

Vertiport Design Standards for eVTOL/UAM Vehicles

Presented to: Airports REDAC Subcommittee

By: [REDACTED] ANG-E62

Date: March 2, 2021



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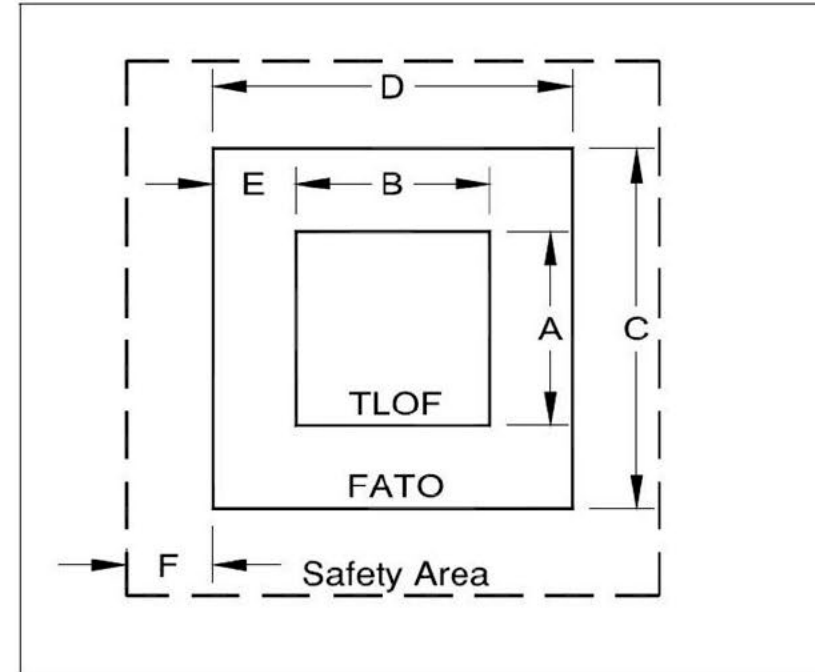
Urban Air Mobility

- 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.



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

NOTE see AC 150/5390-2 for further guidance



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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.



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Research Path

- **Industry Request for Information (RFI)**
- **NASA National Campaign (formerly Grand Challenge)**
- **Aircraft Manufacturer Outreach**
 - Industry Input Forum
 - Manufacturer Inquiries
- **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.



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RFI Results

	Aircraft Design and Specifications	Concept of Operations	Infrastructure Design	Takeoff and Landing Profile
RFI Responder #1	✓	✓	✓	✓
RFI Responder #2	✓	✓		
RFI Responder #3	✓			
RFI Responder #4	✓	✓		✓
RFI Responder #5	✓			✓
RFI Responder #6		✓		✓
RFI Responder #7		✓		
RFI Responder #8	✓	✓	✓	
RFI Responder #9	✓	✓	✓	✓



NASA National Campaign

- The goal of the National Campaign (NC) is to “...promote public confidence and accelerate the realization of emerging aviation markets for passenger and cargo transportation in urban, suburban, rural, and regional environments.”
- ATRD has been a participant of the NC by input to NASA in the creation of a baseline design of a prototype vertiports that will be used during evaluations.



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Vertiport Industry Forum

- The forum will provide a platform to solicit supplemental data from aircraft manufacturers and UAM stakeholders as well as discuss key policy challenges as they pertain to UAM infrastructure.
- Forum members will assist in the simulation and modeling of conceptual vertiport designs and operational on-site testing.
- First Meeting, held on February 10 ,2021, focused on vehicle manufacturer discussions.
 - Subsequent meetings focusing on specific areas will be scheduled with additional industry participants.



Vehicle Performance Data and CONOPS Inquiry

- **Collaboration with FAA Aircraft Certification Group.**
 - Contacted aircraft manufacturers with an inquiry of data needs for infrastructure considerations.
- **Additional engagement with OEMs after initial inquiry.**
 - Focus on specific areas of interest.
- **Working with FAA Technical Center's Legal Department to protect manufacturers' confidential information.**



Volocopter



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Literature Review and Gap Analysis

- Documents will compile relevant information on aircraft design groups (ADG), environmental impacts, safety considerations.
- Documents will be used to develop a first round of recommended design categories for vertiport infrastructure.
 - These design recommendations will be for commercial passenger terminals and cargo handling facilities
- Both documents completed by end of March 2021.



Lilium



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Conceptual/Operational Testing and Simulation

- 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 after receiving vehicle performance data and CONOPS from aircraft manufacturers.
- Research team will work with NASA and vehicle manufacturers to collect on-site test data to refine simulations.



Bell



Jaunt



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Vertiport Electrical Infrastructure Study

- **ATRD will enter an agreement with the National Renewable Energy Laboratory to conduct vertiport electrical infrastructure study.**
- **Study will focus in areas that include:**
 - Vertiport charging needs
 - Cybersecurity concerns
 - Hazards evaluations



Questions?

