

Design Requirements For A Multipurpose UAS

MAE 478-479 Senior Aircraft Design 2010-2011

OVERVIEW

An Uninhabited Aerial System (UAS) capable of performing a wide variety of missions is required. The customer specified missions require a UAS that is capable of both high speed, short duration and low speed, long duration. Two vehicles are not acceptable to the customer, but changing or altering only the wings is acceptable. All avionics, batteries, propulsion systems are to be in a fuselage that is common to the high speed and low speed configurations. Since the customer does not want to reprogram the autopilot thus the handling qualities and control powers must be similar between the two configurations. The customer requires a quick turn around between flights and configuration changes.

Some missions are expected to be in populated areas. Risks to persons and facilities must be reduced as much as possible within available time and budget constrains by design. A reduction in the flight envelope due to a failure is acceptable but needs to be documented. The mission altitude will be less than 2000 feet AGL.

GENERAL UAV SPECIFICATIONS

1. The aircraft will be electric powered. Power will be provided by a single 5400mAh 3s LiPo battery. The powerplant will be a Himax Brushless Outrunner Motor, HC3522-0990. The motor controller will be a Phoenix 60 ESC.
2. The UAS will be a pusher configuration. The propeller will be fixed pitch with folding blades.
3. The low speed configuration will have a stall speed not greater than 17kts. The high speed configuration will have a stall speed not less than 30kts.
4. The high speed configuration will be launched using a NCSU Standard Launcher 3. The maximum launch speed is 34kts. The low speed configuration will be launched by hand.
5. The flight control avionics is contained in a box 5.6in long, 2.4 in wide and 1.8in tall with a weight of 7.9oz. It will provide all signals to the servos and ESC. Antennas for 900MHz and 2.4GHz are not included in the avionics box.
6. The customer has a sensor that is required to be mounted on a 0.28 in diameter boom that extends in front of the nose.
7. Flight duration should be as long as possible.
8. The UAV must be easy to construct.
9. The configuration of the UAS will be specified.
10. The UAV paint scheme will be red and white. The paint scheme requires approval.