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## **Fixed Wing, Rotor, and Vtol Drones in Last Mile Delivery**

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### **Abstract**

Drones are increasingly being used in last mile delivery applications. While last mile delivery has traditionally been accomplished through foot, bicycles, boats, or fossil fuel powered vehicles, these delivery modes face challenges such as roadway traffic congestion, hard to reach destinations due to rough terrain (e.g., unpaved mountainous areas) or over large water surface (e.g., long distances over ocean), or even time constraints (e.g., for timely delivery of life-saving medical equipment or drugs). Drones do not face many of the ground-based constraints and are relatively quick. While some drones operate using fossil fuels and have long range, those that are battery-based are constrained by their onboard battery power. The main types of drones include fixed wing, rotor-based, and a hybrid of fixed wing and rotor-based with the ability for vertical takeoff and landing (VTOL). Each of these types excel in specific last mile delivery applications. We critically evaluate the different types of drones, their characteristics, and their appropriate applications in last mile delivery. While there are some overlaps in their use, there clearly are disparate applications where the different types of drones excel in last mile delivery.

**Keywords:** Drones; Fixed Wing; Last Mile Delivery; Rotor-Based; Vtol