

## Feasibility of Using Bike Lanes in Conjunctions with Sidewalks for Ground Drone Applications in Last Mile Delivery for Dense Urban Areas

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**Abstract :** Ground drones have the potential to reduce the cost and time of making last-mile deliveries. They also have the potential to make a huge impact on human life. Despite this potential, little work has gone into developing a suitable feasibility model for ground drone delivery in dense urban areas. Today, most of the experimental ground delivery drones utilize sidewalks only, with just a few of them starting to use bike lanes, which a significant portion of some urban areas have. This study works on the feasibility of using bike lanes in conjunction with sidewalks for ground drone applications in last-mile delivery for dense urban areas. This work begins with surveying bike lanes and sidewalks within the city of Boston using Geographic Information System (GIS) software to determine the percentage of coverage currently available within the city. Then six scenarios are examined. Based on this research, a mathematical model is developed. The daily cost of delivering packages using each scenario is calculated by the mathematical model. Comparing the drone delivery scenarios with the traditional method of package delivery using trucks will provide essential information concerning the feasibility of implementing routing protocols that combine the use of sidewalks and bike lanes. The preliminary results of the model show that ground drones that can travel via sidewalks or bike lanes have the potential to significantly reduce delivery cost.

**Keywords :** ground drone, intelligent transportation system, last-mile delivery, sidewalk robot

**Conference Title :** ICSTSAP 2020 : International Conference on Sustainable Transportation Systems, Analysis and Planning

**Conference Location :** Miami, United States

**Conference Dates :** March 12-13, 2020