Federal Aviation Administration

Operationalizing an Advanced Air Mobility Ecosystem

REDAC Presentation

March 19, 2024

Advanced Air Mobility (AAM)

DELTA

Joby

UNITED

ARCHER

ups

BETA

American Airlines

VERTICAL

FedEx

ELROY AIR

BOEING

wisk

- First electric vertical takeoff and landing (eVTOL) aircraft expected to be FAA certified in 2025
- Predicted to be $30B market by 2030
- New venture capital funded “disruptive” manufacturers backed by traditional operators
- Initial business cases
  - Air taxi (airport to city pair)
  - Cargo (small market to hubs)
  - Medical transport
- Initial operations look like traditional helicopter/GA piloted aircraft, but plan rapid shift to autonomous
- Unique, yet to be built “ecosystem” needs to support vertiports, charging, routes, & automation

Balancing the Pace of Innovation and Safe Operations

FAA Integrated Team

Requirements Definition and Portfolio / Program Management

Federal, State, Local, Tribal, and Territorial (FSLTT) Government
Completed Jan. 2023

Industry and Local Community Engagement
Ongoing since Sep. 2022

Team Development
Innovation Teams (iTeams) also tie into DOT AAM IAWG sub-groups
Ongoing since Sep. 2022

Aircraft Certification	Airspace Management	Environment	People	Security
Airspace Infrastructure	Community Engagement	Operations Certification	Safety	Vertiports

Advanced Air Mobility Implementation Plan
Jul. 2023

FAA Ongoing Engagement

Federal Government and Workforce Partners

We work with partners across the federal government to implement the AAM Coordination and Leadership Act to coordinate policy for integrating AAM operations.

AAM Interagency Working Group

Office of Science and Technology Policy

Joint test team with Agility Prime and NASA leverages knowledge and resources to collect performance data to develop policy and standards

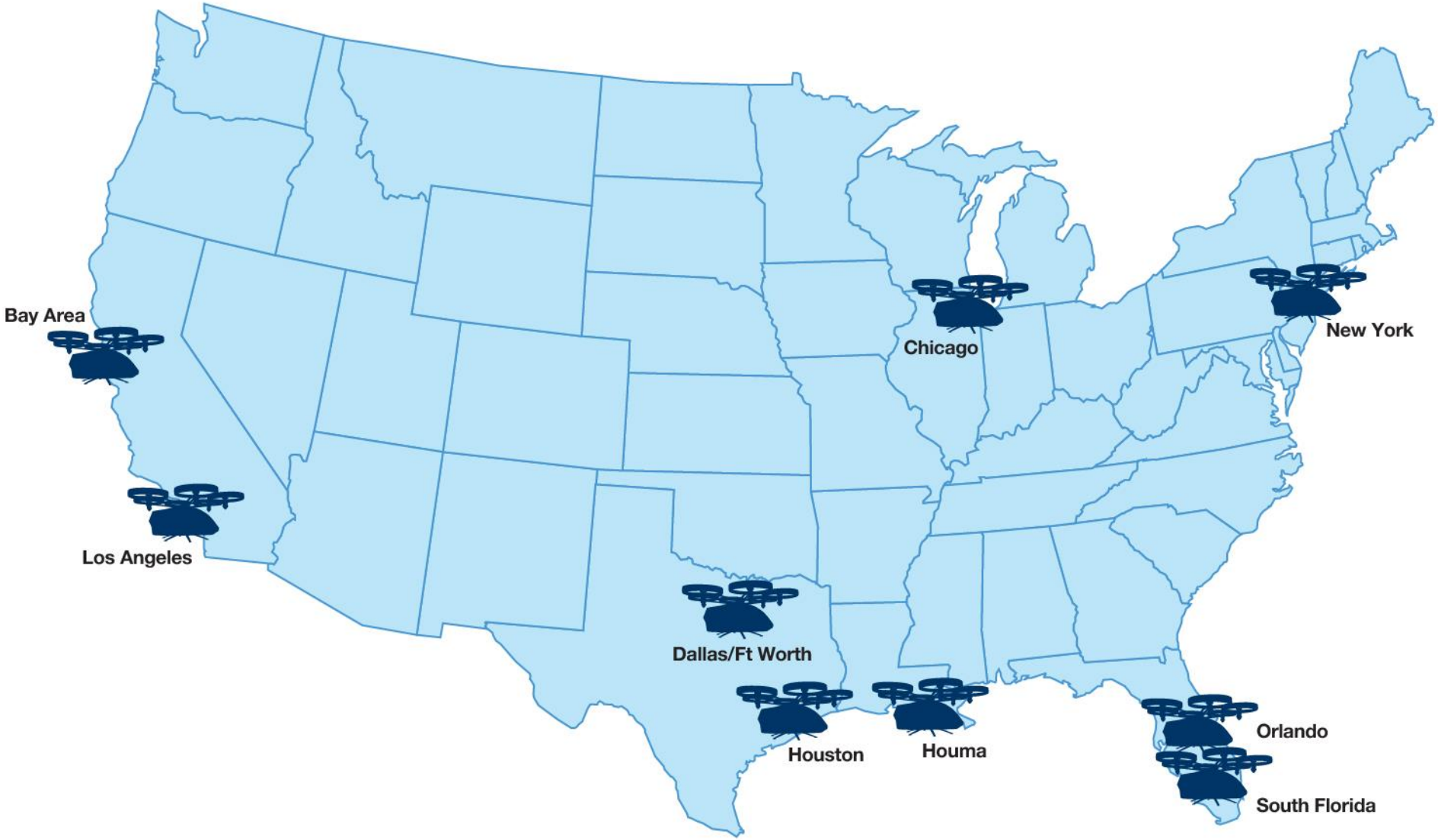
Local/State/Tribal Governments and Community Organizations

We encourage state, local, and tribal communities to be informed about AAM technology and how these new operations will affect them. These meetings help us to better understand local sentiment about AAM operations.

Industry

We engage with industry stakeholders, including aircraft manufacturers, operators, and airport/ vertiport companies to understand their vision and implementation plans. Our current priority is U.S.-based eVTOL piloted-passenger manufacturers undergoing FAA certification. Examples include the following stakeholders:

Potential Initial Operations Locations



Safety Focused Approach

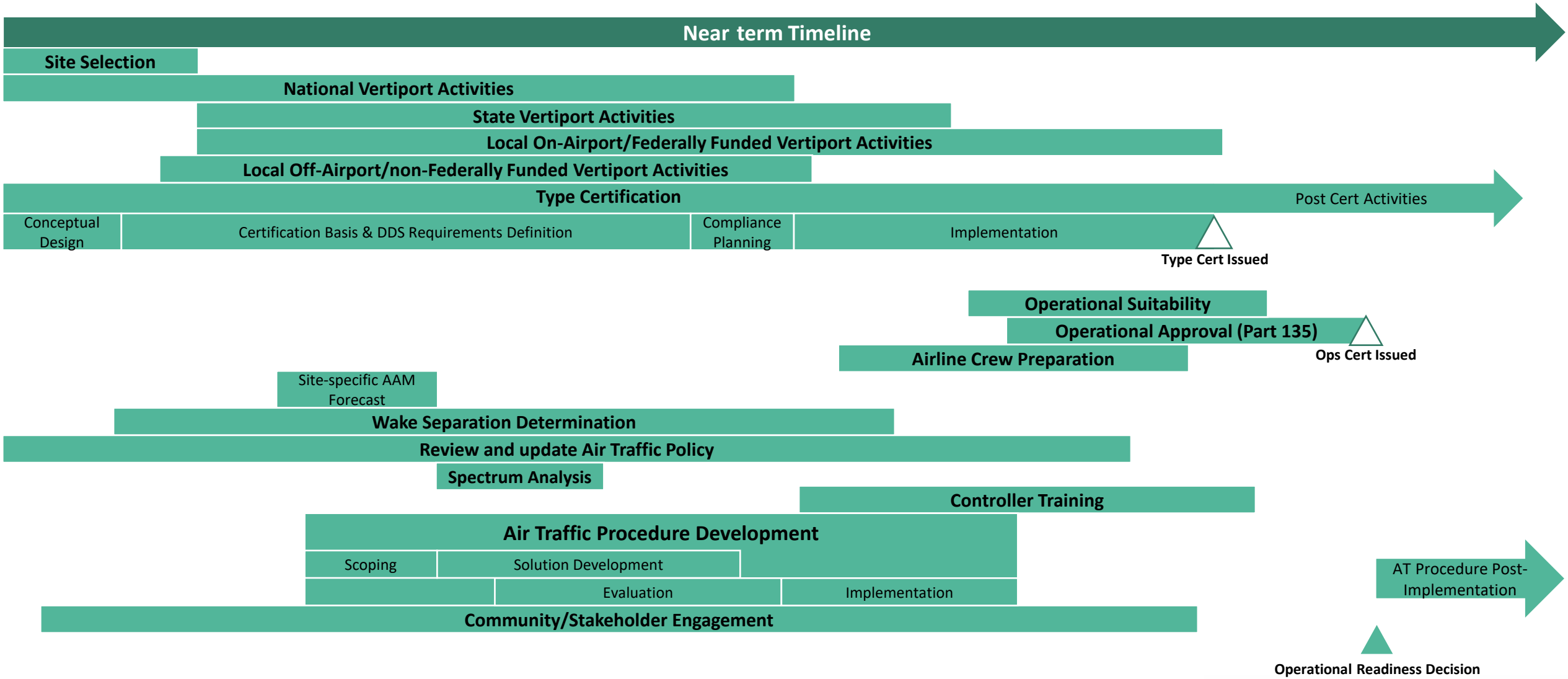
- Whole of government approach needed to support integration of new class of aircraft, flying in constrained airspace, needing new support infrastructure, and accelerating to autonomous operations environment
- Updating a regulatory framework to address the unique aspects of new hybrid, non-traditional aircraft
- The FAA created a programmatic portfolio approach called Innovate28 that integrates all cross-agency efforts toward user initial entry into service goals
- DOT-led AAM interagency working group developing national strategy for AAM, identifying key national issues for implementation; security, power/energy, infrastructure, community impacts, spectrum, and supply chain

Key Innovate28 Activities

- Aircraft Type Certification
- Air Traffic Policy Review and Updates
- Concept of Use (general and local)
- Hazardous Materials
  - Fire/smoke procedures
  - Cabin safety
  - Emergency training
  - Cargo requirements
- Procedure Development
  - Scoping
  - Solution development
  - Environmental review
  - Safety Risk Management (SRM) process
- Community Engagement
- Operational Certification
  - Part 135 Operational Approval
  - Operational Suitability (to establish aircraft type ratings, pilot training programs, maintenance programs, master equipment lists)
- Local Vertiport Activities
  - Vertiport locations
  - Local zoning
  - Construction
  - Charging infrastructure
- Local ATC Activities
  - Controller training
  - Standard Operating Procedures (SOP) and Letters of Agreement (LOA)
- Cybersecurity
- Physical and Operational Security
- Site Selection
- Site-Specific AAM Forecasting
- Wake Separation Requirements
- Crew Preparation
  - Rulemaking for pilot training
  - Crew training and certification
- National Vertiport Activities
  - Flight testing
  - National guidance
  - Rulemaking

➢ The list includes the FAA, other federal government agencies, FSLTT government, industry, and other stakeholder activities.

Portfolio Management for Each AAM Project



Significant Activities

- **Recent**
- October 25, 2023: FAA/AFWERX Memorandum of Understanding (MOU) signed
- December 2023: Autonomy Working Group Kickoff
- January 2024: Autonomy Webinar
- February 2024: Wake Separation Webinar
- February 2024: Interagency Working Group (IWG) Meeting in Dallas, TX

- **Upcoming**
- Community Engagement Webinar, April 17, 2024
- Drone and AAM Symposium, July 30-August 1, 2024
- Targeting Fall 2024 publication of the Powered-Lift SFAR
- AAM IWG National Strategy Report anticipated in 2024
- Updated interim Vertiports guidance end of 2024

Powered-Lift SFAR

- Notice of Proposed Rulemaking (NPRM) published in June 2023
- Complements other rulemaking activities
  - Integrated with aircraft certification activities currently underway, other policy development, and operational certification efforts
- Employs a Special Federal Aviation Regulation (SFAR) approach to set initial requirements and enable the FAA to gather additional information toward determining the most appropriate permanent rulemaking path in the future for these powered-lift aircraft
- Working through the internal agency process now as a high-priority effort, including decisions in a number of policy areas
- Intent is to have necessary regulatory elements in place to support planned entry into service timeframes

Wake Categorization

- The ANG Wake Turbulence Research and Development Program assessed the Joby JS4, Archer Midnight, and Beta CX-300 for initial wake turbulence separation recommendations
- The assessment of these vehicles is based on the best understanding of the initial or early operations of these aircraft in the NAS
- As eVTOL and UAM operations evolve, additional wake studies and analyses will be required to ensure safety and acceptable risk levels are maintained

Vertiport Standards

- Initial vertiport operational testing ongoing
- Testing will inform update to Engineering Brief 105 “Vertiport Design” expected by the end of 2024
- Performance-based Vertiport Design Advisory Circular expected by end of 2025

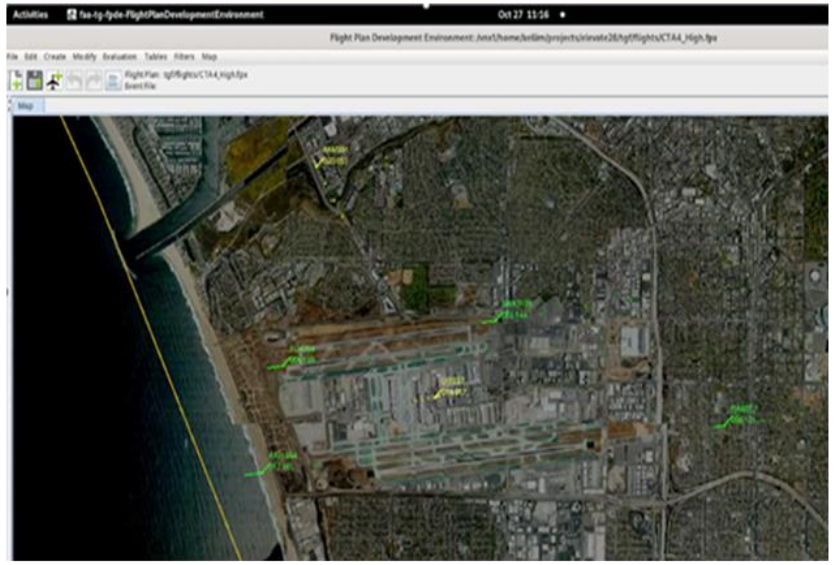
AAM Airspace Integration Assessments

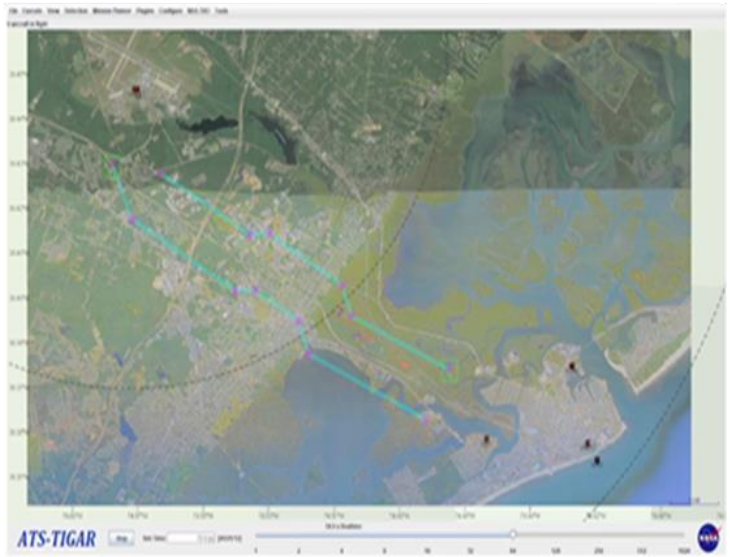
- The majority of AAM operators are targeting use cases at major airports in complex operating environments
- The FAA is developing strategies to understand aircraft performance and how it will impact existing operations
- Complementary integration efforts support our overall process for getting to ‘yes’ safely as we develop an AAM ecosystem encompassing infrastructure, airspace considerations, energy management, etc.
  - Work with airport authority, operators, and Air Traffic Controllers to identify beneficial and safe use cases
  - Operational and flight testing
  - Modeling and simulation

Modeling & Simulation Process for Airspace Integration Impact Assessment

Modeling + **High Fidelity – Human in the Loop Simulation** + **Diverse Subject Matter Experts (SMEs)** = **NAS Integration**

end-to-end NAS integration





Partnering to safely integrate Advanced Air Mobility into the NAS

FAA Test Planning & Approach

Strategic

Overarching test master plan provides a unified approach across all FAA LOBs supporting AAM test events

Comprehensive

Includes FAA LOBs (I28 iTeams) data requirements for collection to inform policy, standards, regulations, and NAS airspace integration

Guidance

Provides a baseline document to drive FAA data collection needs and priorities for AAM testing

Dynamic

Updated as additional information is obtained and new challenges are uncovered

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Questions?

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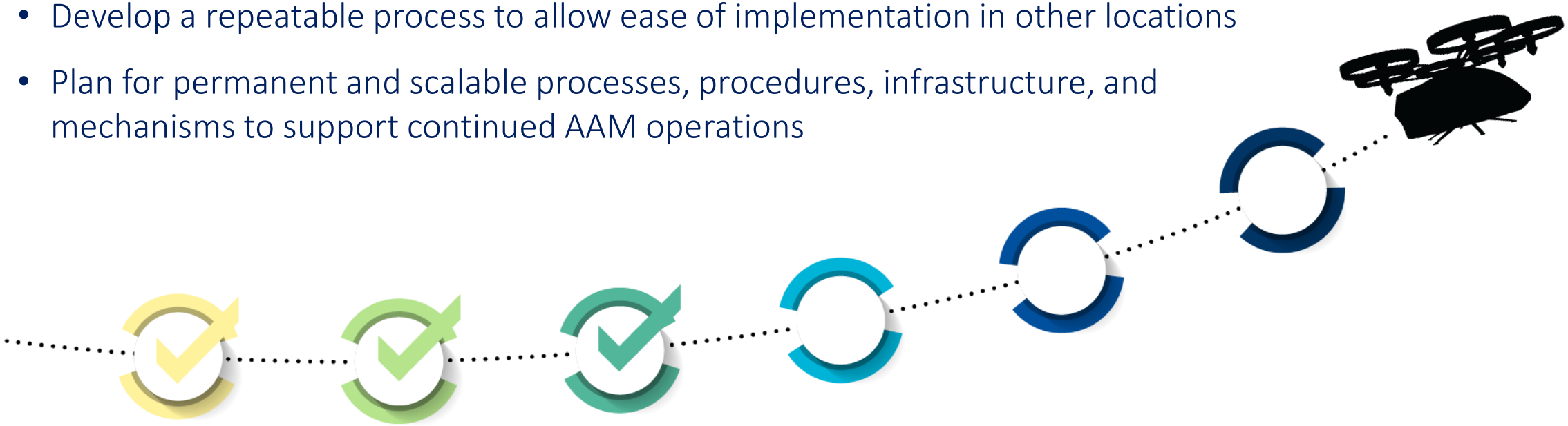
Back Up

Ecosystem Enablers

- Aircraft Safety Rulemaking
  - Recognition of pilot in command experience in military/air carrier operations (final rule Sep 2022)
  - Update to air carrier definitions (comment closed Feb 2023)
  - Airman certification standards (comment closed Feb 2023)
  - Notice of proposed rulemaking (NPRM), which proposes special federal aviation regulations (SFAR) for integration of powered-lift operations and associated pilot certification (published June 2023)
  - For type certification, the FAA is accepting established means of compliance as well as developing new means depending on unique design features/characteristics of vehicle
- Planning & Portfolio Management
  - Urban Air Mobility Concept of Operations v2.0 (May 2023)
  - AAM Implementation Plan (July 2023)
  - Planning integrated simulations/testing in partnership with DOD, NASA
- Airports
  - Interim guidance published September 2022 through Engineering Brief #105; refined performance-based guidance planned through Advisory Circular in 2025

Innovate28 Goals for Near-term Operations

- Define and complete agency actions needed to enable AAM operations in locations determined by industry in the near-term leading up to 2028
- Provide an FAA focal point on AAM issues, and provide programmatic support that coordinates efforts across the agency on behalf of specific key projects
- Develop a repeatable process to allow ease of implementation in other locations
- Plan for permanent and scalable processes, procedures, infrastructure, and mechanisms to support continued AAM operations



AAM Workstreams

Cross cutting Major Risk Areas: Wake Separation, Vertiports, Power, Security, Noise and Community Impacts

Near-term

- Engage with industry to determine operational needs and desired Operations
- Research impacts to Air Traffic Services
- Tailor implementation plan to initial entries into service
- Perform research and engineering activities to support UAM ConOps maturity
- Establish workstreams for mid- and far-term, to include Autonomy Working Group

Mid-term

- Explore operational efficiency through strategic employment of modeling and simulation to effectively manage large-scale operations.
- Develop policies and standards based on learned performance
- Establish standards and requirements for enablers such as Information exchanges, Communications / Navigation / Surveillance (CNS), etc.
- Support industry development of supplemental services

Mature Stage

- Perform research and engineering to validate technological and procedural enhancements to separation management
- Refine policies and standards based on advanced aircraft capabilities
- Derive requirements for infrastructure and automation capabilities
- Refining the mature state of UAM ConOps, and incorporate findings from autonomous WG to integrate Autonomous Operations

Summary

- AAM spans an array of concepts, from piloted to fully autonomous operations
- We are building out an ecosystem to safely and efficiently enable the full range of a new way of flying so that it is beneficial and equitable to the public
- The FAA has established a focal point for industry to coordinate with the FAA as they work though regulatory and operational aspect of their new services
- We strive to be one step ahead of industry