

Group M1.03 – Electric Field Mill

Bryce Raybon, Musa Kurugu, Markell Evans
 Dr. Karl Stephan

Project Description

Our project focuses on constructing an electric field mill designed to gauge the intensity of the atmospheric electric field. This project is an interdisciplinary effort between both Manufacturing and Electrical Engineering Senior Design teams. As the manufacturing team our field of scope encompasses the mechanical components, including the rotating vane, shaft, motor, sensor plate, chassis, encasing, and support structure

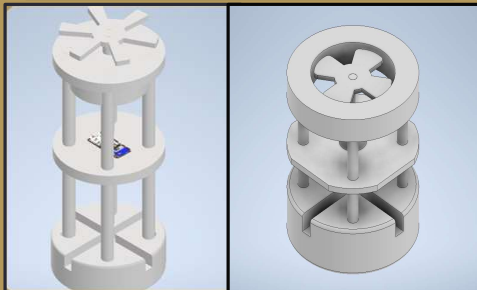
Background

Electric field mills have historically been used by NASA to predict lightning strikes as part of launch criteria to further protect their rockets and other scientific tools.



Process

Concept Generation mainly focused on where to sit each electrical component in a practical manner

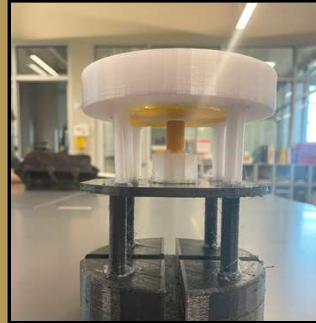


Specifications & Mechanics

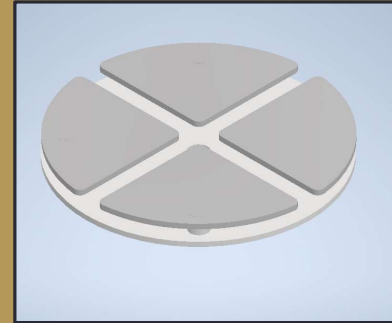
- Fully wireless data relay
- Rounded edges on all major components
- Waterproof from one side
- Base structure of electric field mill should be one person carry
- Constant 2000+ RPM step motor
- Self-sufficiently powered
- Ease of access to PCB and battery
- Deconstructable structure

An electric field mill with a rotating vane operates through electrostatic induction. As the vane spins in the atmospheric electric field, it generates a potential difference due to the separation of charges on its surfaces by constantly shielding an unshielding the electrodes or sensor plate. This induced potential provides a measure of the field's strength, offering a concise method for assessing the atmospheric electric environment.

Process & Design



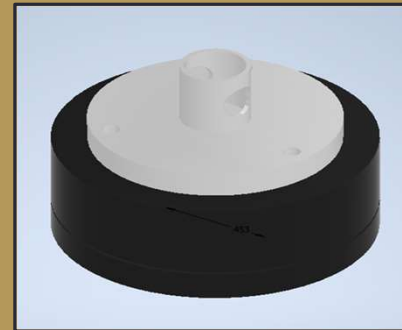
Prototyping of Internal Housing



Design of Sensor Plate



Design of Rotating Vane Assembly



Prototyping of Mounting Plate

Future Steps

- **Integration Goal:** Smoothly merge mechanical components with Electrical Engineering.
- **Wireless Compatibility:** Ensuring wireless connectivity for enhanced functionality and ease of use.
- **Material Emphasis:** Using aluminum for durability:
 - Creating a sturdy inner core to seamlessly hold electrical components and wire
 - Creating a weather-resistant, waterproof outer shell.
 - Using Teflon for electrical insulation
- **Focus on Support:** Developing a robust tripod support for adaptable positioning.
- **Key Priorities:**
 - Timely completion.
 - Emphasis on cooperative teamwork.
 - Thorough testing.
- **End Goal:** Deliver a fully functional electric field mill for Senior Design Day.

Meet the Team!



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