

Design of a Vertiport Traffic Flow Management System

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Abstract: Urban Air Mobility (UAM) is a concept that uses urban skies to transport commuters in the city. The FAA Concept of Operations for UAM does not address traffic management at a Vertiport. The Vertiport Traffic Flow Management System (VTFMS) is proposed to autonomously manage traffic flow at Vertiports. The VTFMS collects the status and intentions of all vehicles at the Vertiport, evaluates the situation, and determines instructions for each vehicle. The VTFMS handles normal, non-normal (e.g. delayed taxi), and emergency (e.g. low battery) situations. An agent-based simulation in NetLogo was developed to model the performance of the VTFMS, measured by (i) collision risk, (ii) throughput, (iii) equity, (iv) number of messages, and (v) vehicle waiting time. The simulation indicates the performance of a Vertiport without the VTFMS results in a mean total waiting time of 17.41 minutes ($\sigma = 5.66$), average number of messages per hour of 25.92 ($\sigma = 1.40$) and minimum proportional equity of 0.97 ($\sigma = 0.106$). Implementation of the VTFMS resulted in the mean total waiting time to 11.39 ($\sigma = 4.12$), average number of messages per hour of 12.24 ($\sigma = 0.68$), and minimum proportional equity of 0.99 ($\sigma = 0.07$).

Keywords: Urban Air Mobility, Vertiport, Traffic Management, Agent-Based Simulation