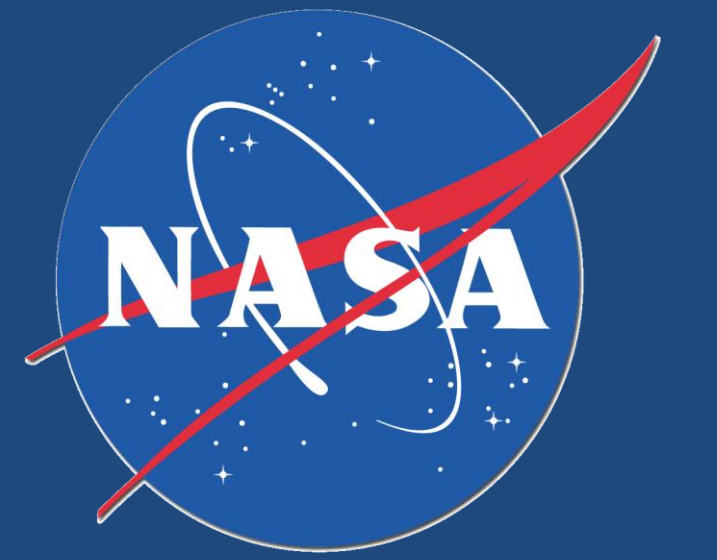


Astronaut Magnetic Anchoring System



Introduction

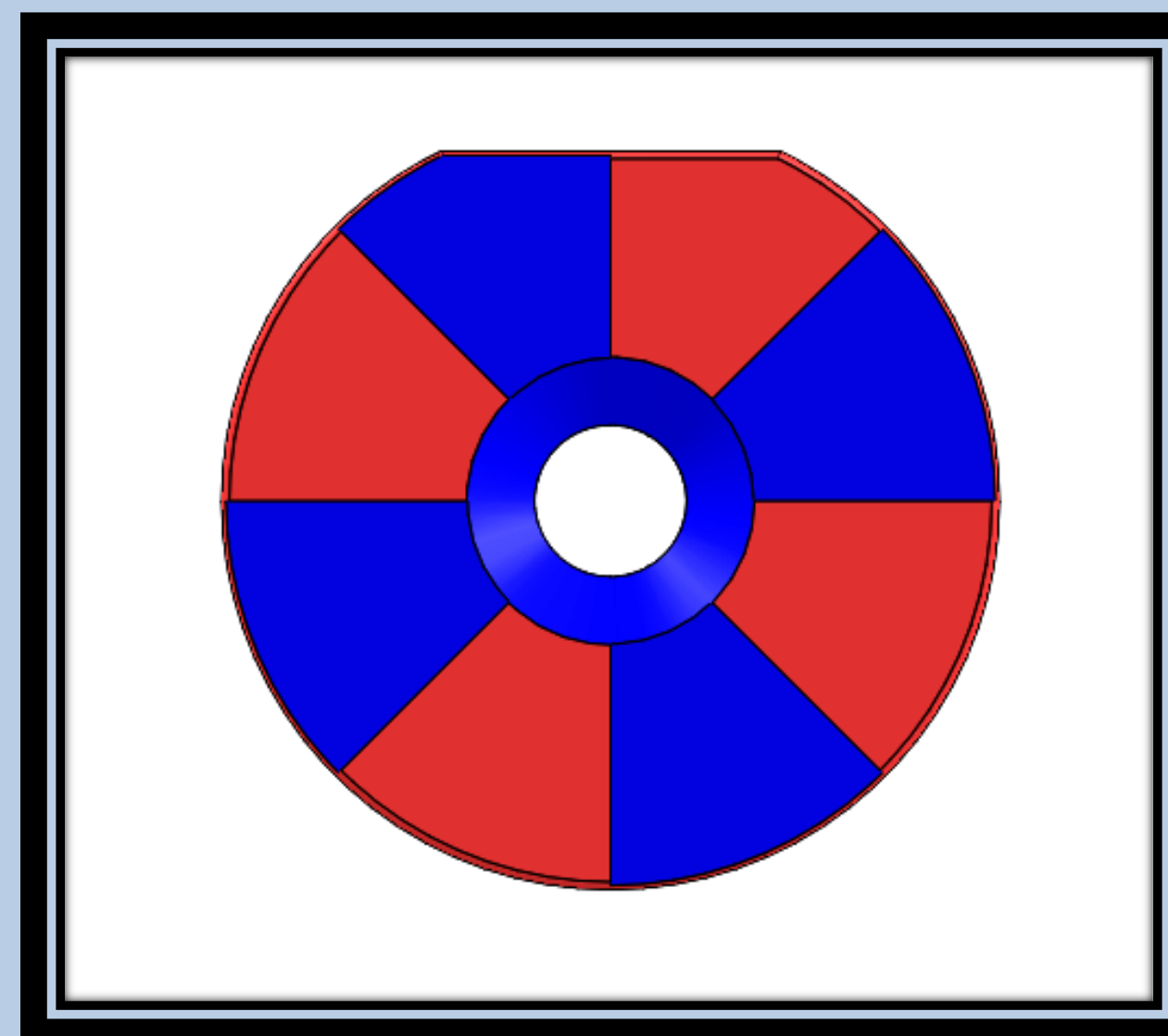
The magnetic two-body separation system development program located at the National Aeronautics and Space Administration (NASA) Armstrong Flight Research Center (AFRC) focuses on developing and testing two-body separation techniques using novel magnetic-based hold-and-release mechanisms. Developed systems aim to demonstrate principal advantages of magnetics over current competing techniques.

Modern Magnetics

Correlated Magnetics has the ability to determine size, position and quantity of magnetic poles on their magnets.

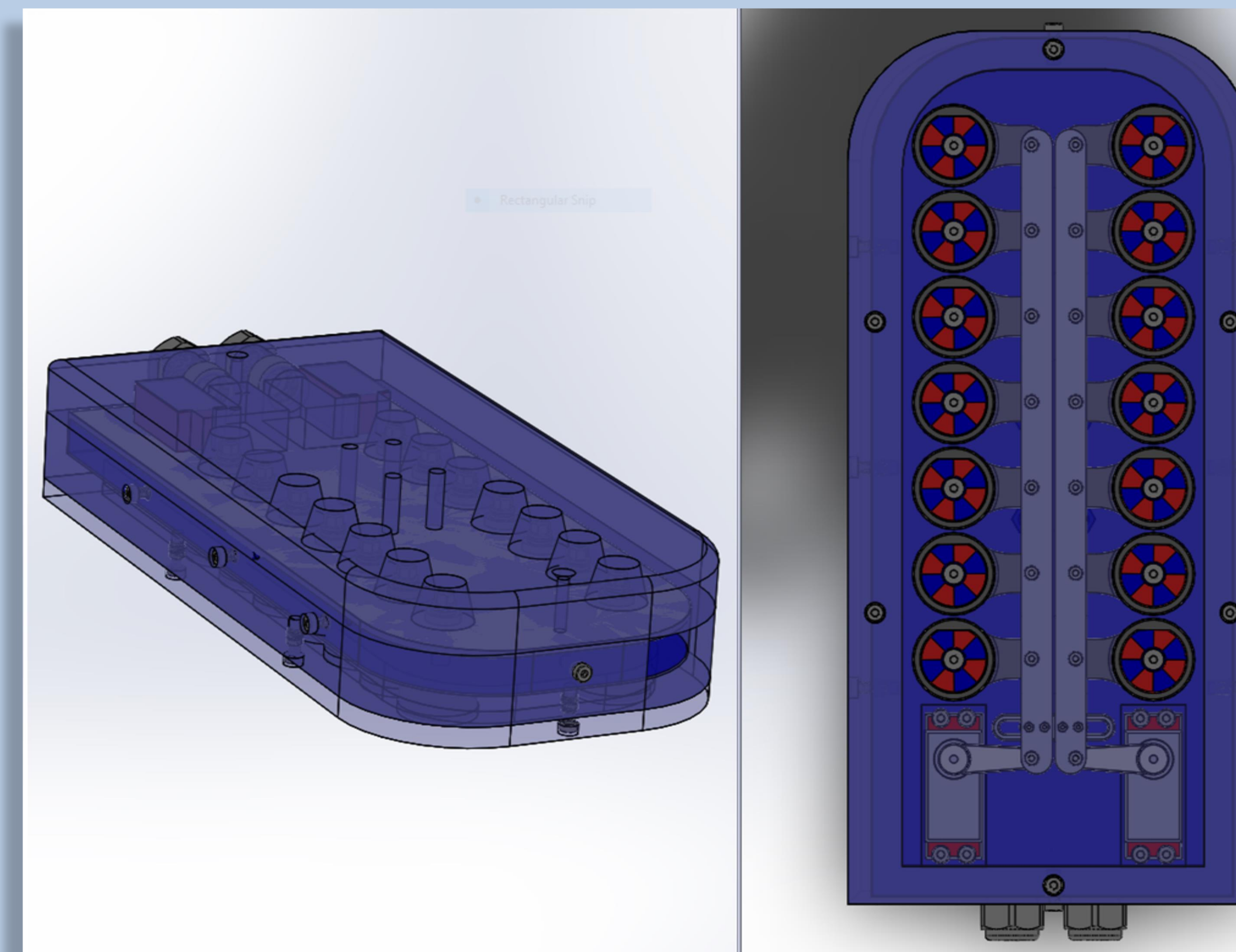
Correlated Magnetics can create quantifiable magnetic field and flux densities and can have attractive and repulsive forces on the same face.

The images display magnetic pole designs, the design to the right was used for this project.



Goals

The astronaut magnetic anchoring system design aims to display the functionality of polymagnets (Correlated Magnetics, Huntsville, Alabama), specifically the torque twist-release magnet, in a situation where a mechanical mechanism is not optimal. This project contributes to NASA goals by demonstrating the functionality of modern magnetics and hold-release techniques to spark future space and flight innovation and research.



Prototype Design

Permanent magnet hold-release mechanisms consume minimal energy in held positions, are dust tolerant, lightweight, and have simple connections. Through the use of 3D modeling and printing, a prototype was designed and fabrication is ongoing. The prototype's development included both mechanical and electrical system design as well as software development for system control. The image directly to the left displays the current prototype 3D model. Not shown in the model is the wiring, system control box, external power supply and the boots/bindings which attach atop the mechanism. The design features:

- A human control interface which integrates command restrictions for operator safety
- A linear mechanism, chosen over a geared mechanism to decrease the friction forces
 - Servo motors are utilized to push a lever arm which rotates the connected magnets into specific orientations, a repulsive one and an attractive one
- Modular housing, which allows parts to be easily altered and replaced
- The system must anchor to a path with identical inlaid magnets, the system must couple with identical magnets to function properly