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The digital revolution has made life for many people more accessible, but with good also comes evil. Since the turn of the century, the rapid proliferation of organized crime syndicates dedicated to the poaching of rare wildlife has driven numerous species to the brink of extinction. At least one rhino and ninety-six elephants are killed daily for their ivory horns and tusks, while an average of a ranger a week is killed in defense of these animals by poachers. Despite the stringent enforcement of penalties enforced on poaching, the illegal wildlife trading industry is estimated to be worth around 70 billion each year, due to the potential for enormous profits. The low regard for human and animal life and the rise of high-tech equipment, such as the GPS to locate animals and avoid ranger detection, give the poachers a considerable advantage over the often under-equipped rangers fighting against the illegal wildlife trade. Usambara, named for the African eagle-owl which soars above the forests of Tanzania, aims to provide a technical solution and tip the scales back in favor of wildlife protection programs.

Mission Objective

Usambara, an autonomous aerial vehicle, equipped with high-fidelity thermal imaging is designed to monitor and protect wildlife and the environment. Usambara will serve as an effective partner to park rangers in the fight to protect national parks, allowing rangers to locate and apprehend poachers more efficiently and safely. Additionally, Usambara will produce zero emissions and cause minimum disturbance to the surrounding wildlife and habitat. Finally, as the UAV monitors large swathes of natural reserves for poachers, the existing sensors also provide the capability for early detection of wildfires.

System Design

Usambara will monitor a designated area by flying at an altitude of 860 meters with an average cruise speed of 80 Km/h. Equipped with a state-of-the-art camera, optical and thermal lenses will help detect poachers during the day and the night. The design combines the vertical take-off capabilities of a multi-rotor and the endurance advantages of a conventional fixed-wing aircraft. Vertical take-off averts the need for a runway, minimizing the footprint of the ground station, and furthering the ease of deployment. In addition, the design is optimized in terms of design and mission profile to produce a noise footprint considerably less compared to similar products, minimizing the

impact of Usambara on the animals it is deployed to protect.

Hydrogen is the chosen fuel for its zero-emission characteristics. Furthermore, unlike batteries, it can refuel the vehicle within fifteen minutes, increasing the number of missions flown in one day. This greatly improves the in-air monitoring time, enhancing the chance of detecting poachers, while also reducing the number of UAVs needed to monitor a given area, reducing the cost burden on price-sensitive national parks.

