Designing an AI-Guided Hybrid Vertical Takeoff and Landing Aircraft for Wartime Humanitarian Aid

Lee, Matthew (School: Wilbert Tucker Woodson High School)
Cui, Austin (School: Wilbert Tucker Woodson High School)
Hall, Benjamin (School: Wilbert Tucker Woodson High School)

With recent wars increasingly unfolding in urban regions, escalating urban warfare leaves civilians trapped and deprived of essential supplies in their own home. UAVs have proven effective in many other applications of delivery, but warzones pose increased challenges such as longer distances to travel and the risk of hijacking by combatants, necessitating wartime aid drones to be both highly agile and possess sufficient range. This project is about designing a novel airframe that is mobile and can fold its wings around its original center of gravity, keeping it stable and efficient while also eliminating the many shortcomings of existing UAVs. We also designed and implemented an autonomous guidance program that can operate even under GPS-denied environments, allowing it to navigate through warzones without an operator. To validate and prove our design, we built and tested a full size prototype, fully equipped with our autonomous guidance program and sensors. In a series of acceleration and current draw tests, we proved that our design is functional and is highly efficient and maneuverable. We also tested the autonomous guidance system by allowing our prototype to guide itself through an obstacle-dense environment that we created with its GPS module removed. Overall, the aircraft that we have designed has met our design goals of autonomy, maneuverability, and range. This opens up possibilities not only in humanitarian aid, but in many other applications, such as search and rescue or emergency medical inter-city delivery, where both range and maneuverability are valuable, and autonomy is needed.