



Self-Deployable 3D Printed Structures

Problem Statement

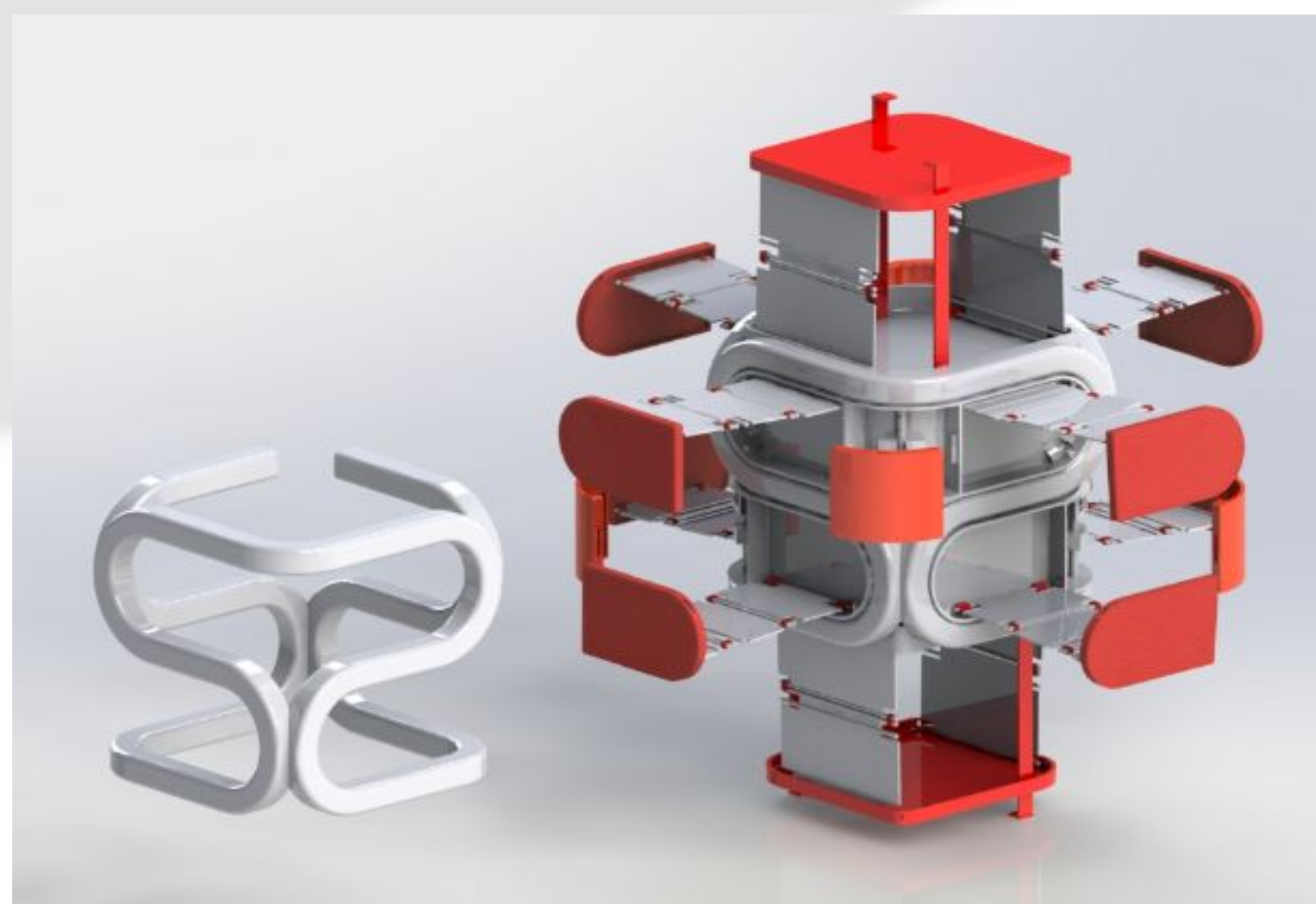
The CubeSat design model by the SDSU Experimental Mechanics Laboratory (EML) does not include self-deployable panels. The users of the EML also do not know how to print flexible materials using their 3D-printers. Without knowing the process for 3D-printing using flexible material, the EML's use of the 3D printer will be restricted to producing rigid objects, and it will not be possible to incorporate a self-deployment mechanism, which requires flexible material, into the satellite model's panels.

Need Statement

The EML needs a process specific document on 3D printing with flexible filaments using the Funmat HT 3D Printer. The sponsor also needs compatible self-deployable panels for the EML's CubeSat design, which utilizes both rigid and flexible 3D printed components. The main components should be made using 3D printed material.

Spring 2020

Solid Model Design

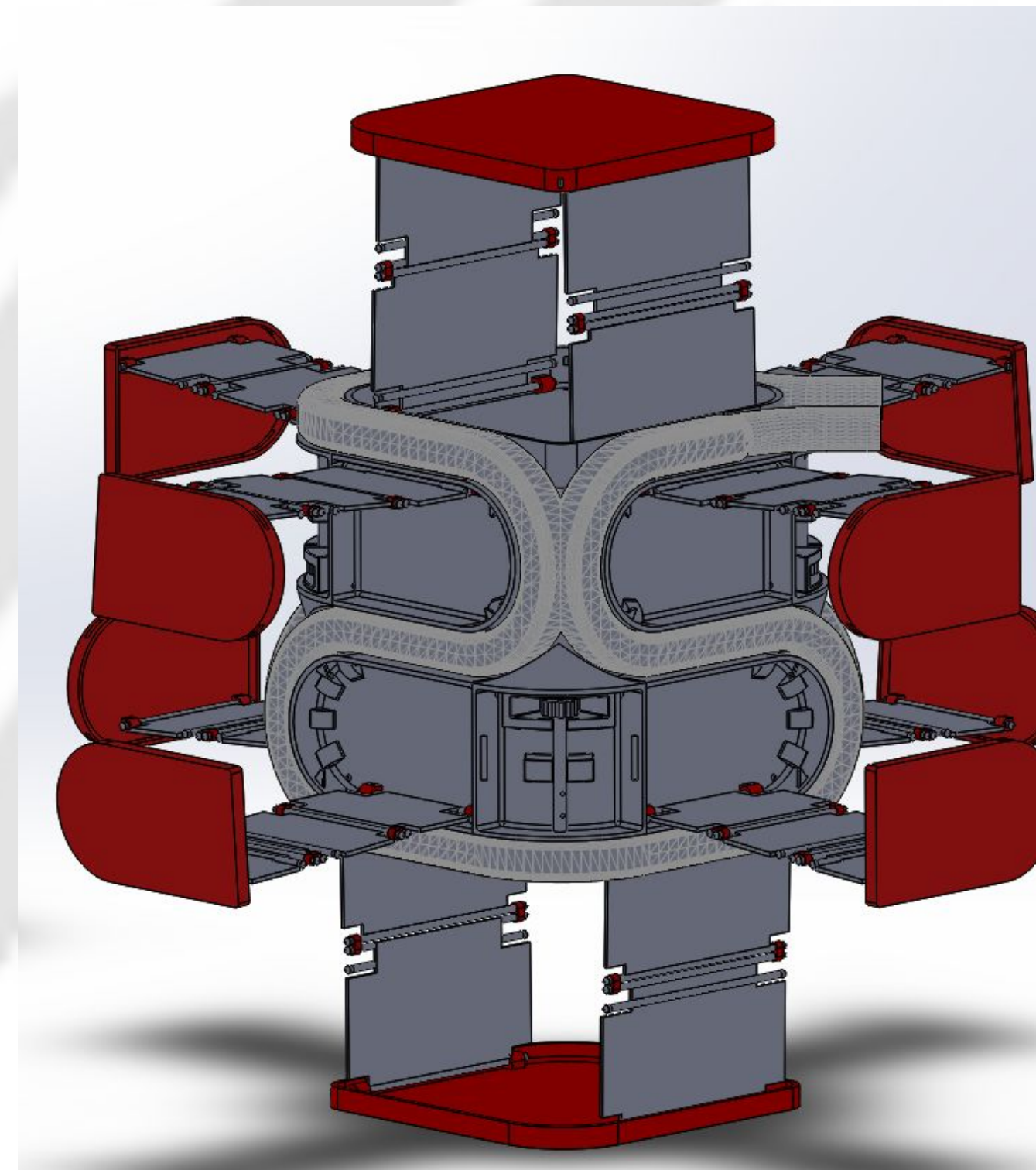
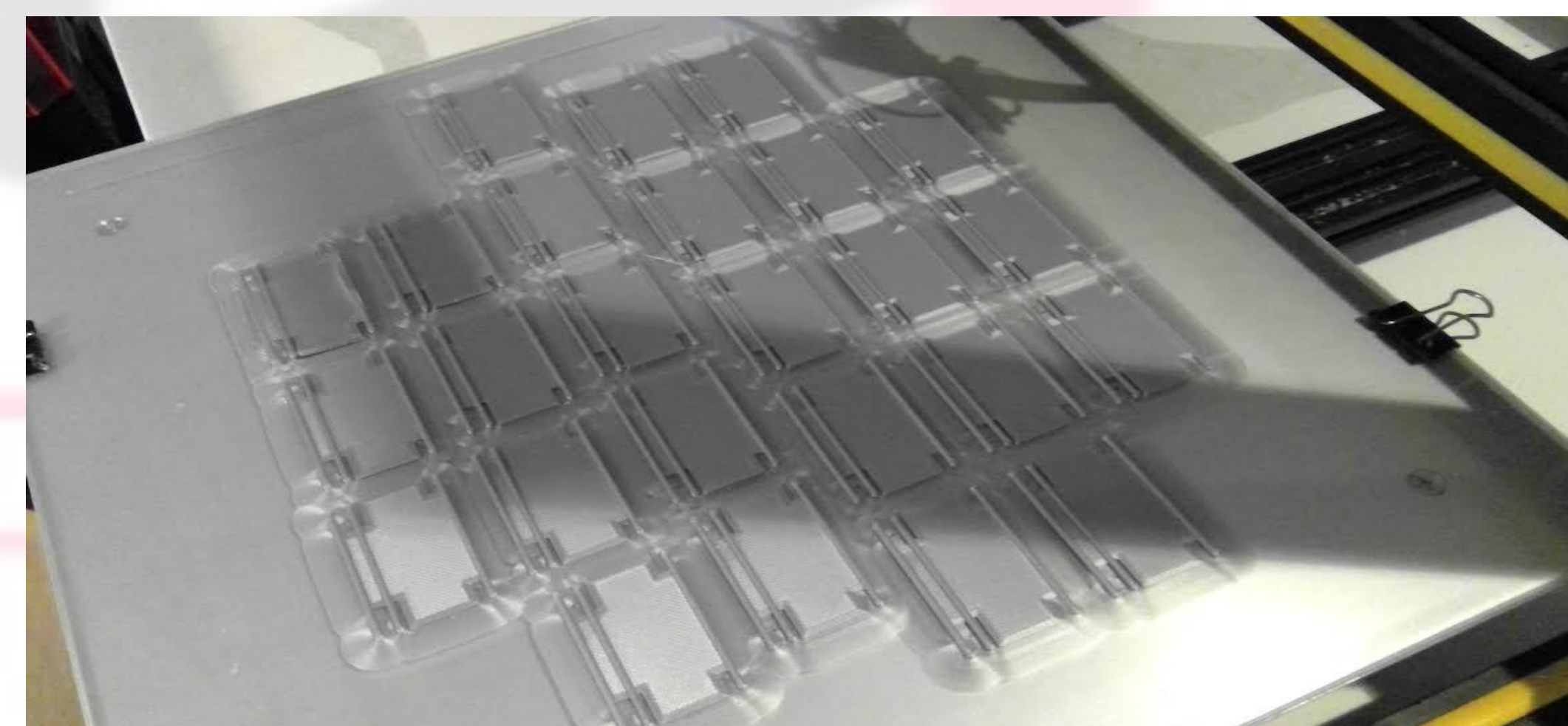
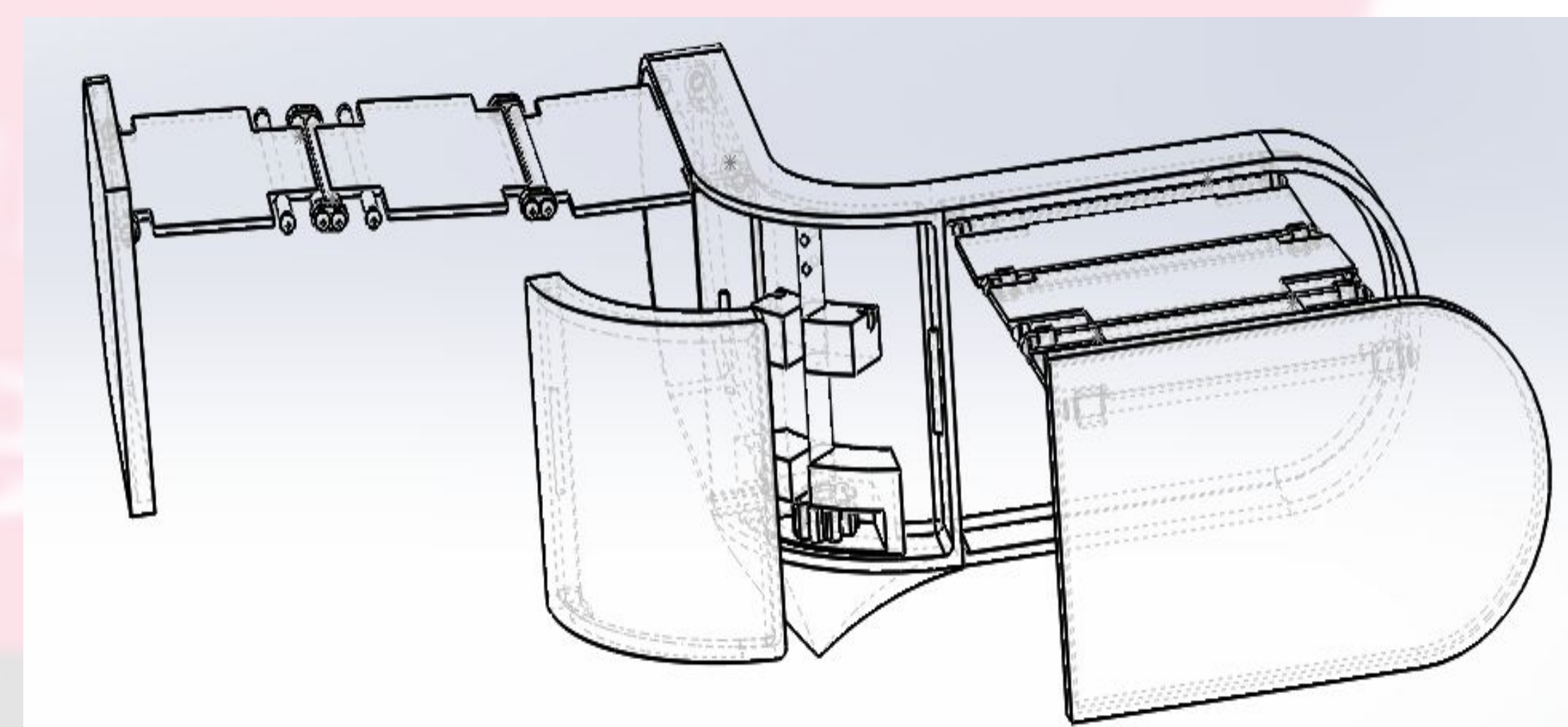


Project Goal

There are two main goals of this project. The first is to make sure that the assigned Funmat HT 3D printer is capable of printing flexible filament and to produce a document with details on how to make this successful. The second goal is to design and manufacture self-deployable panel models that are compatible with the given cubesat frame. The models must be fully 3D printed. The 3D printed panels are not intended to be launched into space. The design models are intended to be used as a reference to contribute to research towards increasing the solar panel surface area of the provided cubesat frame after being launched into space.

Design and Manufacturing

All of the parts and assemblies was done through SolidWorks. Design took place in the computer lab in the Engineering building and the high performance computers in the library and on personal computers. Manufacturing took place in the Experimental Mechanics Laboratory, using the Funmat HT 3D printer.



Budget

For this project, the sponsor, Dr. Youssef, provided the team with a \$300 total budget. The group decided to purchase FiberFlex 40D. The FiberFlex 40D material is used for the production of the panel for the CubeSat. The total cost of the FiberFlex 40 D, including shipping and handling, came out to be \$62.99. The total project budget is \$400, and after the purchase of the printer filament, the team has \$337.01 left to spend on materials.

Meet the Team



Members from Left to Right:

- Samuel Bumatay
- Brandon Pires
- Jeffrey Leigh
- Fahad Almarzooqi

Project Sponsor:

- Dr. George Youssef

Faculty Advisor:

- Dr. Scott Shaffar