

## **Project Vestia: Future of Martian Habitats**

### **Abstract**

Project Vestia's main goal is to design and test a floor for inflatable habitat modules (IHM) in Martian or Lunar environments. Currently, there is no method for creating a stable floor in an IHM that does not inhibit the benefits of using that module, as there is for a hard shell habitat. The scope of this project is to: design and simulate three designs; manufacture and test scale models of the top two performing models; design, manufacture, and test different hinge constructions. Each final scale model must withstand 1668.2 N of downwardly applied force, a scaled down representation of what could be typical use modified to account for difference in gravitational pull. Three folding designs were created with Fusion 360 computer modeling software, and simulation was performed using ANSYS software. The hinges used in each model are all of one design but multiple different construction methods. Hinges were manufactured using each method, and then were subsequently tested to determine each method's tensile strength and flexibility. The parts are all manufactured and tested by the student researchers in house, with materials obtained externally. Preliminary results show that with current design methodology, all models have a minimum factor of safety of 1.5 at the weakest point, compared to at least 5 across the rest of each design. The end goal of this project is to confirm a design and create a scale model of the best design with the best hinge construction method and publish the findings to encourage further research and apply this technology in future IHMs.