Vertiport Design Standards for Advanced Air Mobility

Presented to: Airport REDAC
By: Jonathan Torres
Date: September 8, 2021
Urban Air Mobility

- Urban Air Mobility (UAM) concepts and technologies are set to revolutionize transportation systems.
- Major component of the UAM ecosystem are the landing sites and facilities to service vertical takeoff and landing (VTOL) aircraft.
- Advisory Circular (AC) 150/5390-3 “Vertiport Design” was cancelled on July 28, 2010 due to lack of compatible aircraft use.
Vertiport Design AC Goals

• The operational requirements of these facilities will include:
  • Landing area design and layout/geometry
  • Approach/departure paths
  • Load bearing requirements
  • Electric propulsion and charging stations
  • Safety requirements for batteries and other hazardous materials
  • Noise requirements

• The dimensional requirements of the landing area will depend on an aircraft’s Critical Dimensions (CD) and maximum gross takeoff weights.
  • For certain aircraft designs, the CD needed for their aircraft will be less or equal to the current heliport design regulations.

NOTE see AC 150/5390-2 for further guidance

Federal Aviation Administration

A - Minimum TLOF Width: 1.0 RD
B - Minimum TLOF Length: 1.0 RD
C - Minimum FATO Width: 1.5 OL
D - Minimum FATO Length: 1.5 OL
E - Minimum separation between the perimeters of the TLOF and the FATO: 0.5 (1.5 OL – 1.0 RD)
F - Minimum Safety Area Width:

RD: Rotor diameter of the design helicopter
OL: Overall length of the design helicopter
Vertiport Design AC Goals

• A minimally developed facility is required to be defined for the boarding and discharging of passengers and cargo by VTOL aircraft.

• Not One Size Fits All - These facilities may have a variety of configurations depending on the level of throughput that is expected at that facility and the characteristics of the aircraft they plan to support.
Research Path

- Industry Request for Information (RFI)
- NASA National Campaign (NC)
- Aircraft Manufacturer Outreach
- Research Studies
  - Literature Review and Gap Analysis
  - Conceptual/Operational Testing and Simulation
  - Vertiport Electrical Infrastructure Study
Industry RFI

• From April 3, 2019 to October 31, 2019, the FAA posted an RFI seeking information from industry regarding VTOL aircraft design and specifications, concepts of operations, infrastructure design, and takeoff and landing profile.

• The RFI was in mentioned by:
  – NATA’s “Urban Air Mobility: Considerations for Vertiport Operation” Whitepaper
  – Vertical Flight Society

• Only nine responses to the RFI, some incomplete.
# RFI Results

<table>
<thead>
<tr>
<th>RFI Responder #</th>
<th>Aircraft Design and Specifications</th>
<th>Concept of Operations</th>
<th>Infrastructure Design</th>
<th>Takeoff and Landing Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFI Responder #1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>RFI Responder #2</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #3</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #5</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #6</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFI Responder #8</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>RFI Responder #9</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
NASA National Campaign

- ATRD has been a participant of the NC by input to NASA in the creation of a baseline design of landing areas that will be used during evaluations.
- Vehicle performance data collected through the NC will aide in the development of vertiport guidance.
Literature Review and Gap Analysis

- Over 90 AAM related documents compiled regarding relevant information on aircraft design groups (ADG), environmental impacts, safety considerations.
- Gaps analysis looked at areas where research needed to focus.
  - Gap analysis highlighted the need for vehicle performance data to address many of the design parameters.
- Gap analysis and manufacturer data will be used to develop a first round of recommended design categories for vertiport infrastructure.
Vehicle Performance Data and CONOPS Inquiry

• Coordination with FAA Aircraft Certification Group.
  – Contacted a group of aircraft manufacturers with an inquiry of data needs for infrastructure considerations.
    • 10 manufacturers contacted as of today.
    • As newer entrants become more mature we will continue communications with the Aircraft Certification Group for introductions.
  – A second inquiry was sent to aide with the development of interim guidance. Information was provided by July 31, 2021.
  – Responses from the manufacturers have provided researchers a good idea of the maturity of each vehicle.
Conceptual/Operational Testing and Simulation

• Initial recommendations developed through gap analysis will be tested through conceptual vertiport simulations, and modeling of a vertiport in multiple infrastructure environments and for different use cases.

• Simulations will be improved as additional vehicle performance data from aircraft manufacturers and NASA NC is provided.
Vertiport Test Bed

- Final design specifications from modelling will be used to convert FAA’s research heliport to a research vertiport.

- Research vertiport will be used to conduct performance testing.
Vertiport Electrical Infrastructure Study

• ATRD established an agreement with the National Renewable Energy Laboratory (NREL) to conduct an 18-month vertiport electrical infrastructure study.

• Study will focus in areas that include:
  – Vertiport charging needs
  – Cybersecurity concerns
  – Hazards evaluations
Vertiport Electrical Infrastructure Study

- FAA has coordinated communications between NREL and aircraft manufacturers.
- FAA is initiating communication with landing sites that could be part of the study.
- NREL is developing inquiries for both the aircraft manufacturers and site owners.
Vertiport Guidance Timeline

- Vertiport Interim Guidance- June 2022
  - Engineering Brief with comment period starting February 2022.
- End of Research Effort- September 2023
- Vertiport Advisory Circular- September 2024
Questions?