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Martian Atmospheric Rover Simulation (M.A.R.S.)

Matt Berard
Florida Institute of Technology

Shelby Beddard
Florida Institute of Technology

Alexander Brunette
Florida Institute of Technology

Emma Conti
Florida Institute of Technology

Collin Duke
Florida Institute of Technology

See next page for additional authors

Authors

Matt Berard, Shelby Beddard, Alexander Brunette, Emma Conti, Collin Duke, Delaney Novak, and Keelin Weaver

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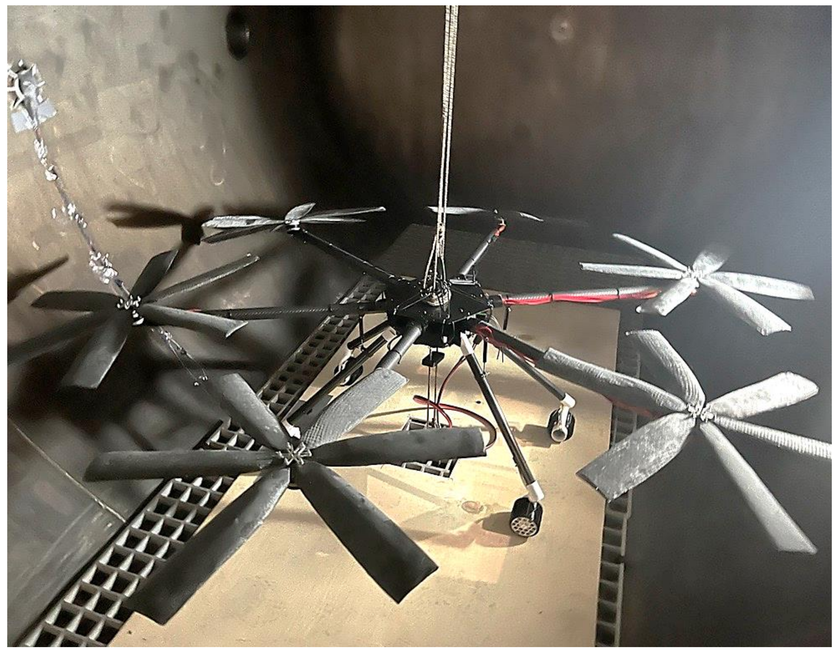
Faculty Advisor: Dr. Eric Swenson, Dept. of Aerospace, Physics, and Space Sciences, Florida Institute of Technology

Mission

While rovers have been used by various agencies to explore Mars, their travel is limited by terrain obstacles, which may prevent mission completion. Creating a vehicle equipped with both driving and flight capabilities would allow greater range of motion on extraterrestrial planets. Integrating the technology for both transportation modes into one rover allows for efficiency and advancements in technological and planetary research.

Terrestrial Design

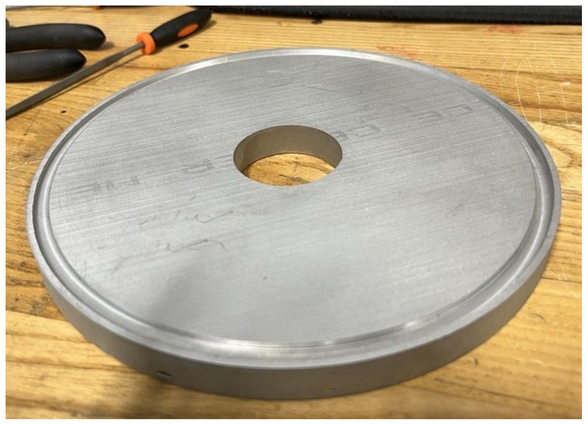
- Strong, lightweight materials for mass conservation.
  - Carbon Fiber
  - *Markforged* Onyx Filament
  - Polylactic Acid filament
- X-shaped wheel treads overcome uneven landscapes while remaining materially cost efficient.
- A spring suspension allows the legs to pivot in accordance with obstacles
- Angled legs allow for travel on slopes up to 20°



M.A.R.S. in testing.

Vacuum Chamber and Testing

- Vacuum chamber restored and used for testing
- Confirmed chamber can reach 1 torr, or 0.019 psi
- Circular passthrough created to provide power to rover within chamber from external source
- Rover flight tested utilizing gantry system to simulate Martian gravity.



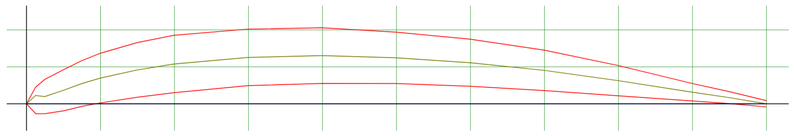
The passthrough designed for the vacuum chamber.

Future Work

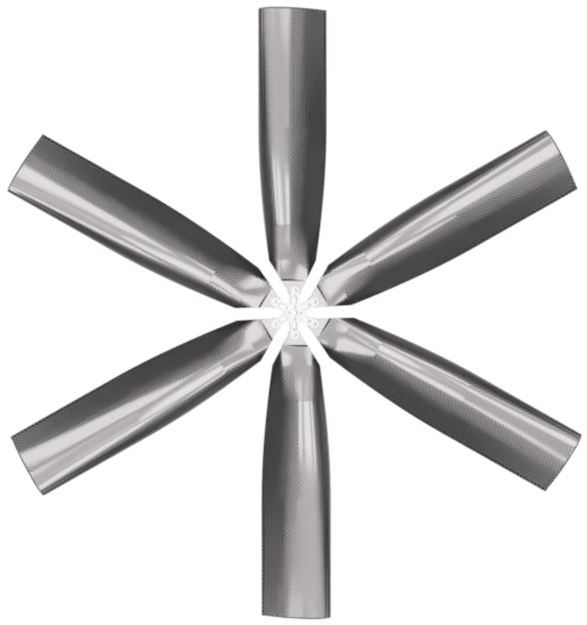
- Test rover driving abilities in Martian atmospheric pressure
- Change materials for increased performance
- Improve spring suspension system
- Combine aerial and terrestrial controls into one remote
- Improve propeller manufacturing method for uniformity
- Increase capabilities of driving controls

Aerial Design

- Hexacopter design
- Motors each generate individual thrust of 24.525 Newtons in 0.095 psi.
- GOE 198 Xsec airfoil chosen due to high lift coefficient and high lift to drag ratio.
- Lightweight, hand-made, foam-core carbon fiber fiberglass composites for propeller blades



The GOE 198 Xsec airfoil.



One of six propeller formations.