JETSTREAM: Building the World's Fastest Drone

Zhao, Jason (School: Collingwood School)

Jetstream is the world’s fastest drone, flying at 40% of the speed of sound. Jetstream paves the way for future high-speed-drone design, enabling future drones to tackle a new realm of high-speed applications. Nearly 7% of donated organs fail to arrive on time due to traffic delays and are wasted. Radioisotope medicines, with half-lives of minutes, face similar urgency. Jetstream’s speed, and ability to bypass traffic and fly to a destination in a straight line, significantly improves the accessibility of such treatments. Other applications include search and rescue, wildfire response, film, and defense. To reach such speeds, factors of maximum speed were investigated: propeller selection, battery voltage sag, thermal buildup, and factors of drag—pressure, friction, interference, and lift. Since kinetic power scales linearly with current while thermal scales exponentially, there is a specific current setting which optimizes peak output power. Motor testing found a peak force of 29N at 67A. The effect of capacitors on managing voltage sag was tested, and a 6600uF capacitor resulted in 15% more force than 2200uF 6 seconds into the flight. To manage thermals, the electronic speed controller was placed outside, exposing it to incoming air, and vortex generators were used to make local flow turbulent, enhancing heat dissipation. For the shape of the body, dart shaped torpedoes are more aerodynamically efficient but extrusions are more compact. Computational fluid dynamics (CFD) were used to compare these body shapes, finding a NACA0022 dart produced least drag. A NACA63-215 airfoil was used for wings, and CFDs were used to ensure sufficient lift and stability.

Awards Won: