



Future Power Solutions for Exploring Hypothesized Surfaces



Introduction

The metal rich asteroid Psyche is a point of scientific focus by NASA. The Psyche spacecraft launched in 2023 and is set to arrive at the asteroid in 2029 for the purpose of orbitally studying the composition and formation of Psyche and its surface. These future results have the potential to shed light on the makeup of the cores of planets.

Objective

Team 36 is focused on what the future of Psyche exploration may entail. Particularly:

What are potential power system solutions capable of sustaining future surface exploration missions of the asteroid Psyche?

The team focused on producing a simulated power system that accounts for the unique and extreme conditions on the surface of Psyche. The design was created with a focus on having a user-friendly interface that presents power system data in a clear and simple manner.

Project Value

The constructed power simulation tool provides an accessible means of exploring power implementation in deep space. The simulation was designed in a way that allows for users with limited to complete knowledge on the topic to see how specific design choices respond to the environment on Psyche. The team's product helps to bring more understanding to the unknowns of deep space and provide a glimpse into potentials of future space exploration and study.

Conclusion

The team successfully produced an interactive simulation tool capable of providing insight into the power necessities for theoretical, future Psyche surface missions. The tool is built accounting for the environmental conditions of Psyche and presents an interactive means of designing a potential power system solution through solar, RTG and hybrid designs. Overall, the tool allows for simple and visually-supported exploration of power implementation on Psyche's surface.

Team 36

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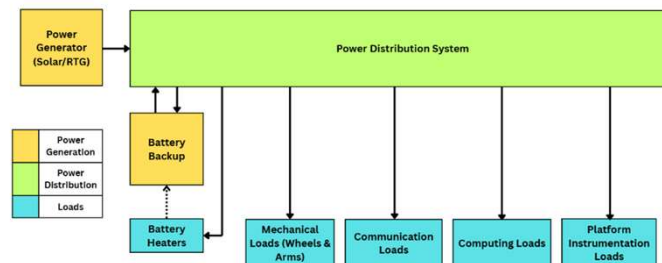
Design Theory

The power simulator involved a hybrid approach of handwritten code and gen-AI assisted code. The back-end code contains equations and variables for power system calculations. Gen-AI (Replit) was tasked with UI creation (front-end).

In terms of the specific focus areas for the power solutions, the simulation is centered around two generation sources:

Solar Power Generation

- Solar irradiance has inverse square relationship with distance
- **Radioisotope Thermoelectric Generator (RTG)**
- Creates a temperature difference to generate voltage (Seebeck effect)



Solar Maximum Exposure

Simulation Results



Polar Winter Survival



Normal Psyche Day



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