Vertiport Automation System- System Design Review (SDR)

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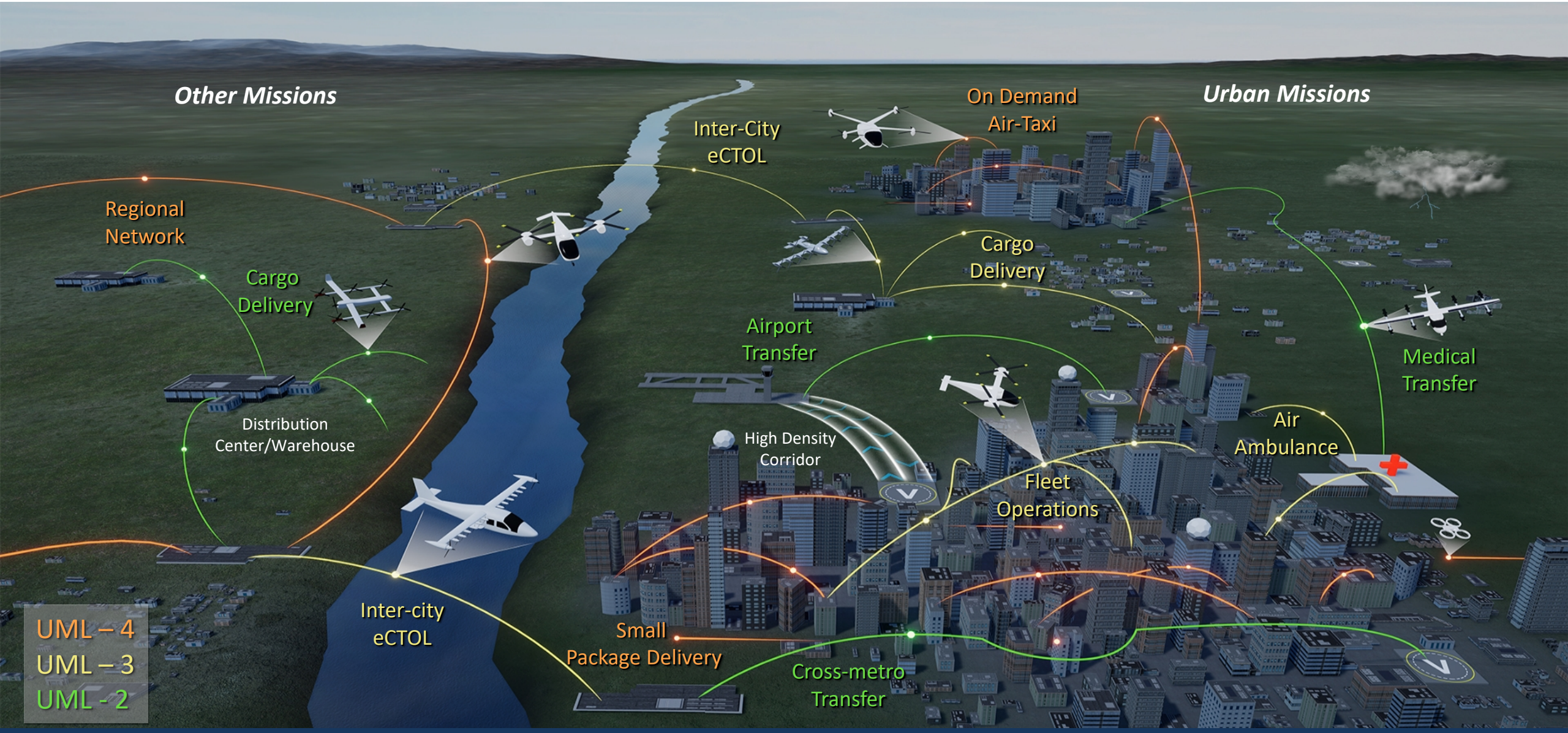
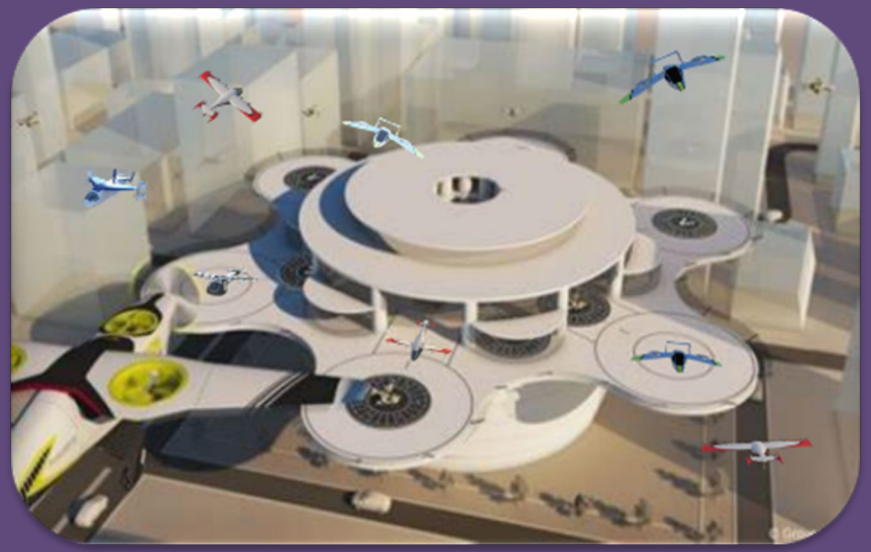
Advanced Air Mobility (AAM) Missions



Develop validated AAM System Architectures that define safe, certifiable, and scalable AAM operations.

NASA Sponsored:
Vertiport Automation System Task

NYUAST Vertiport Automation System Task



Vertiport Automation System

The intent of this task is to accelerate concept development, technology development, and standardization around vertiport infrastructure and automation.

This task forms the basis for research that will inform policy decisions and system design decisions.

Scope of Work

- Perform a **trade study and analysis of existing technologies** that would support high density vertiport operations using automation.
  - Vertiports serving UAS cargo delivery and small passenger-carrying aircraft (< 10 passengers) are of interest.
  - Particular focus on vertiport infrastructure, vehicle, and airspace services sensors and automation technologies that would enable large volumes of traffic in and out of a vertiport
- Scope the **use cases** for all tasks to align with vertiport and operations requirements associated with heavy lift UAS cargo delivery eVTOL operations and passenger carrying eVTOL operations.
- **Develop a concept of operations** for a specific location(s) to develop relevant requirements, considerations, barriers, and enabling technologies to best inform operationalization of vertiports and maturation of vertiport automation technologies.
- **Develop a vertiport automation system architecture** and software specification to incorporate infrastructure, vehicle, and airspace technologies to enable proposed eVTOL business models for passenger carrying and heavy-lift UAS cargo delivery operations.

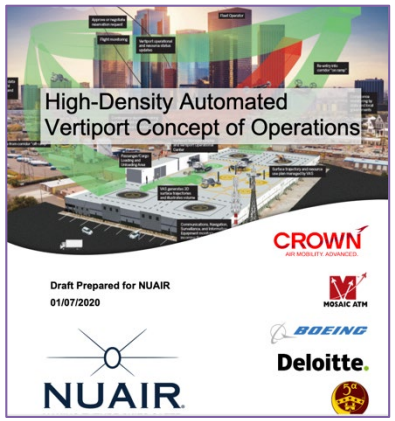
NYUAST Vertiport Automation Task

Vertiport Automation Trade Study

Completed

- Public Release
- FAA-NASA Community Integration Working Group (FAA ARP,AFS)
- NASA AAM HDV Technical Scope

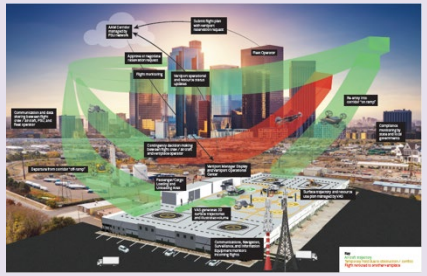
High-Density Automated Vertiport CONOPS



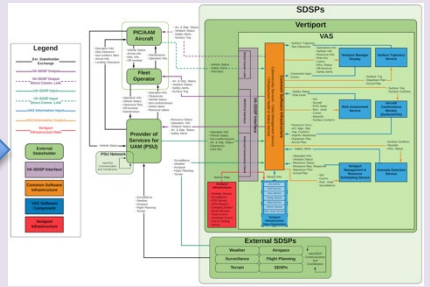
Completed

- Public Release
- ASTM F38.02 Vertiport Automation SDSP
- FAA-NASA Conops Working Group –UAM CONOPS v2.0
- FAA-NASA Community Integration Working Group – Vertiport AC
- NASA AAM Concept Development
- NASA AAM HDV – Partnership Engagement

Vertiport Automation SDSP Architecture



OV-1



ScV-4

MBSE Model (Magic Draw)

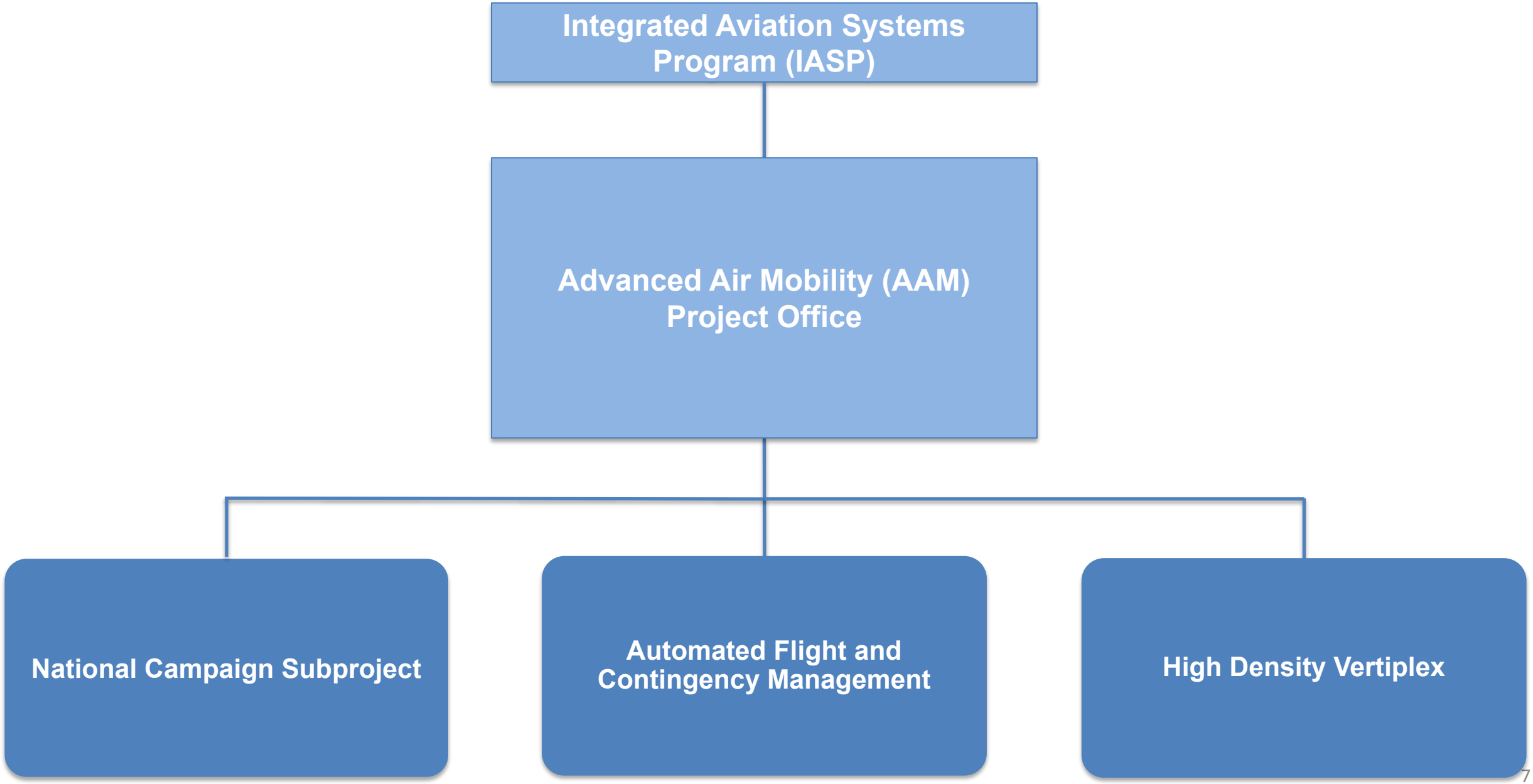
In Work – Contractor Development

- Public Release
- ASTM F38.02 Vertiport Automation SDSP
- FAA-NASA Conops Working Group
- NASA AMIO System Architecture
- NASA AAM HDV and ATM-X Technology Development

In Consideration

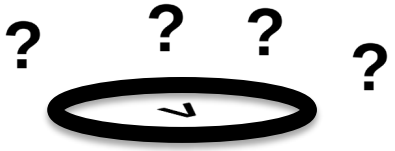
Advance Air Mobility Project:
High Density Vertiplex (HDV) Subproject

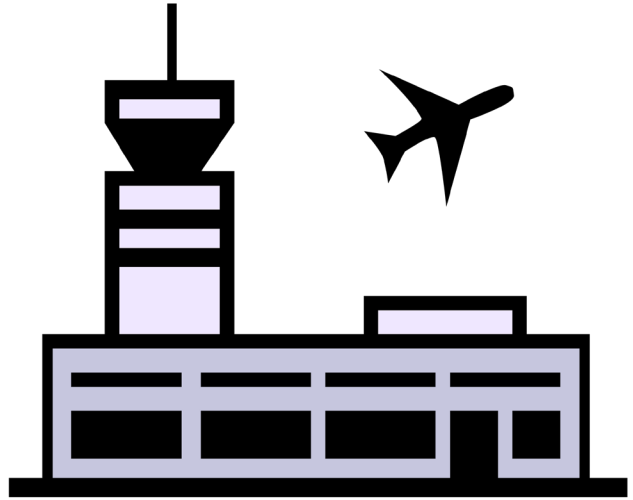
AAM Project Organization



Industry Need for Vertiport Technology

HDV is developing technologies and requirements to support industry infrastructure and automation needs and FAA vertiport design guidance development





Heliports

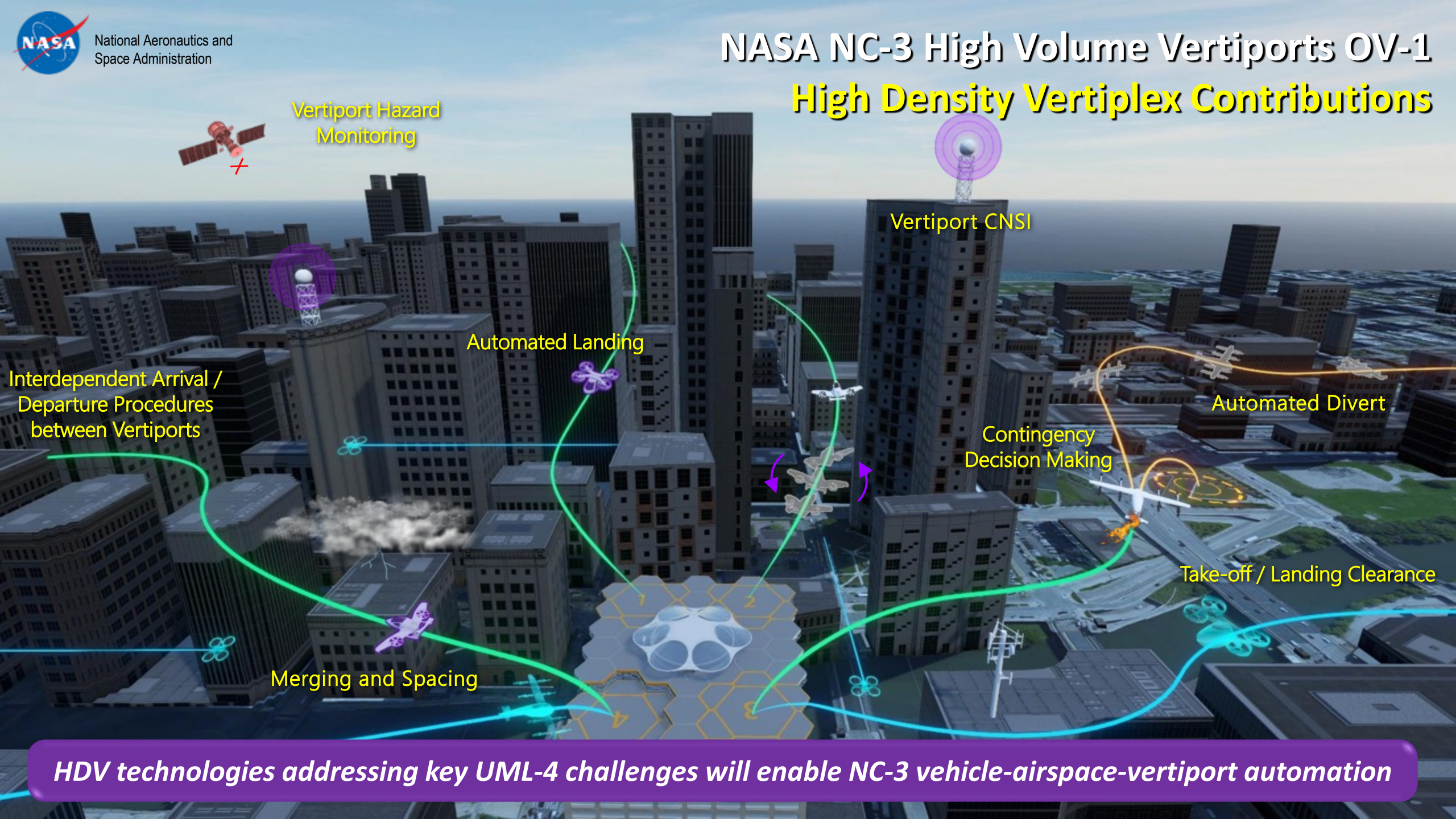
- Low throughput operations
- Limited infrastructure needed
- FAA Guidance and State/Local Government Oversight
- Operations managed mostly by aircraft Operators

Vertiports

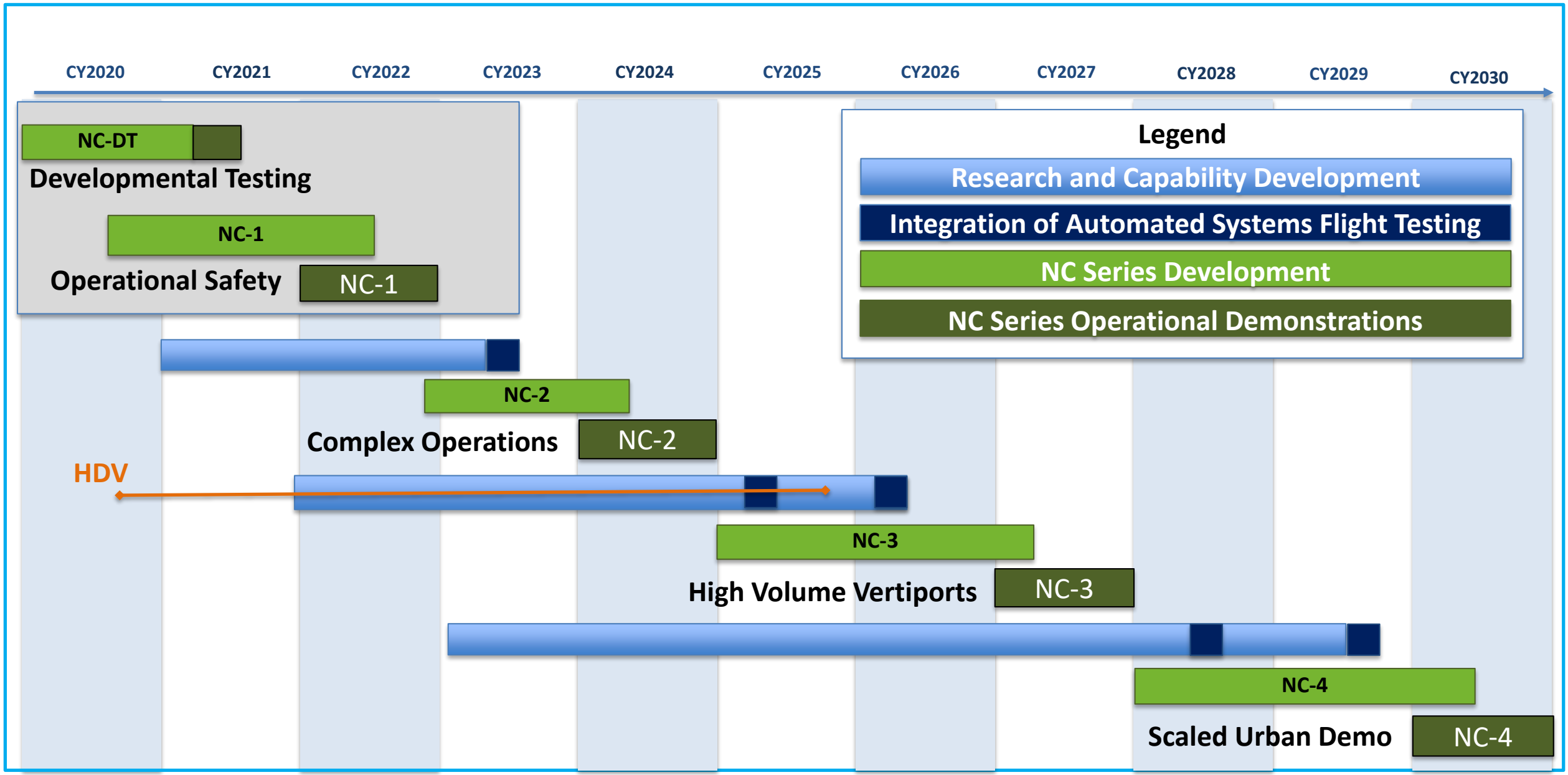
- Moderate-High throughput operations
- Infrastructure and Automation Needed
- FAA Guidance and State/Local Government Oversight
- Operations intended to be managed by vertiport Operators, PSUs, aircraft/fleet operators aided by automation
- Interoperability with UAM, UTM, and ATM

Airports

- High throughput operations
- Infrastructure and automation
- FAA Regulations and Oversight
- Operations managed by airport operator, ATC, procedures, and aided by automation
- Interoperability with ATM


National Aeronautics and Space Administration
NASA NC-3 High Volume Vertiports OV-1
High Density Vertiplex Contributions
Vertiport Hazard Monitoring
Vertiport CNSI
Automated Landing
Interdependent Arrival / Departure Procedures between Vertiports
Automated Divert
Contingency Decision Making
Take-off / Landing Clearance
Merging and Spacing
HDV technologies addressing key UML-4 challenges will enable NC-3 vehicle-airspace-vertiport automation

National Campaign Execution



HDV Research Flow to National Campaign

Automated Aircraft

Small UAS x3

Small UAS x5

Small UAS x7

Representative eVTOL

UAS Automation Reference Architecture

Operations

Automated Landing

Merging and Spacing

Contingency Decision Making

Scenarios and Use Cases

Simulation and Multi-Aircraft VLOS Flight Test

Simulation and Limited Multi-Aircraft BVLOS

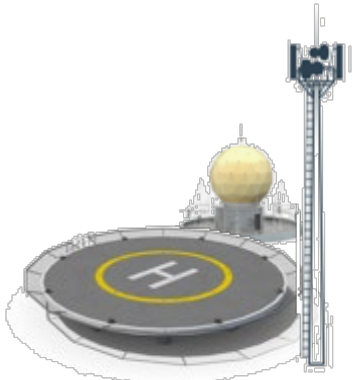
Simulation and Expanded Operations (BVLOS & m:N aircraft control)

Operational Environment (e.g. Test Range for NC)

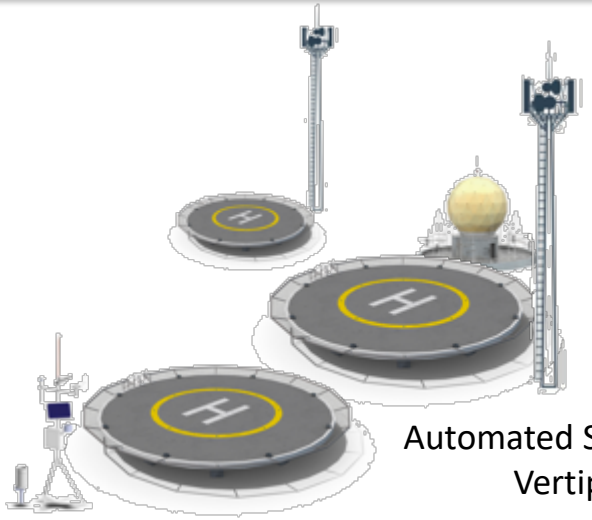
BVLOS Safety Case

Infrastructure

Vertiport Terminal Procedures Design



Instrumented and Connected Vertiport



Automated Services for Vertiplex

Vertiport Automation Reference Architecture

Vertiport Automation System Design Review

Vertiport Automation System – System Design Review

NASA's Objectives

- **Tell Us:** NASA highly encourages industry participation, feedback, and thoughts on the proposed Vertiport Automation Concepts and Architecture
  - Tell us what works for your business cases
  - Tell us what doesn't work for your business cases
  - Tell us what we are missing
  - Tell us what your priorities are
  - Tell if certain decisions (e.g. technology, policy/regulation, etc.) have big impacts on your development, business case, etc.
  - Tell us where you see challenges ahead
  - Tell us if we need to speed up (and yet at the same time slow down)

- **Join Us:** NASA sees this as the start of many discussions to mature and accelerate vertiport development and automation
  - **Concepts:** Advanced Air Mobility Ecosystem Community Integration Working Group Meetings
  - **Standards:** ASTM Vertiport Standard (WK59317, Ballot F38 21-02), ASTM Vertiport Automation Supplemental Data Service Provider (WK75981)
  - **Research and Development:** NASA Announcement for Collaborative Opportunities (ACO-2 released, ACO-3 to be released soon)

- **Share with Us:** Discussions on Vertiport Automation should not end today, NASA encourages participants to continue the discussions with us.
  - Existing or planned research and development activities that you have that could inform the vertiport automation requirements and standards
  - Feedback on the CONOPS, Vertiport Automation Architecture, the workshop, or future directions NASA should be considering for vertiport research