I.D.A.S - Interlocking Drone Aerial Swarm: Enhancing Thrust and Battery Configuration Flexibility

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My project explores a novel design of interlocking transformative drones that drastically increases the number of potential applications of drone swarms. With my design, drones in a swarm can dynamically attach to each other in midflight to form larger and more complex structures thus offering more configurability in their aerial capabilities. This report presents the methodology of designing such a drone. Each modular drone has a specially engineered frame allowing them to physically connect mid-flight and facilitate bi-directional data exchange. For the data exchange, I developed a customized code for the Teensy 4.1 microcontroller which allows it to act as a motor proxy. This innovative approach allows me to dynamically bypass one of the drone's flight controllers, allowing for one drone to assume a 'secondary' role under another's control which allows integration. Data was collected by creating a thrust stand with a strain gauge-based load cell, and measuring the thrust generated with various configurations. Incremental throttle inputs were applied, and the resulting data was recorded to evaluate the thrust benefits. Additionally, the impact of connecting drones on battery life was measured by recording voltage telemetry data. The results show that by creating this dynamic system, multiple attached drones result in higher achieved thrust, and better battery life. This product has many potential applications. It offers maneuverable small drones that can reassemble to form larger drones that have more thrust, which is highly useful in rescue and factory settings. This can also be useful in recharging a larger drone midair.

Awards Won:
Fourth Award of $500
Missouri University of Science and Technology: Summer Camp scholarships (camp tuition and travel expenses, valued at up to $1,500)
University of Arizona: Renewal Tuition Scholarship
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $58,000 each)