NCTCOG UAS Safety & Integration Task Force

May 2022

New infrastructure is required for AAM to achieve liftoff

Skyports

To offer sustainable service, eVTOLs need places to take off, land, re-charge their batteries, and discharge passengers

Landowners are in a unique position to augment their assets to act as key nodes in a broader transport network

The Leading AAM Infra. Developer and Operator

Skyports leases, builds and operates vertiports, the dedicated landing areas in urban environments for electric air taxis

Video with illustrative vision [here]

Strong partnerships

- Partner with top vehicle OEMs across regions
- Strong relationships with key regulators, including the FAA, and local stakeholders

Proven ability to deliver

- Designed and built the world's first vertiport prototype in 2019 in Singapore
- First permanent commercial operations planned in 2023

Strategic investor base

- Large infrastructure operators (Groupe ADP, Deutsche Bahn)
- World's premier low cost carrier airline developer, including Ryanair (Irelandia Aviation)

Where we are

Skyports has operations across the world, with core commercial ops based in the Americas, EMEA, and APAC


Skyports
Skyports

Cergy-Pontoise Testbed

- **Europe's first test vertiport in France**
- **Aim to launch commercial ops at Paris Olympics (2024)**
- **Supported by DGAC (French Civil Aviation Authority) and EASA**

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ConOps in Miami-Dade County (with Eve)

- **Miami International Airport (MIA) and the Miami Beach Convention Center**
- **“Listen and learn” sessions with community stakeholders, peers, and operators**
- **ConOps will explore:**
  - **Operating environment**
  - **Flight profiles**
  - **Charging infrastructure**
  - **Community concerns**

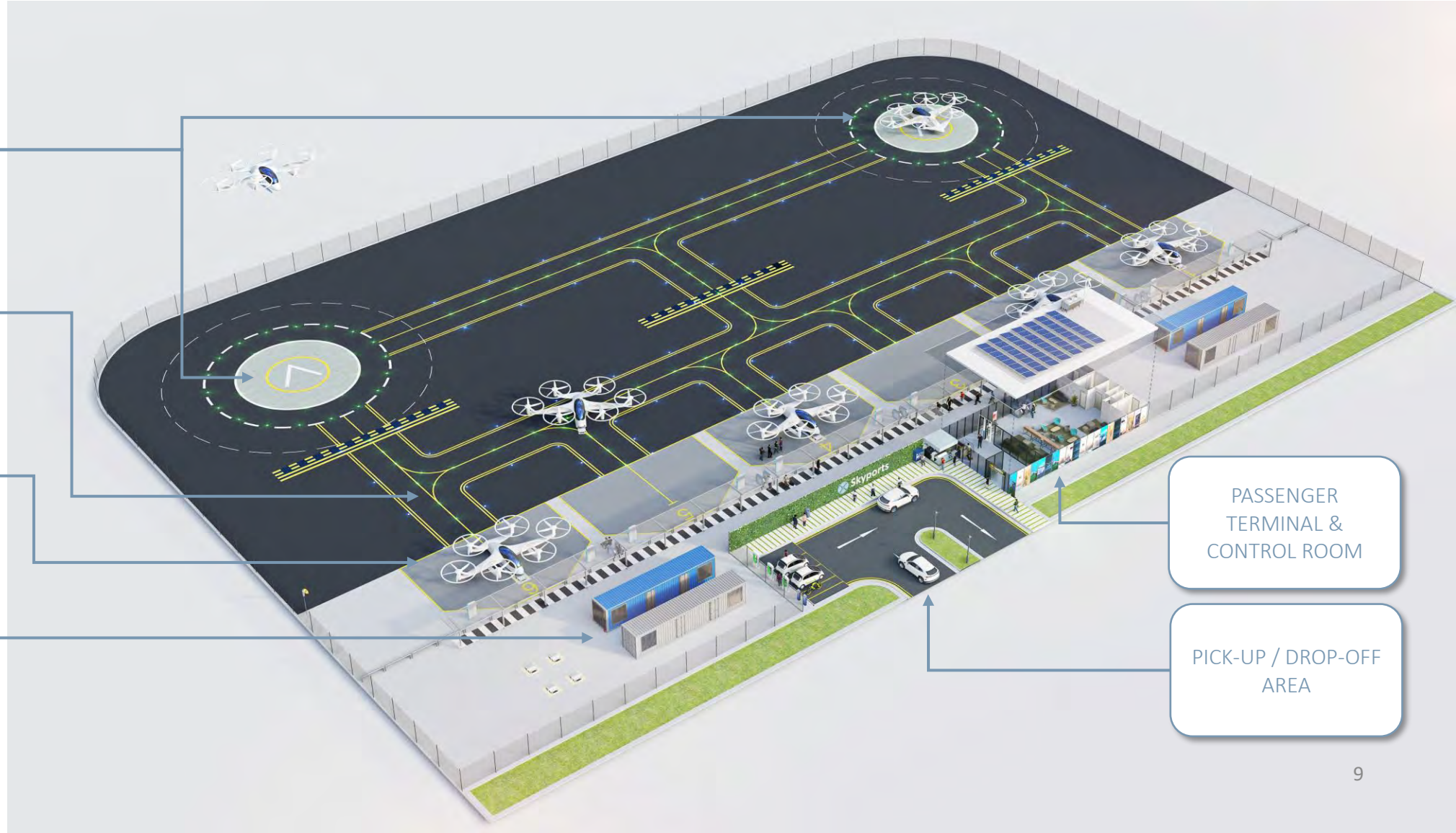
7

Los Angeles region

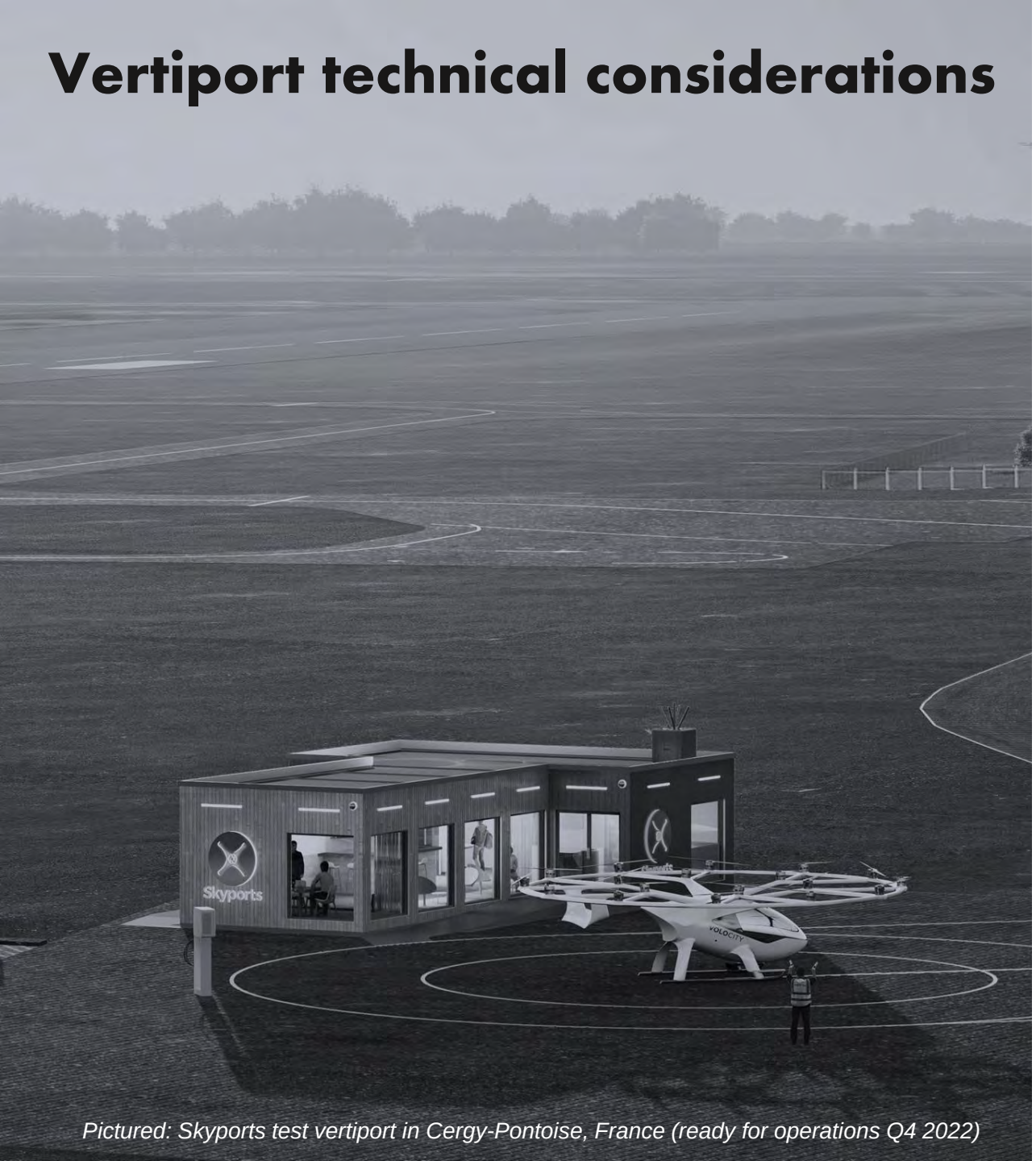
- **Collaborating with South Bay Workforce Investment Board on upskilling / apprenticeships**
- **Participant in Long Beach Economic Partnership's AAM Working Group**
- **Ongoing conversations with CalSTA, CalTrans and FAA's ADO in Los Angeles**

Passenger vertiport description

The main features of a vehicle-agnostic passenger vertiport are landing areas, aircraft stands, recharging and turnaround equipment, passenger terminal, control room and safety and security facilities.



Vertiport technical considerations



Pictured: Skyports test vertiport in Cergy-Pontoise, France (ready for operations Q4 2022)

Skyports

- Airspace provisions and procedures
- Aircraft ground movement operations
- Resource management and scheduling
- Passenger check-in, security, and processing
- Situational awareness
- Safety Features
- Federal, state, and local permitting
- Electrification

Building Infrastructure for Diverse OEMs and Operators

Skyports

Information-sharing with vehicle manufacturers ensures our vertiports are designed and sited according to manufacturers' and operators' needs and requirements.

NON-EXHAUSTIVE LIST

- Vehicle Specifications
- Charging / Fuel Requirements
- Special Conditions
- Passenger Experience
- Network Planning
- Routing

Pathway to Development and Operation

Skyports

Government Body	Likely application
FAA	• Establishment of Vertiport Deign and Operation Guidance • Jurisdiction over Public-use Infrastructure Design (received federal funding) • Aeronautical study of any vertiport based on design and site selection
Texas	• Guidance for Airport Land Use
Counties & Cities	• Licensing • Permitting • Inspecting • Approving

Zeroing in: North Texas

Skyports

- **Short-term: Repurposing existing assets for AAM infrastructure**
  - Parking structures
  - Surface parking lots

- **Integration with existing transportation system**
  - Multi-modal mobility hubs
  - AAM can serve as nice complement to existing transportation alternatives

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- **Longer term: opportunities for integration with regional airports**
  - Feeder vertiport to airside / groundside locations
  - Minimize traffic congestion
  - Provide a compelling first-mile and last-mile transportation alternative

Laying the groundwork: North Texas

Skyports

Short-term:

- Understand North Texas' goals and objectives
  - Key gaps in existing transport system
  - Transit deserts
  - Traffic congestion chokepoints
- Identify key barriers or obstacles to enabling AAM services
  - Airspace, land use, electrification
- Collaborate with local Fire Department / Police / EMS personnel to better understand emergency preparedness
- Identify potential changes to land use policy (e.g., zoning, building heights, density requirements, parking minimums)

Longer-term:

- Workforce development opportunities
- Public acceptance
  - Demonstration vertiport project (passenger journey, surface accessibility, etc.)
  - Noise simulation
  - Identify opportunities to co-create / co-develop a strategic plan for AAM

Skyports

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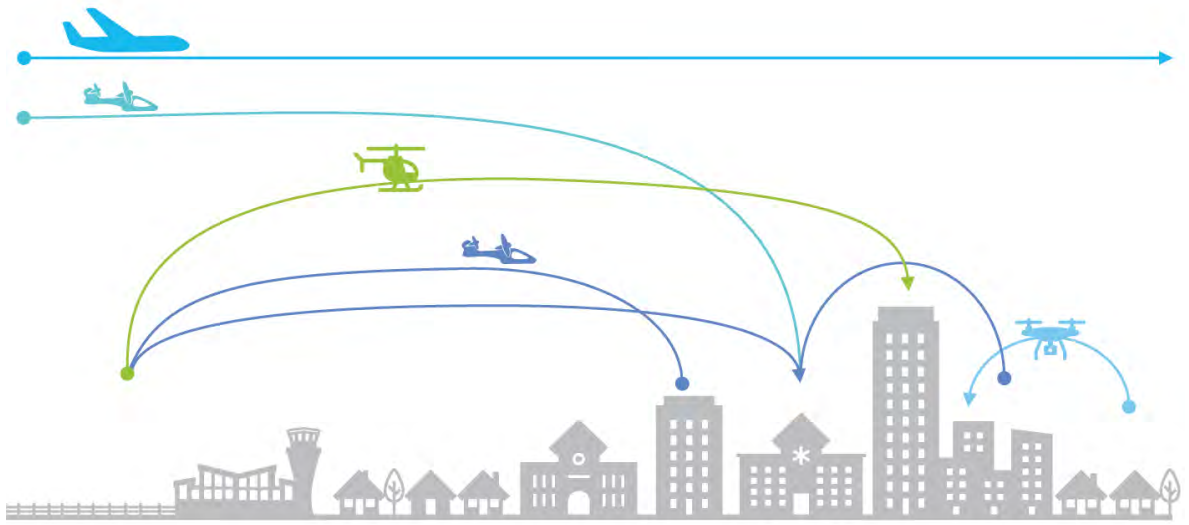
Airport Electrification

Mead & Hunt

MAY 31, 2022

Agenda

- Aircraft and Infrastructure
- Considerations
  - Planning
  - Environmental
  - Design
- Guidance
  - FAA
  - Other Organizations



Advanced Air Mobility (AAM) Network,
Mead & Hunt, Inc.

Key Terms

- AAM – Advanced Air Mobility
- ADG – Aircraft Design Group
- eCTOL – Electric Conventional Takeoff and Landing
- eVTOL – Electric Vertical Takeoff and Landing
- FAA – Federal Aviation Administration
- RAM – Regional Air Mobility
- UAM – Urban Air Mobility
- UAV – Uncrewed Aerial Vehicle

Aircraft and Infrastructure

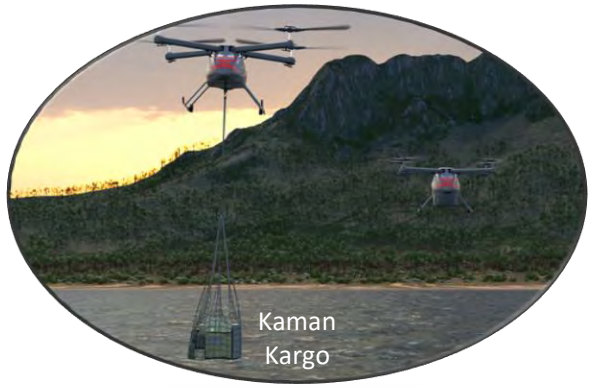
Mead & Hunt

Aircraft

Existing Design, eCTOL

Magnix
C208 Caravan

UAVs



Kaman
Kargo

Hybrid-Electric

Airbus
E-Fan X

New Design, eVTOL

BETA
Alia 250

New Design, eCTOL

Heart Aerospace
ES-19

Air mobility startup market map

Air mobility startup market map

Source: Pitchbook Air Taxi Startup Handbook, 2021

Certification Status

- **In five years**
  - ADG I and II fixed wing and eVTOL
  - General aviation, air taxi, small cargo
- **Beyond five years**
  - Designs larger than ADG II
  - Air carrier
  - Hybrid, hydrogen, and sustainable aviation fuels vs. pure electric


Pipestrel
Alpha Electro

MagniX
C208 Caravan

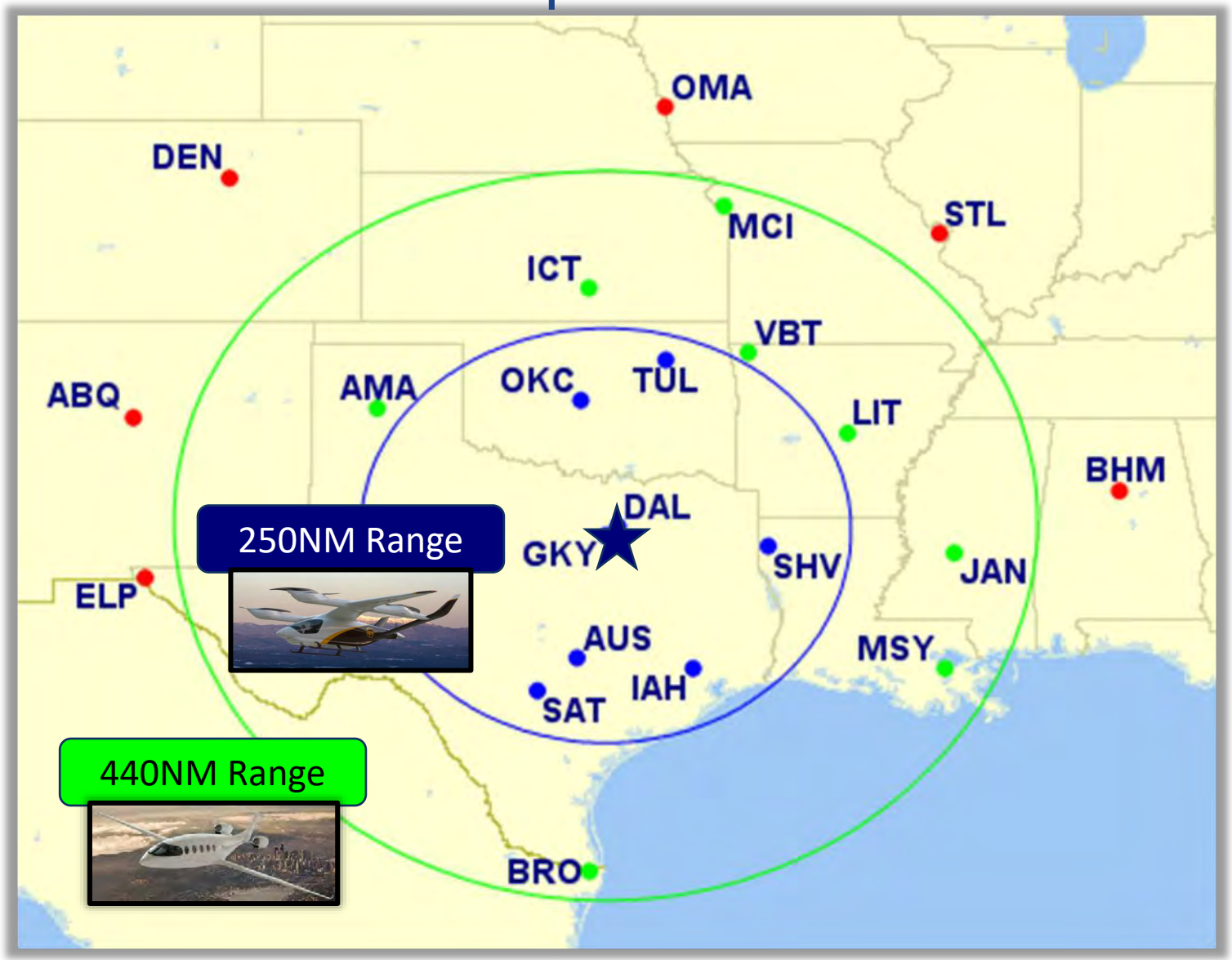

Eviation
Alice

Roles

	2020	2025	2030	2035	2040	2045	2050
Commuter » 9-19 seats » < 60 minute flights » <1% of industry CO_2	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Regional » 50-100 seats » 30-90 minute flights » ~3% of industry CO_2	SAF	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Short haul » 100-150 seats » 45-120 minute flights » ~24% of industry CO_2	SAF	SAF	SAF	SAF potentially some Hydrogen	Hydrogen and/or SAF	Hydrogen and/or SAF	Hydrogen and/or SAF
Medium haul » 100-250 seats » 60-150 minute flights » ~43% of industry CO_2	SAF	SAF	SAF	SAF	SAF potentially some Hydrogen	SAF potentially some Hydrogen	SAF potentially some Hydrogen
Long haul » 250+ seats » 150 minute + flights » ~30% of industry CO_2	SAF	SAF	SAF	SAF	SAF	SAF	SAF

Source: ATAG Waypoint 2050

Near-term Capabilities



Infrastructure

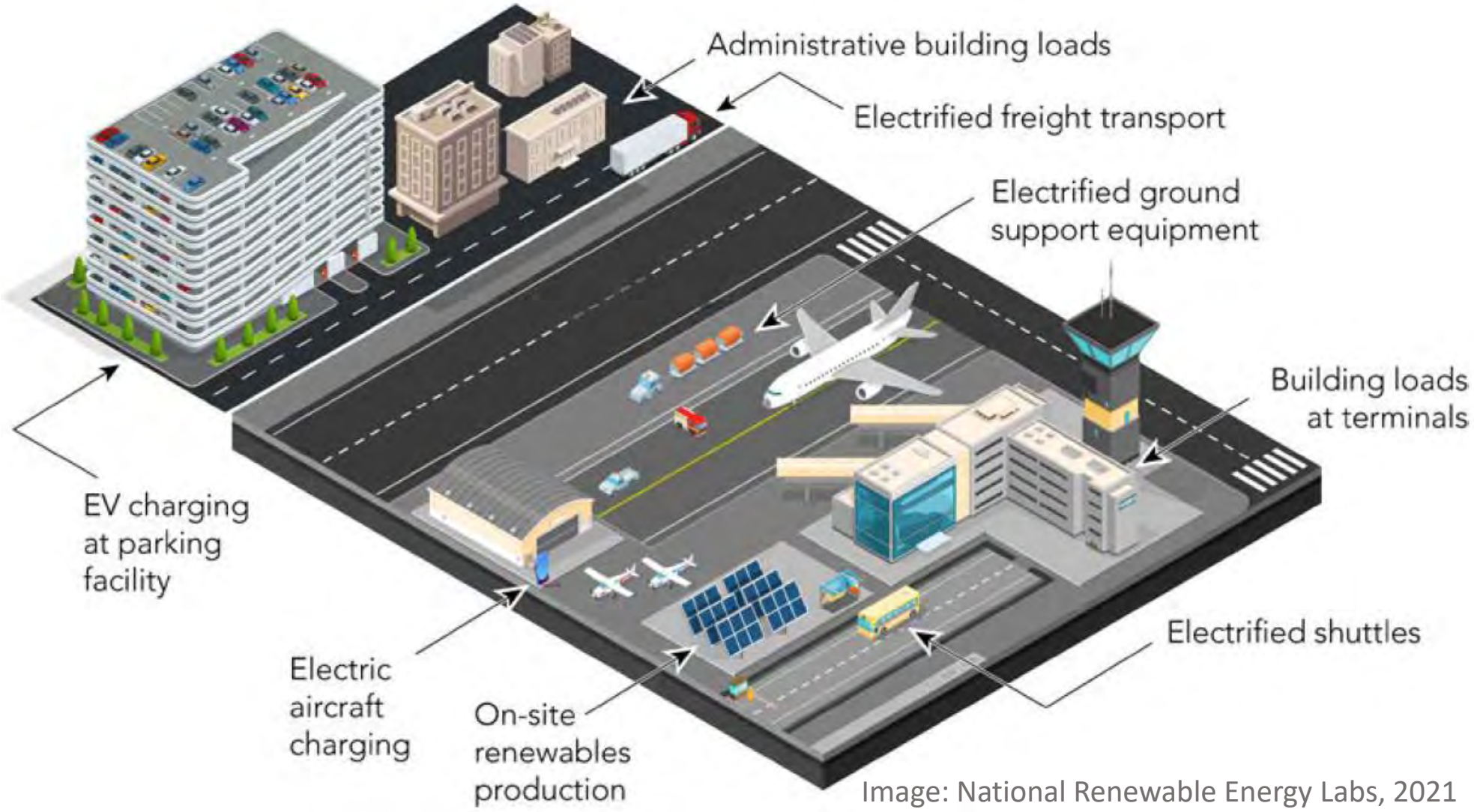
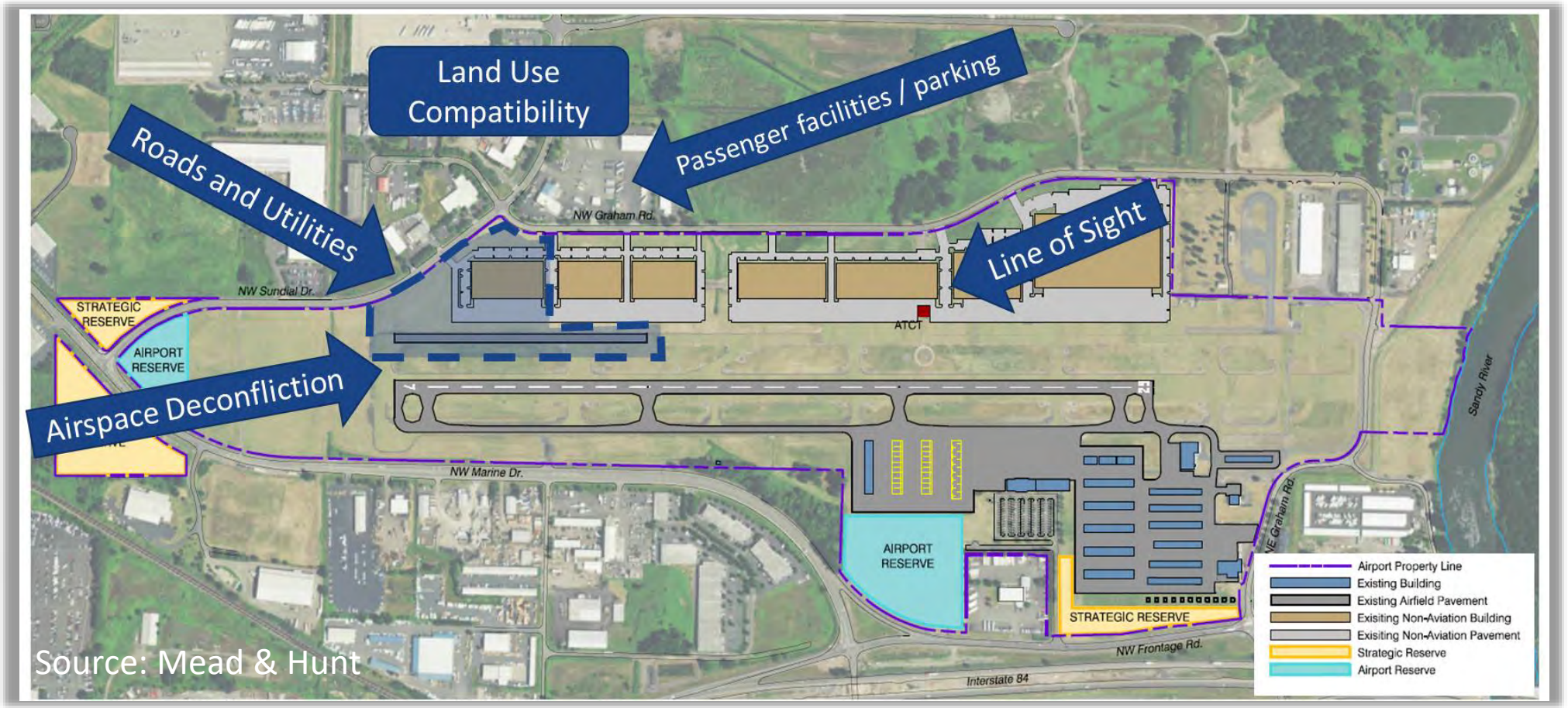


Image: National Renewable Energy Labs, 2021

Planning & Environmental Considerations

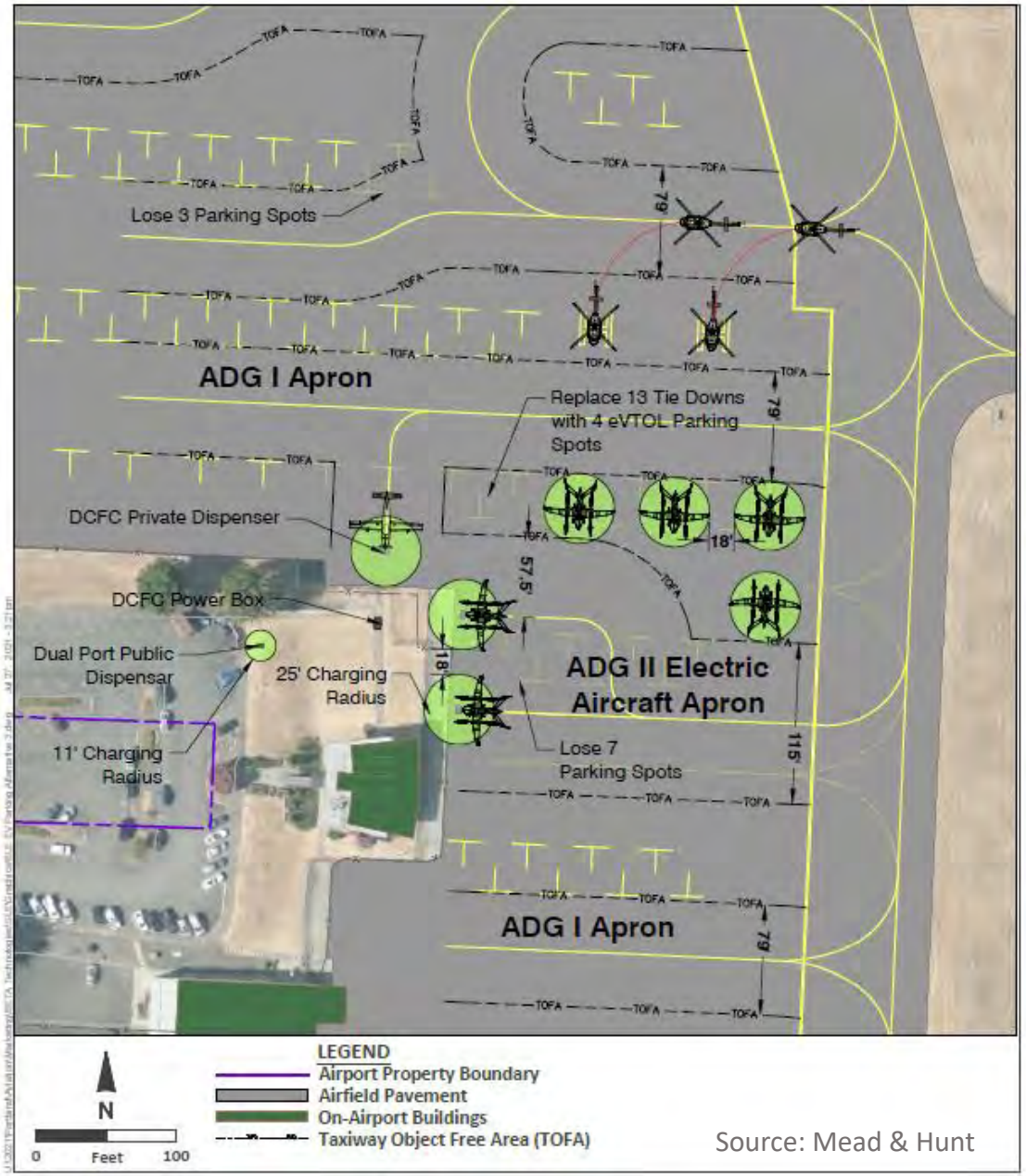
Mead & Hunt



Source: Mead & Hunt

- **Power Supply**
  - Simultaneous charging
  - Comprehensive need
- **Airside Planning**
  - Aircraft type
  - Airfield compatibility
- **Landside Planning**
  - Transit tie-in
  - Auto parking and Road network
- **Environmental**
  - Noise and overflight
  - NEPA
  - Source of electricity

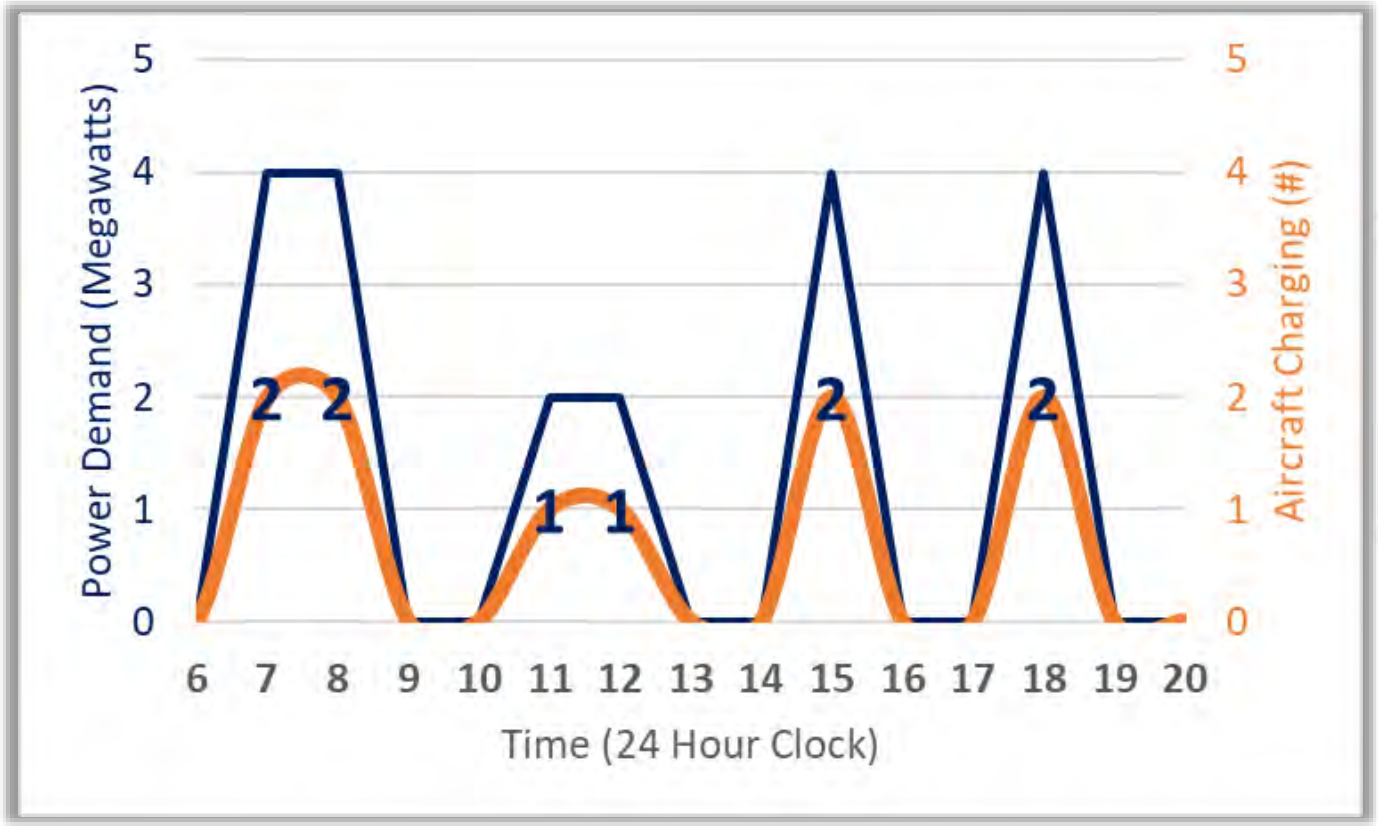
- **Planning**
  - Distance to power
  - Setbacks
  - Compatibility
  - Rotor wash
  - Pilot services
  - MRO facilities
  - Car charging
- **Environmental**
  - Trenching
  - Facilities
  - Noise



Source: Mead & Hunt

Electricity Demand

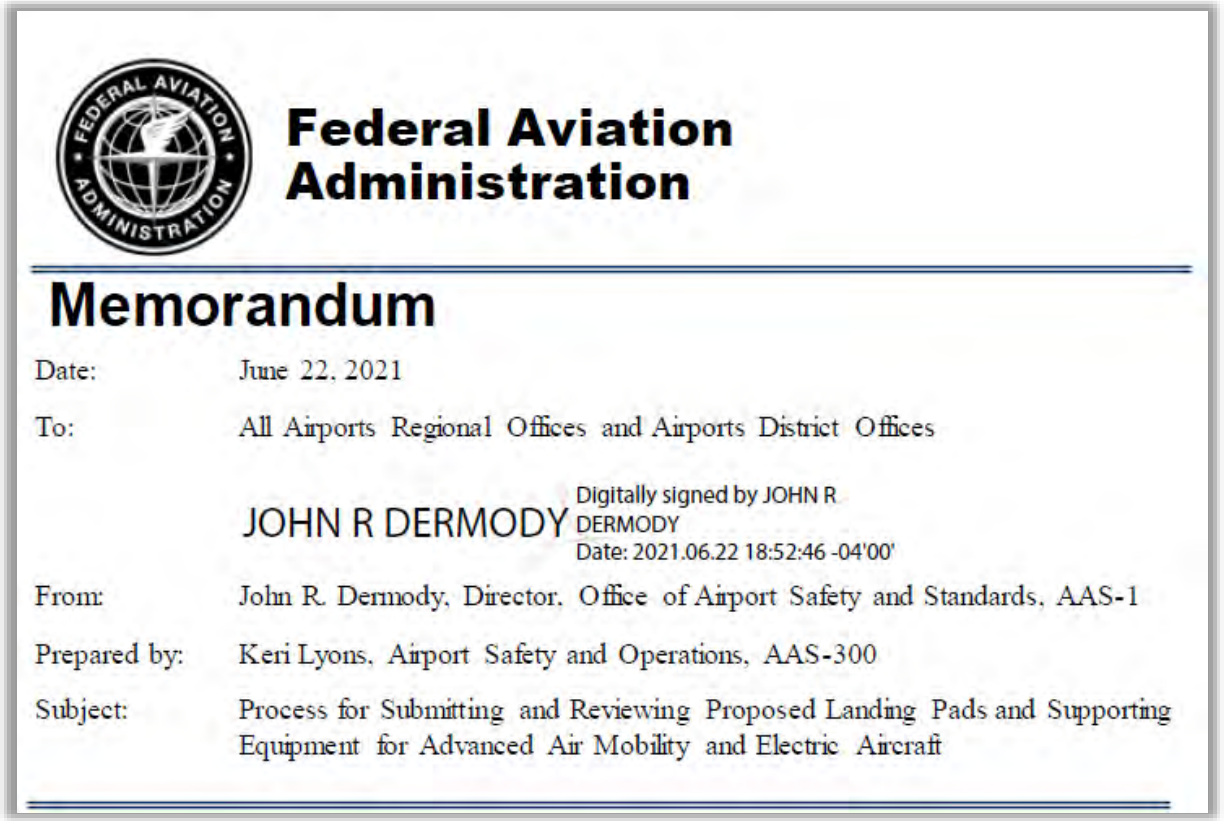
- 1 megawatt = 5-10 acres of panels
- In addition to other demands
  - Buildings
  - Rental Cars
  - Passenger Cars
  - Ground Equipment



Data: National Renewable Energy Labs, 2021
Modeling essential air service demand at Denver International (DEN)

FAA Guidance

- Desktop planning
  - Taxi and parking
  - NAVAID interference
  - Policy in development
- Permitting
  - ALP Pen & Ink
  - §163 (ADO/RO)
  - NEPA (if applicable)
  - 7460
- Design and Build
- Implement
  - Revenue
  - Grant assurances



Federal Aviation Administration

Memorandum

Date: June 22, 2021

To: All Airports Regional Offices and Airports District Offices

JOHN R DERMODY Digitally signed by JOHN R DERMODY Date: 2021.06.22 18:52:46 -04'00'

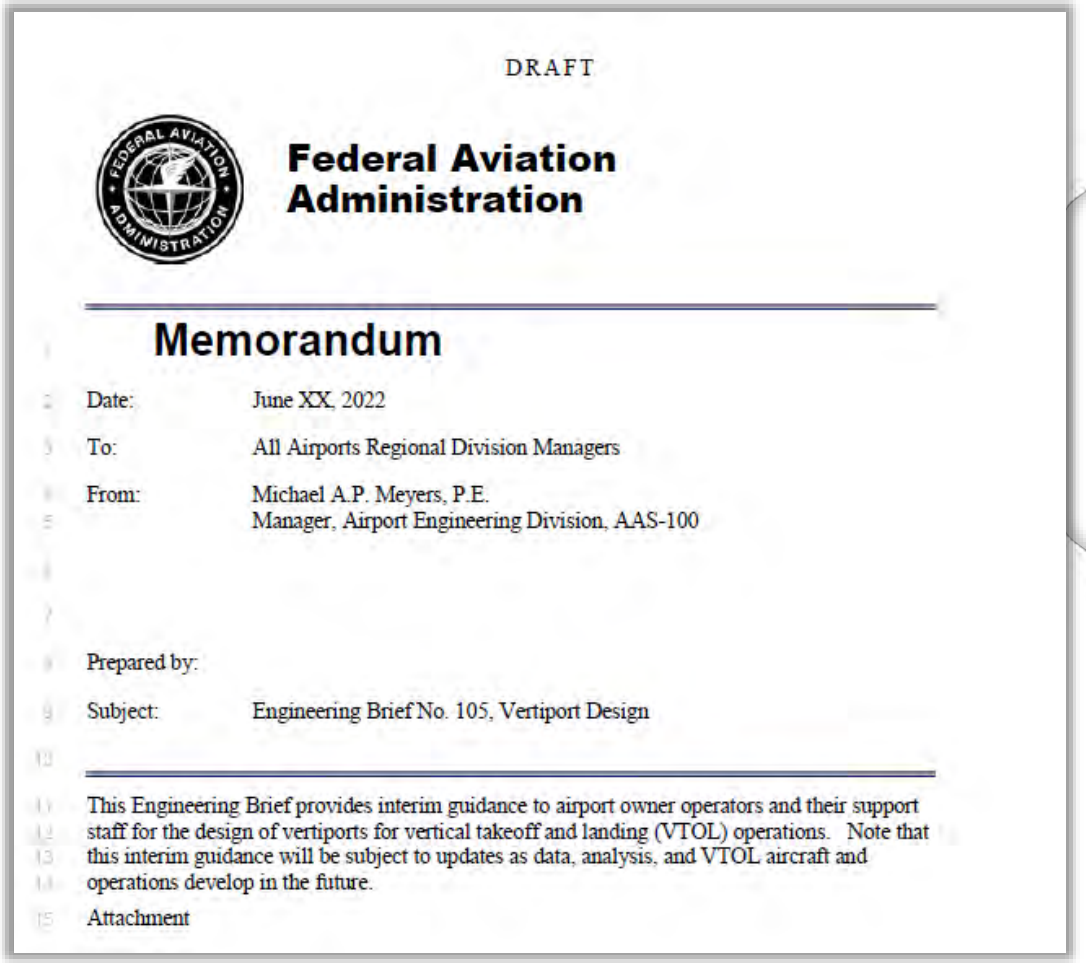
From: John R. Dermody, Director, Office of Airport Safety and Standards, AAS-1

Prepared by: Keri Lyons, Airport Safety and Operations, AAS-300

Subject: Process for Submitting and Reviewing Proposed Landing Pads and Supporting Equipment for Advanced Air Mobility and Electric Aircraft

FAA Guidance

- **EB No. 105**
  - Comments submitted 4/18/22
  - FAA is revising document
- **Contents**
  - Design and Geometry
  - Marking, Lighting, and Visual Aids
  - Charging Infrastructure
  - On-Airport Vertiports
  - Safety Elements
- **Key Takeaways**
  - Much research to be done
  - Plan like helicopters for now



DRAFT

Federal Aviation Administration

Memorandum

Date: June XX, 2022

To: All Airports Regional Division Managers

From: Michael A.P. Meyers, P.E.
Manager, Airport Engineering Division, AAS-100

Prepared by:

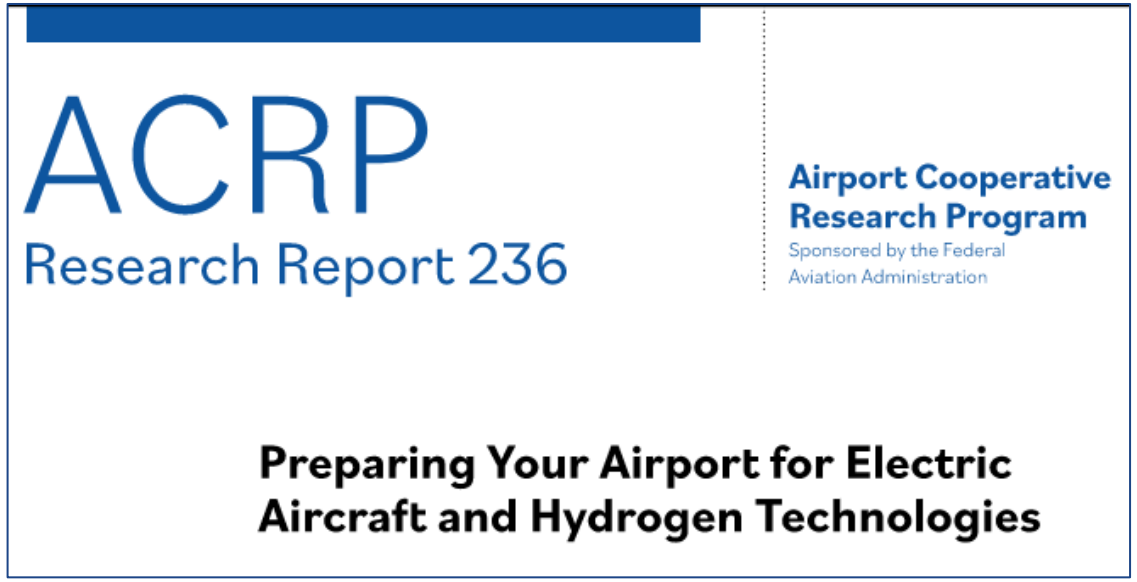
Subject: Engineering Brief No. 105, Vertiport Design

This Engineering Brief provides interim guidance to airport owner operators and their support staff for the design of vertiports for vertical takeoff and landing (VTOL) operations. Note that this interim guidance will be subject to updates as data, analysis, and VTOL aircraft and operations develop in the future.

Attachment

ACRP Guidance

- **ACRP Report 236**
  - Electric Aircraft Overview
  - Guidance
  - Toolkit
- **ACRP Project 11-02/43**
  - Community Inclusion
  - State of the Practice Scan
  - AAM Primer
  - Communication Sequencing Plan



Other Guidance

- **EASA**
  - Vertiports
- **Lillium**
  - Vertiports
  - Taxiways
  - Charging Requirements

Thank You!

Mitch Hooper| Aviation Services Manager
Mitchell.Hooper@MeadHunt.com | 360.771.1764