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Sprout: Setting the Roots for the Future Of Astronautics

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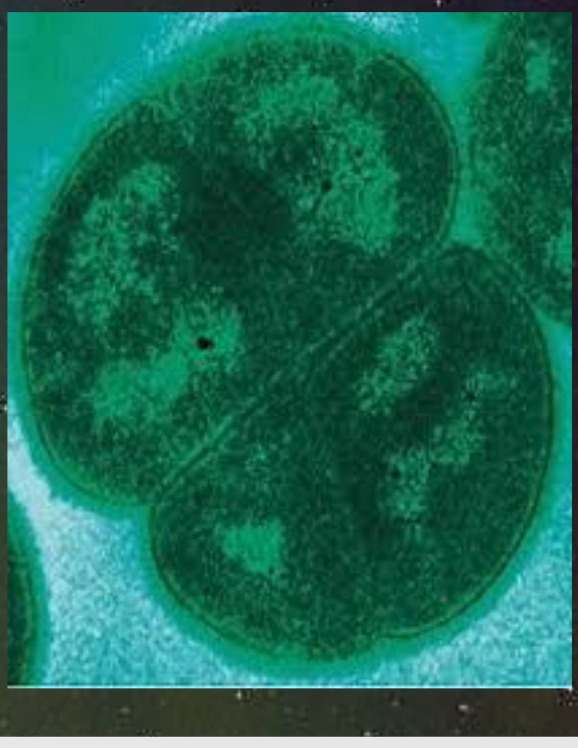
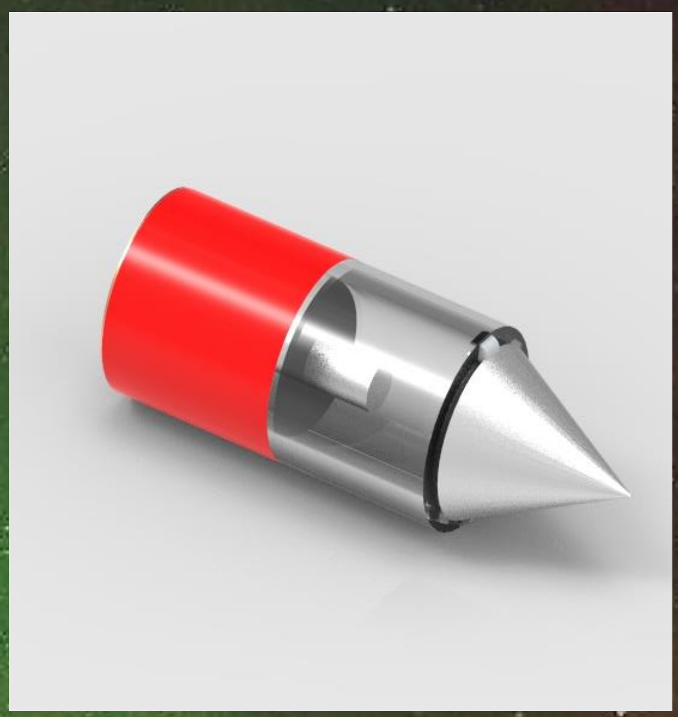
Introduction

A notable obstacle in the field of astronautics is the space and financial constraints necessary for life support. In an endeavor to reduce the impacts of these constraints, the Sprout payload has been developed to offset costs and spatial restrictions. By producing atmospheric gases in a controlled test-space, the payload will facilitate easier, cheaper, and longer-lasting astronautic endeavors.

Biological Framework

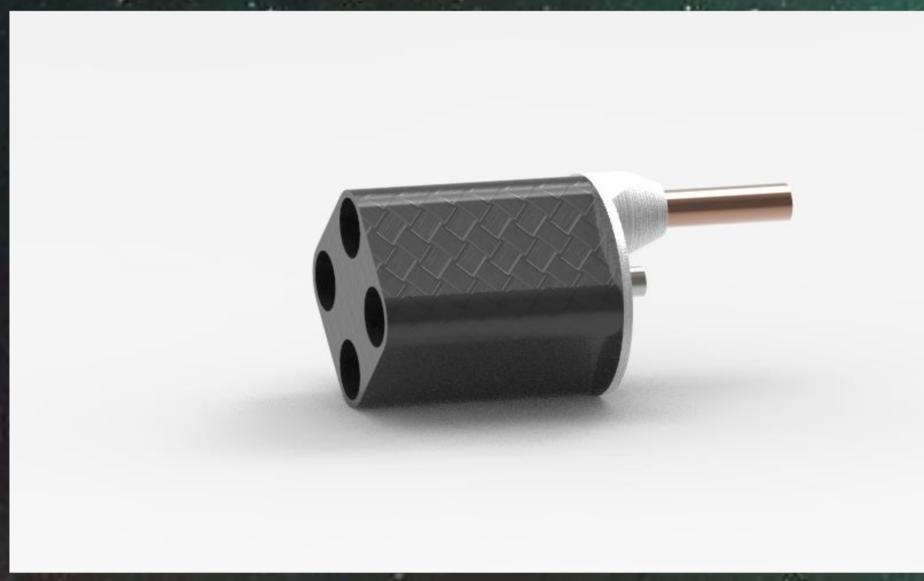
At the core of the payload is the utilization of Clustered Regularly Interspaced Palindromic Repeats (CRISPR), which will be employed in the modification of Deinococcus radiodurans bacteria. This bacteria is renowned for its radiation resistance and has multiple laboratory strains used in various global projects. The Sprout Project modifications would encode for the production of atmospheric gases, such as Oxygen, Nitrogen, and Argon as biproducts from the metabolism of agar nutrients.

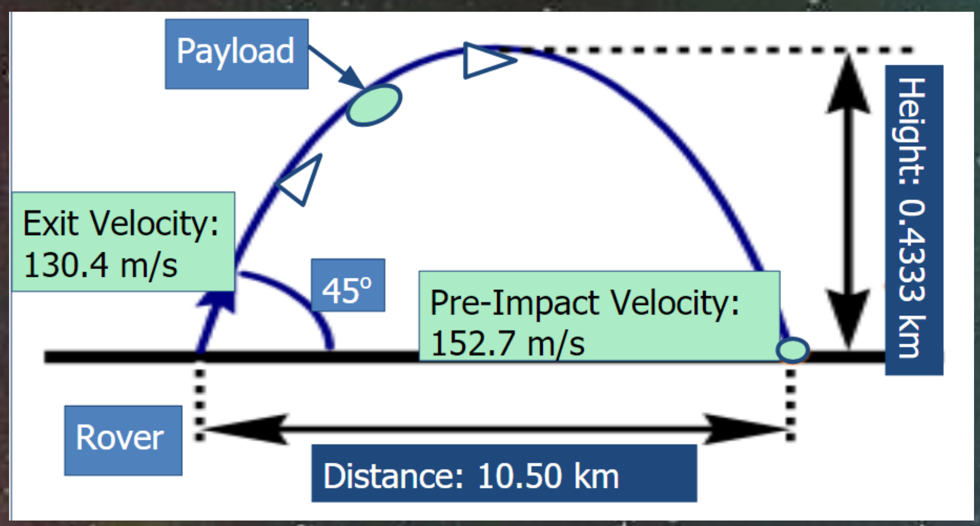




Mechanical Framework

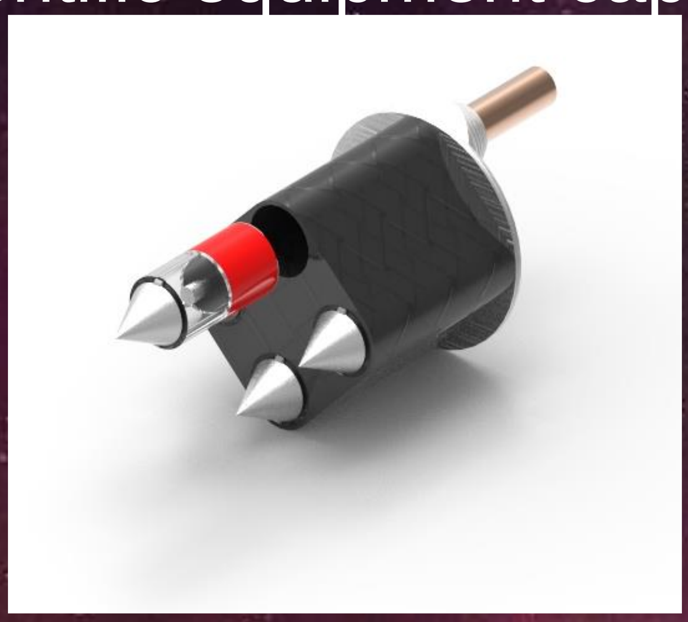
Four bacterial pods will be jettisoned from a helium-powered launcher mounted to a lunar surface module. The bacterial pods will be constructed from carbon fiber, high impact polycarbonate, aluminum and steel. These four pods are designed for launching up to 10.5 kilometers for sample variety and feature a double airlock system to contain the bacteria safely. Gas production and bacterial growth will be measured via integrated mass spectrometers, pressure plates, and gas sensors.





Impact

The success of the Sprout payload will significantly decrease the life support costs of astronautics. Its diverse usability makes it a valuable resource in multiple extraplanetary locations. Additionally, collected data will serve to aid in the evolution of systems and astronautical infrastructure to facilitate the possibility of new longer work times and increased scientific equipment capacity.



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