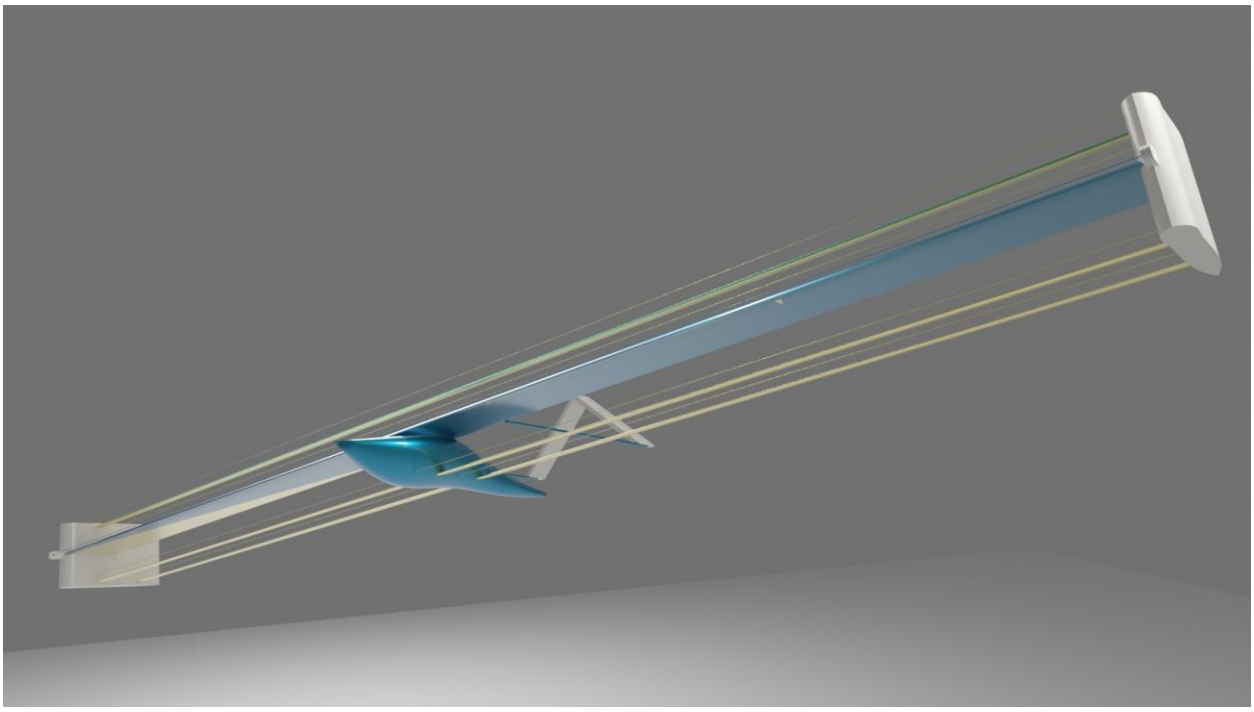
Ionic Skies

Project Description

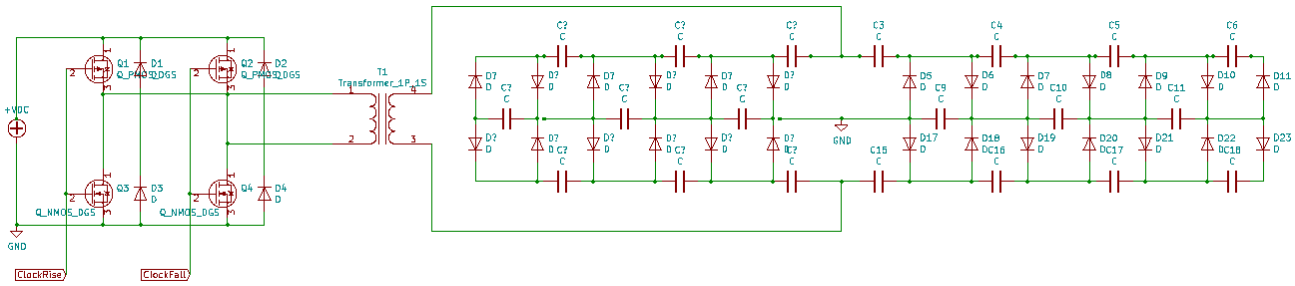
For the last 100 years, aircraft propulsion technology has remained fundamentally the same - jets and propellers. More exotic forms of propulsion such as rockets, time machines, and ion cannons were only considered for use in space ... until now.

The goal of Ionic Skies is to design, build, and fly an aircraft powered by ionic propulsion. Unlike conventional propulsion systems, ionic propulsion generates thrust by ionizing and propelling air molecules. For this reason, ionic propulsion uses zero moving parts and is completely silent. Only one instance of successful ionic flight has ever been demonstrated, by a team at MIT. We hope to improve on their design with untested ideas, placing us at the forefront of this technology. In the future, ionic propulsion could be used to fly ultra long range drones, achieving "infinity flight."

The thruster and power converter are unique opportunities for EE students to develop and validate high performance electrical systems. The thruster is a delicate network of precisely positioned conductors that will generate newtons of thrust given voltages up to 40,000V, involving electromagnetic modeling and extensive use of a high voltage test buck. The power converter is a high power to weight DC-DC converter that must step 200V up to 40,000V with high efficiency, involving power electronics design, component characterization, and PCB fabrication. The airframe team is comprised of ME students tasked with building an ultralightweight and high lift to drag airframe. Students will have the freedom to design, build, and test highly creative solutions to challenges that arise with the use of ionic propulsion.



Airframe concept design



Converter Design

Project Scope

- Power Converter
    - Perform diode and capacitor characterization for Cockroft Walton multiplier
    - Iteratively test full bridge and multiplier designs at increasing voltages and frequencies
    - Perform thermal testing of heat pipes for multiplier cooling
    - Use converter to power thruster test buck, test cycle efficiency
- Thruster
    - Build thruster test buck for testing both DC Corona and Dielectric Barrier Discharge
    - Use thruster test buck to collect high quality data on the thrust to power ratio, 2D and 3D thrust density of various thruster configurations
    - Use EAD theory and test data to iteratively develop optimal thruster configuration
- Integration (reach goals)
    - Integrate converter, thruster, and airframe in full scale test rig
    - Integrate converter, thruster, airframe, batteries, and control system into testable aircraft

Project Requirements

- No US Citizenship Requirements
- No invention assignment requirements for this project