

A Systematic Review of Ground-Based Infrastructure for the Innovative Urban Air Mobility

Gazmend Mavraj¹⁾, Jil Eltgen²⁾, Jan Berling³⁾, Majed Swaid⁴⁾, Tim Fraske⁵⁾, Ole Röntgen⁶⁾, Azrina Mujanovic¹⁾, Yuzhuo Fu¹⁾, Daniel Kloock-Schreiber³⁾

¹⁾Electrical Power Systems, Helmut Schmidt University, Hamburg, Germany

²⁾Institute for Aircraft Production Technology, Hamburg University of Technology, Hamburg, Germany

³⁾Institute for Air Transportation Systems, Hamburg University of Technology, Hamburg, Germany

⁴⁾German Aerospace Center (DLR), Air Transportation Systems, Hamburg, Germany

⁵⁾Digital City Science, HafenCity University (HCU), Hamburg, Germany

⁶⁾Institute for Transport Planning and Logistics, Hamburg University of Technology, Hamburg, Germany

Abstract:

Due to the increasing level of urbanization and traffic congestion and upcoming innovative Vertical Take-off and Landing (VTOL) vehicles, studies predict that up to 160,000 passenger drones will be used worldwide by 2050 [1]. The development of a suitable ground-based infrastructure is necessary to be able to supply these urban air vehicles. Mainly this includes networks of take-off and landing sites, facilities for maintenance, energy supply, as well as navigation and communication capabilities. Further requirements comprise robust business and operating models for the emerging service providers and regulatory frameworks, particularly regarding safety, liability and noise emissions [1].

Addressing these main challenges is one goal of the research project i-LUM¹ to develop methodical, systemic and knowledge-based fundamentals for the elaboration and the feasibility of innovative urban air mobility (UAM) concepts and technologies, exemplarily applied to the Hamburg metropolitan region [2].

The project contains five main work packages (WP) that comprise societal interactions and legal framework, demand modeling and concept development, ground-based infrastructure, airspace organization and operation and overall modeling and assessment (see Figure 1). This paper focuses on the ground-based infrastructure in WP 3, which is divided into four main research-topics: Development of a methodology for capacity modeling of vertiports (3.1), automated ground-based MRO (3.2), conceptual design of an energy-management-system (3.3) and integration of vertiport concepts into a metropolitan area (3.4).

The objective of this paper is to provide an overview on the current results and developments in the field of UAM ground-based infrastructure, conducting a systematic literature review, and to identify the most relevant research gaps in the field. For the systematic literature analysis, our search string contains vertiports and the equivalents, urban air mobility and equivalents, and search phrases

¹ The project "innovative airborne urban mobility (i-LUM)" is funded by the Hamburg State Research Funding as part of the HamburgX projects.

