

Improving UAV Drone Defenses Against Vulnerabilities and Attacks

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This paper delves into the burgeoning popularity and utility of Unmanned Aerial Vehicles (UAVs), widely referred to as drones, across a diverse array of sectors, including civilian applications, agriculture, and defense. We conduct a thorough analysis of the operational efficiencies that drone technologies facilitate, with a particular focus on substantial cost reductions in package delivery services and enhanced crop management through advanced remote sensing techniques. Research questions that were asked consisted of how accurate and secure DJI drones are, what the known vulnerabilities for military use UAVs are, and which US states have reported the most illegal drone sightings in 2024. The methods used throughout the research were secondary data analysis, flight experiments, and literature reviews. For instance, we examine the innovative package delivery systems being developed by companies like Amazon, which leverage UAVs to streamline planning and reduce delivery times. In agriculture, advancements in drone technology allow for precise monitoring of crop health, soil conditions, and irrigation needs, highlighting how farmers utilize these aerial tools to boost productivity and sustainability. Additionally, military contractors such as Northrop Grumman illustrate the pivotal role UAVs play in defense operations through surveillance, reconnaissance, and even combat. However, as the drone market continues to expand at a rapid pace, it simultaneously presents a spectrum of security vulnerabilities that merit thoughtful consideration, particularly concerning potential cyber threats. Our literature review provides an overview of notable past incidents involving drone security breaches, as well as the regulatory challenges that accompany the integration of UAV technologies into the public sphere. To safeguard public safety, we discuss the implementation of counter-Unmanned Aerial Systems (counter-UAS) solutions, which aim to neutralize unauthorized drone activities. In conclusion, we explore the technical specifications of various UAVs—including their flight capabilities, payload capacities, and sensor technologies—while offering insights into how to select the most suitable drone types for specific missions. This study emphasizes the delicate balance between fostering technological advancement and ensuring robust security measures are in place within the rapidly evolving landscape of UAV operations.