM operations: the **Vertiport**.



Duration: 06/2023 – 05/2026 (36 months)
Participants: 35 partners

EUREKA Solutions

Vertiport Collaborative Traffic Management

Centralised airside information for effective vertiport management.

Enhanced U-space airspace capacity through Common Information Platform.

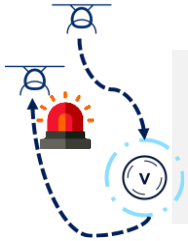
Focus on key data exchange between stakeholders for safe operations.

Vertiport network flow, capacity & operational management

Management of vertiports' network in controlled/uncontrolled airspace.

Introduction of Local Vertiport Network Manager to improve efficiency and coordination.

Avoid interference with ATM operations through dynamic airspace reconfiguration.



VCA Flight and Operating Procedures for Safe and Resilient Vertiport Operations

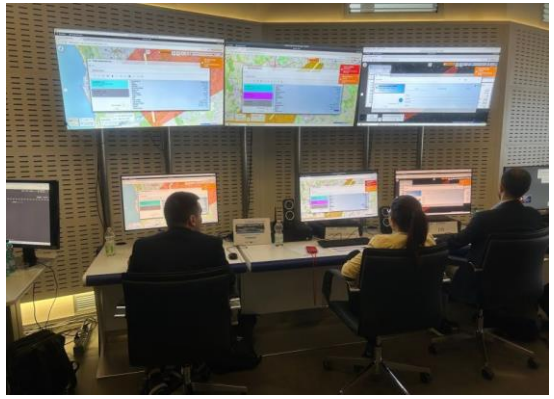
Definition airspace structures around vertiports for efficient take-off/landing, and approach/departure paths.

Requirements for VCA operations across controlled and U-space airspace.

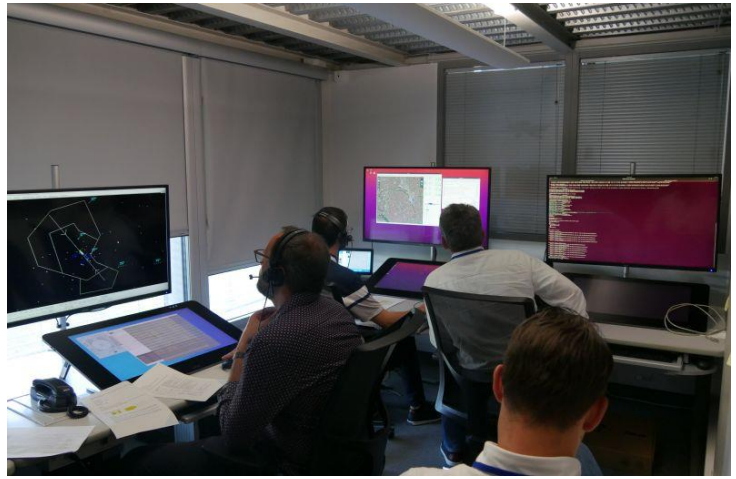
Development of procedures for contingency events.

Roles & Responsibilites → **Airspace Design** → **Traffic Mangement Services**

Multicentric Validation Activities



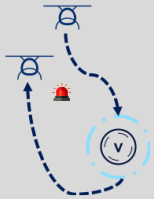


- Expert Judgement
- Model Based Simulations
- Fast Time & Real Time Simulations

Outcomes

Vertiport collaborative traffic management

Vertiport network flow, capacity & operational management



VCA Flight and Operating Procedures for Safe and Resilient Vertiport Operattions

Harmonisation

Concept & Results

Standard & Regulation

EUREKA Expected Benefit

Capacity

Operational efficiency

Safety

Security

VERTIFIED

Vertiport Research Infrastructure for Innovation Exploration and Demonstration

Objective: Development and implementation of flexible, modular vertiport research infrastructure

Next step towards the safe introduction of air taxis and the necessary infrastructure in urban and regional areas

Main content

- Requirements engineering and concept development for vertiport prototypes
- Physical research infrastructure for vertiports at DLR site Cochstedt
- Urban and airport integration of vertiports
- Air traffic management through implementation of U-space services for vertiports
- Experimental system architecture for vertical take-off and landing capable vehicle (VCA)
- Flight testing

Duration: 07/2024 – 06/2028 (48 months)

Participants: 6 DLR institutes/facilities, stakeholder cooperation

VERTIFIED Project

Two variants of the vertiports:

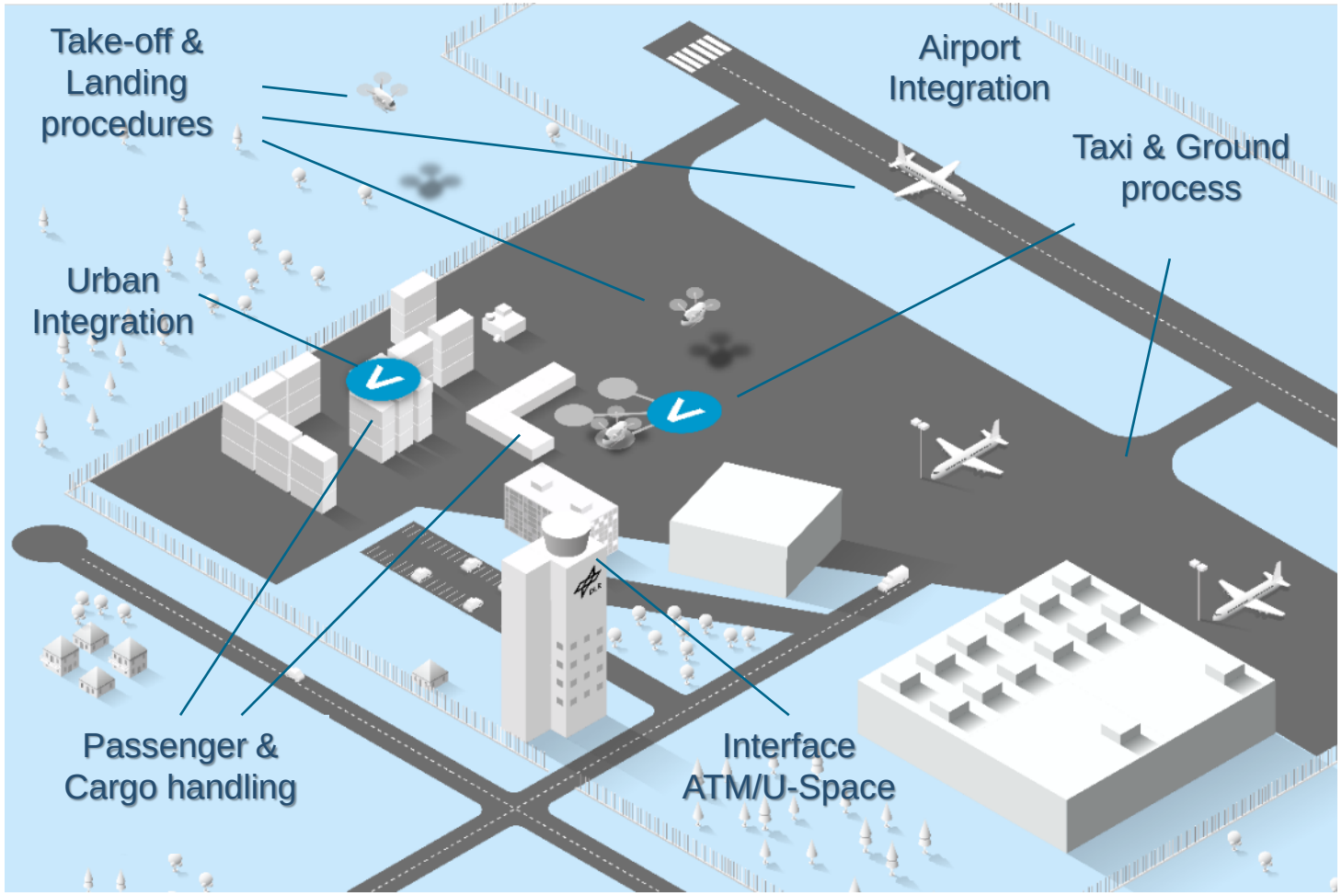
- Integration in the **urban environment** (model) with a prominent location (e.g., parking garage or skyscraper roof)
- **Airport** integration near terminal buildings and the apron (position on the ground)

Implementation of infrastructure:

- Two flexible/modular vertiports (1:1 scale)
- Modular urban environment in planning, with direct connection and integration to air traffic management (ATM)

Use cases:

- Cargo handling
- Passenger flow
- Ground/take-off and landing operations



marzia.corsi@dlr.de

Marzia Corsi

Researcher at DLR-Institute of Flight Guidance

Braunschweig, Niedersachsen, Deutschland

DLR

DLR
UAS Department

EUREKA
Project

VERTIFIED
Project

THANK YOU FOR YOUR ATTENTION

Imprint

Topic:	**Safe integration of vertiport operations in controlled and uncontrolled airspace**
Date:	2025-11-21
Author:	Marzia Corsi
Institute:	Institute of Flight Guidance
Credits:	All images “DLR (CC BY-NC-ND 3.0)” unless otherwise stated