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## CubeSat Test Rig



### Overview

The SSPL is designing a CubeSat bus to be used in a number of flight missions. The CubeSat is 10cm on each side and weighs 1.33kg with high efficiency solar cells on each side. The purpose of the CubeSat development is to design a test rig that can simulate the solar input of the sun on the CubeSat at various angles and rotational speeds.

### Objectives

SSPL requested a test rig be designed that can mimic the conditions for a CubeSat pico satellite in orbit. The test rig will need to allow the CubeSat's power system to be verified at a 3-axis tumbling rate of  $>1$  deg/s to 30 deg/s with minimal shadowing from the test rig itself. An arc lamp assembly that shines light directly on the CubeSat will also be created to simulate sunlight.

### Approach

- The team met with the sponsor for a general project overview, design criteria, and customer needs
- A patent search was conducted to gain feedback and input from similar creations
- Three concepts were brainstormed and the team used a Concept Scoring Matrix to select the best design – The Fork Design
- The Fork Design was analysed and modelled in SolidWorks
- The team attended weekly Power Meetings with SSPL to provide updates and receive feedback
- A torque analysis of the motors was conducted to ensure they were performing rotations that met the 3 axis tumbling rate of  $>1$  deg/s to 30 deg/s
- A cylindrical assembly was made to hold the arc lamp that will simulate the sunlight
- A mixture of aluminium and steel was used to build the prototype because it can withstand the heat simulation and was still inexpensive

### Outcomes

- Total cost of this prototype: \$500 excluding labor costs
- Production time: 50 hours (Assuming an experienced worker)
- Allows for 3 dimensional rotation
- Materials used in the prototype do not out-gas
- Shadowing effect is minimized by using thin rods and belt system
- Mimics solar energy by using arc lamp and a parabolic reflector for parallel rays

