Multi-Rotor Hexicopter

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Introduction

The idea for this project originated from LIFT Aircrafts drone named Hexa. Hexa is a battery powered 18 rotor drone that is piloted by a human. The Hexicopter was tasked with being hydrogen fuel cell powered with batteries for takeoff and landing. Fuel cell power is more environmentally friendly, gives increased power over a longer period, and can be refueled in a short amount of time. The fuel cell works by taking hydrogen and oxygen and converting it into electricity. The only biproducts from fuel cells are heat and condensation which make them a very clean source of energy. The main advantage of fuel cells are their increased flight time compared to battery power.

Research Purpose

The purpose of this project encompassed designing a Multi-Rotor Hexicopter powered by hydrogen fuel cells with a battery powered fail-safe. The Hexicopter was designed to have 18 rotors and be powered by two 2.0 kW hydrogen fuel cells. Also, this drone is meant to have a passenger/pilot with remote or manually control.

Hexicopter Constraints

- ❖18 Rotors
- ❖Hold 200 pounds
- ❖Weigh less than 450 pounds including Pilot
- ❖Hydrogen Fuel Cell Powered
- ❖Manually or remotely controlled

Assembly and Model

Autodesk Inventor was used to model the components of the Hexicopter.

* The drone will be assembled using bolts and the welding of components. From the sled to the top section there are compartments for wiring and tubing.

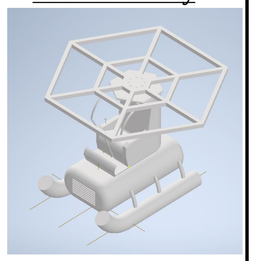
* The top will have 18 rotors attached to it. These rotors will have a battery pack under for takeoff and landing.

* The middle section will house the controller and display module. The pilot will sit here and control the Hexicopter.

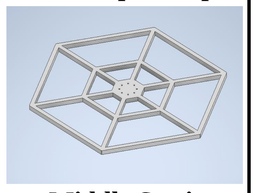
* The fuel cell housing will house two 2.0 kW fuel cells. On each side are vents for cooling fans, and the hole in the top is to run wiring.

* The sled is where the two-carbon fiber high pressure hydrogen tanks will be housed. Inside is a rail system to secure the tanks.

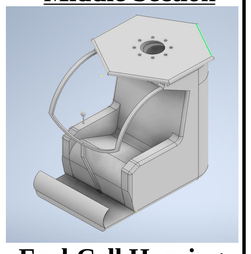
Full Assembly



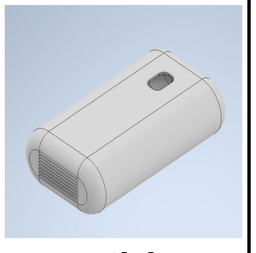
Hexicopter Top



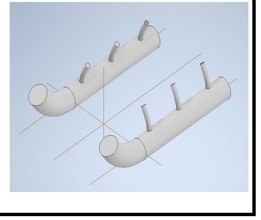
Middle Section



Fuel Cell Housing



Sled



Parts

The parts for the Hexicopter were chosen to meet the weight requirements and design constraints.

- ❖ 18 TMotor P80III P Type 100 kV Motors
- ❖ 18 TMotor G28*9.2 Props
- ❖ 18 LiPo 3250 5S 18.5 V Battery Packs
- ❖ Logitech G X56 Controller
- ❖ 2 H3Dynamics A-2000 Hydrogen Fuel Cells
- ❖ 2 26"x19" Dillon Radiator Cooling Fans
- ❖ 2 H3Dynamics A20 Pressurized Hydrogen Tanks
- ❖ 2 H3Dynamics Ultralight Pressure Regulators
- ❖ 6061 Aluminum Tubing
- ❖ 8 1"x5" Bolts and Nuts
- ❖ Custom Plexiglass Windshield
- ❖ Custom Carbon Fiber Exterior
- ❖ 18 Carbon Fiber Battery Containers

Calculations

Total Thrust with 18x P80III P Type 100kV Motors:
(18.2kg/motor)(18 motor) = 327.6kg
(327.6kg)(2.20kg/lb) = 720lbs of thrust

Future Considerations

The design for the Hexicopter is finished and ready to be built. Future design teams will be composed of mechanical and electrical engineers to not only build the Hexicopter, but to program all electronic components.