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HAWQ DD

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Faculty Advisor: Dr. Kaplinger, Dept of MAE, Florida Institute of Technology

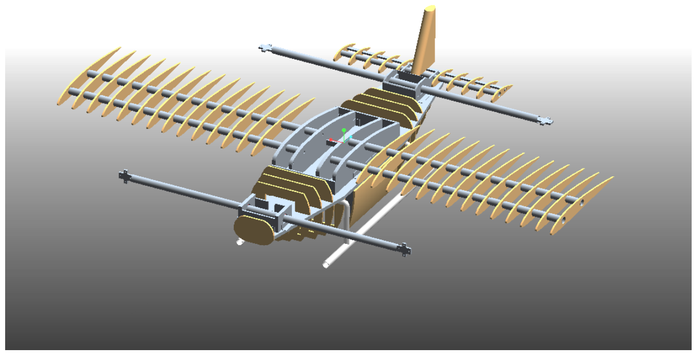
Objective

Execute an autonomous mission to deliver a package to a predetermined location. HAWQ DD (Hybrid Autonomous Winged Quadrotor Delivery Drone) transitions from quadcopter configuration to fixed wing and delivers the 3 kg package to a location within 5 meters accuracy.

Design

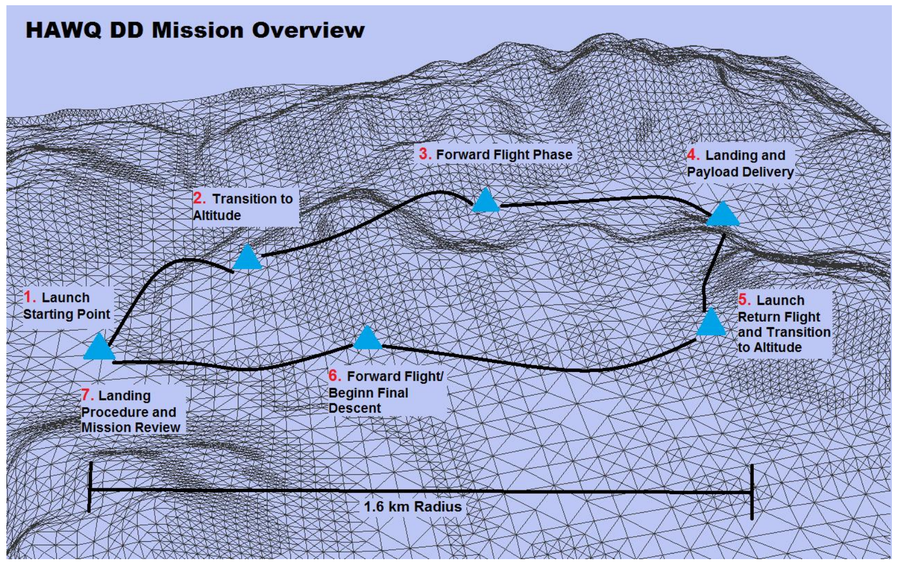
The design concept of the HAWQ DD will utilize the following:

- Quadrotor configuration on a conventional fixed wing design
- carbon fiber main body with balsa wood ribs and carbon fiber support tubin
- monokote skin that surrounds the fuselage and the wings
- Angled aluminium skids are mounted beneath the drone to support the fuselage
- Ardupilot Mega 2.6 , to command and operate the unique functions during the course of the mission.



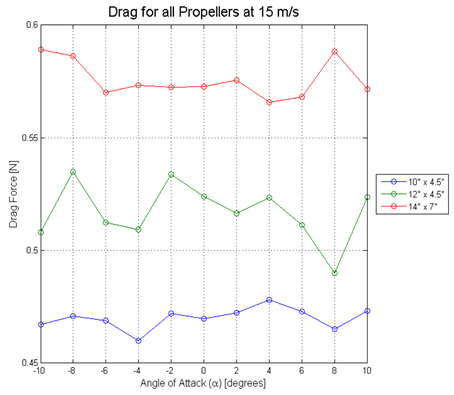
Specifications/Performance

HAWQ DD is to engage in a minimum of 20 minutes of flight time: 4 minutes of hovering, 1 minute of transitional flight, and 15 minutes of forward flight. The velocity of the drone should be 17 m/s with a maximum mass of 11 kg. Propulsion will generate 15 kg of thrust in vertical direction. The aircraft must be capable to complete fully autonomous delivery missions.

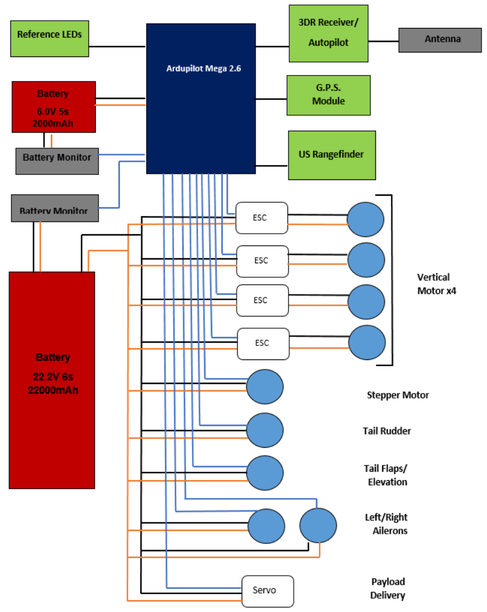


Experimental Data

Since the rear propellers will not be activated during the forward phase, it was necessary to obtain experimental data that would reflect this "windmilling" effect. On the Graph provided, the Drag Force (N) is plotted against the Angle of attack of the propeller. It can be seen that the Drag force is very small totalling less than 0.5 N.



Controls Diagram



Mission Overview

1. Vertical Takeoff
2. Transition with front tilt-rotor
3. Forward Flight
4. Transition
5. Land
6. Deliver payload
7. Repeat steps 1-5 for return flight