(16) PSYCHE LANDING SYSTEM

Purpose: to design a landing system for a lander that could investigate the surface of (16) Psyche. This project focuses mostly on research and development, giving the team creative freedom to try and produce a solution to the problems within the challenge statements.

Focus: The focus of the team has been working on the feet and legs of the lander with the purpose of reducing rebound by implementing a biomimicry of gecko skin to adhere to the surface, as well as use deforming foot pads to ensure maximum adhesion to the surface of the asteroid.

https://psyche.asu.edu/gallery/psyche-asteroid/

CHALLENGES

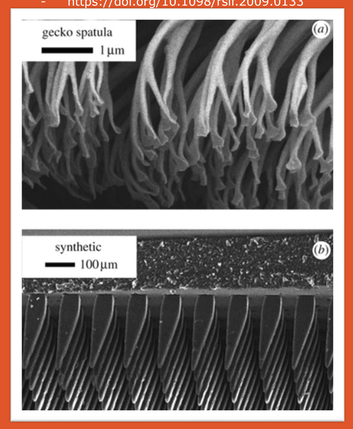
- There is an extremely low gravitational constant on the surface of (16) Psyche (~0.144 m/s)
- (16) Psyche is theorized to have a rough metallic surface, making it difficult to drill or pierce the surface
- There is no atmosphere on the asteroid, making drag negligible

SOLUTIONS

- There will be a deforming foot pad, which will form to the rough surface of (16) Psyche. This will work in tandem with the next solution
- Gecko-influenced adhesive on the bottom of the footpad, which will ensure the lander foot will grip onto the surface of the asteroid
- Tuned suspension system to ensure elimination of rebound.

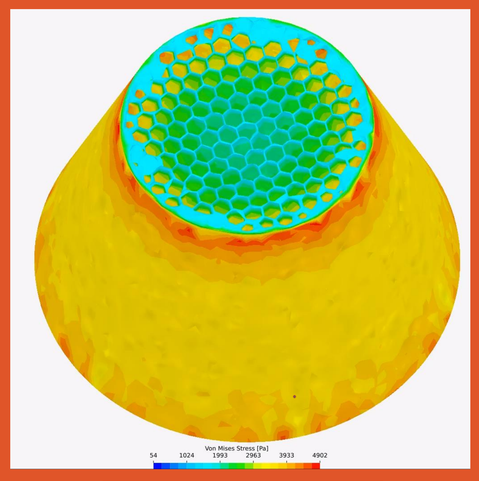
SOLUTION PHOTOS

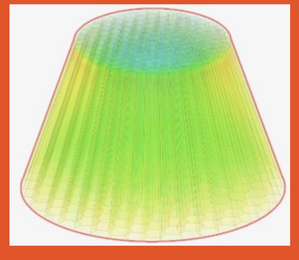
- https://doi.org/10.1098/rsif.2009.0133



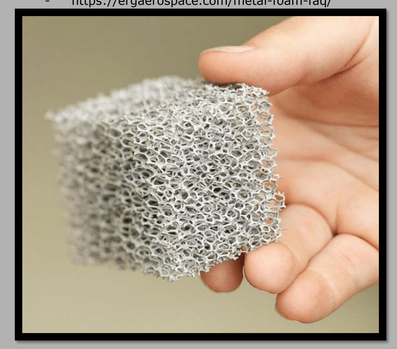
Above: a microscopic view of the synthetic gecko skin, which has an immense shear adhesive force

Below: the deforming foot pad in SimScale, (stress simulation software)



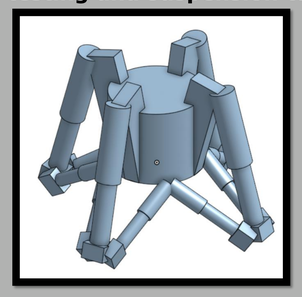


- https://ergaerospace.com/metal-foam-faq/



Above: The bottom layer of the footpad will be filled with an open-cell aluminum structure for maximum deformation, minimizing destruction

Below: MSC Adams model used for impact testing and suspension tuning



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