Space Navigation Simulation

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Background

New Mexico Tech reaches out to students in High School in order to inspire students to pursue STEM degrees. The Space Navigation Simulator is going to help students decide if they are interested in learning all about the simulation. The simulator will show different aspects of STEM fields . For instance Physics, Engineering,Electrical Engineering and Computer Science.

Objective

Figure 1 : Earth and mars

To accurately demonstrate a space shuttle navigating through space from Earth to Mars with the effects of gravity. This will be used by NMT for recruitment efforts in college Fairs and at local High Schools.

Design Specifications

- Battery powered
- Portable
- Easy to assemble and disassemble
- Simulate the effects of the gravitational pull of earth and mars
- Simulate a weightless environment

Scale Model

The 4 foot high, 5 foot long, 1 foot wide frame is constructed of 80-10 Aluminum. The linear actuator will be mounted to the middle most part in between the two lengthwise parallel bars, placing the simulation at about eye level.
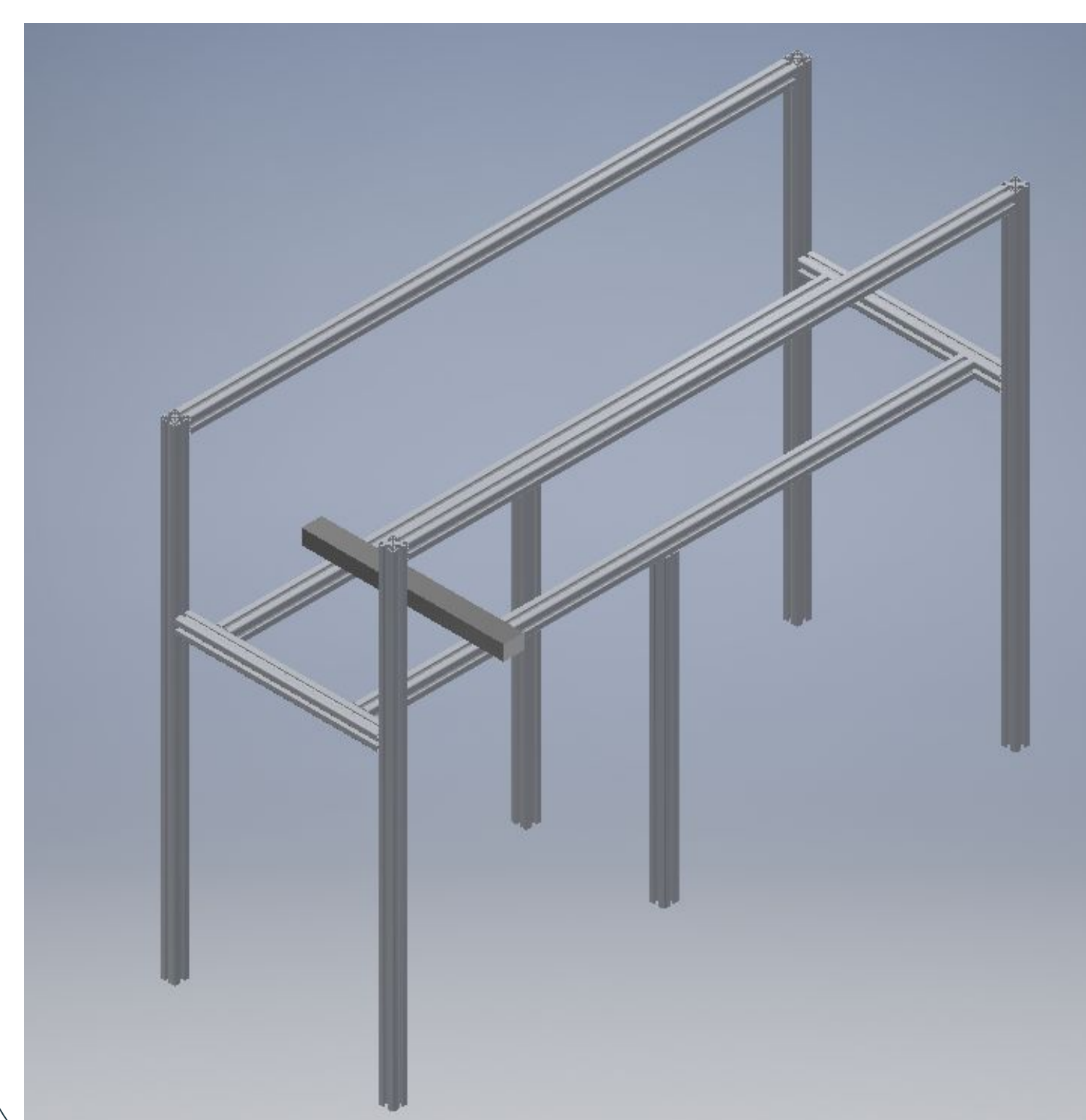
The rocket is controlled by three motors two in order to achieve two axis of motion. The linear actuator will also control if the rocket moves up and down.These two components are going to be controlled by the user as it moves from earth to mars.

Figure 2: Frame Model

Figure 3. Craft Articulation
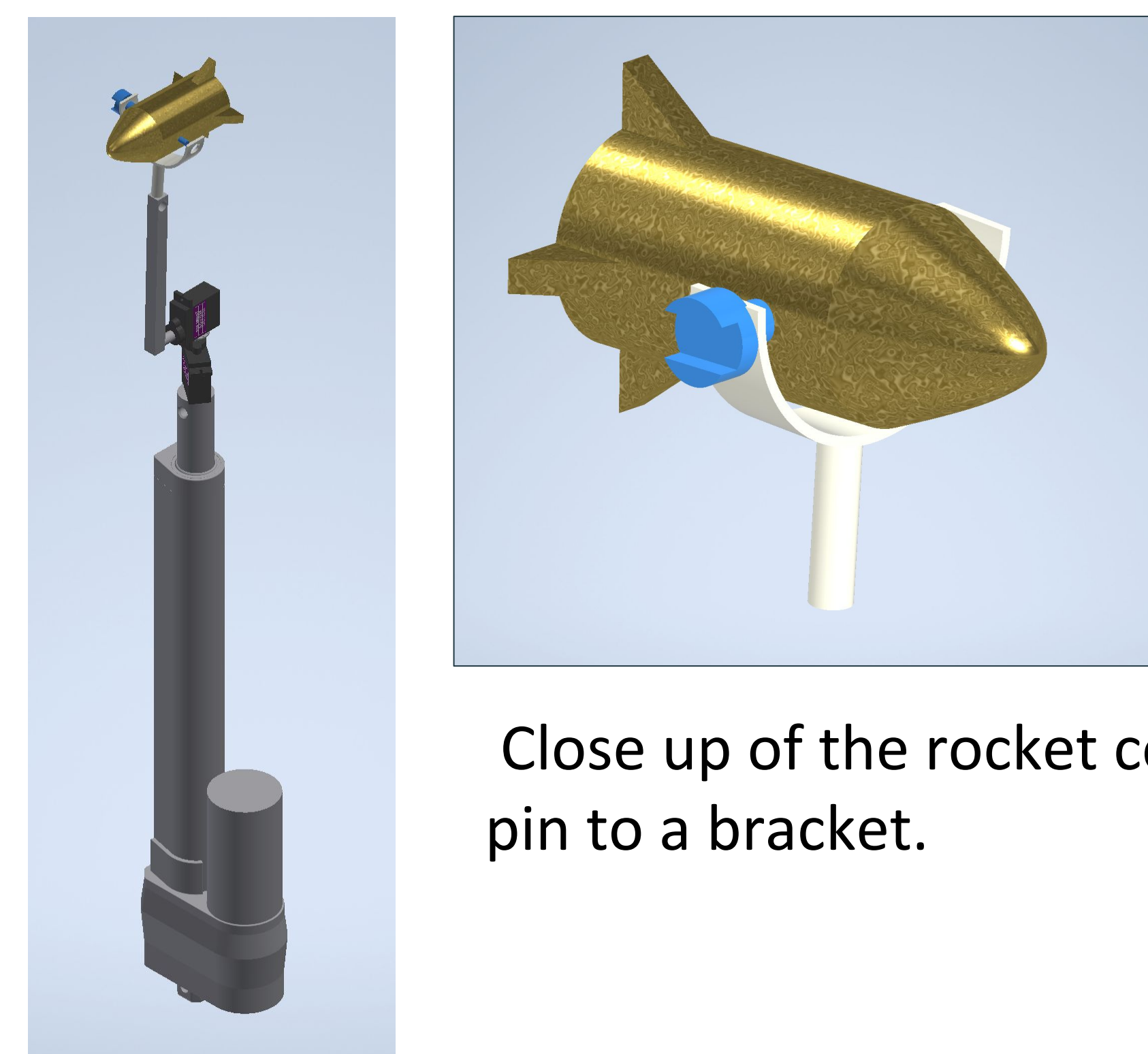
Close up of the rocket connected by a pin to a bracket.

Simulation

Written in Python, the simulation calculates the gravitational pull from both planets and the moon, and also the velocity of the craft when it is in motion. The python code uses a Raspberry Pi to run the code and make the calculations of where the craft is in position x, y, and z axis.

The graphs below represent how the effects of gravity and how a space shuttle travels from earth to mars.

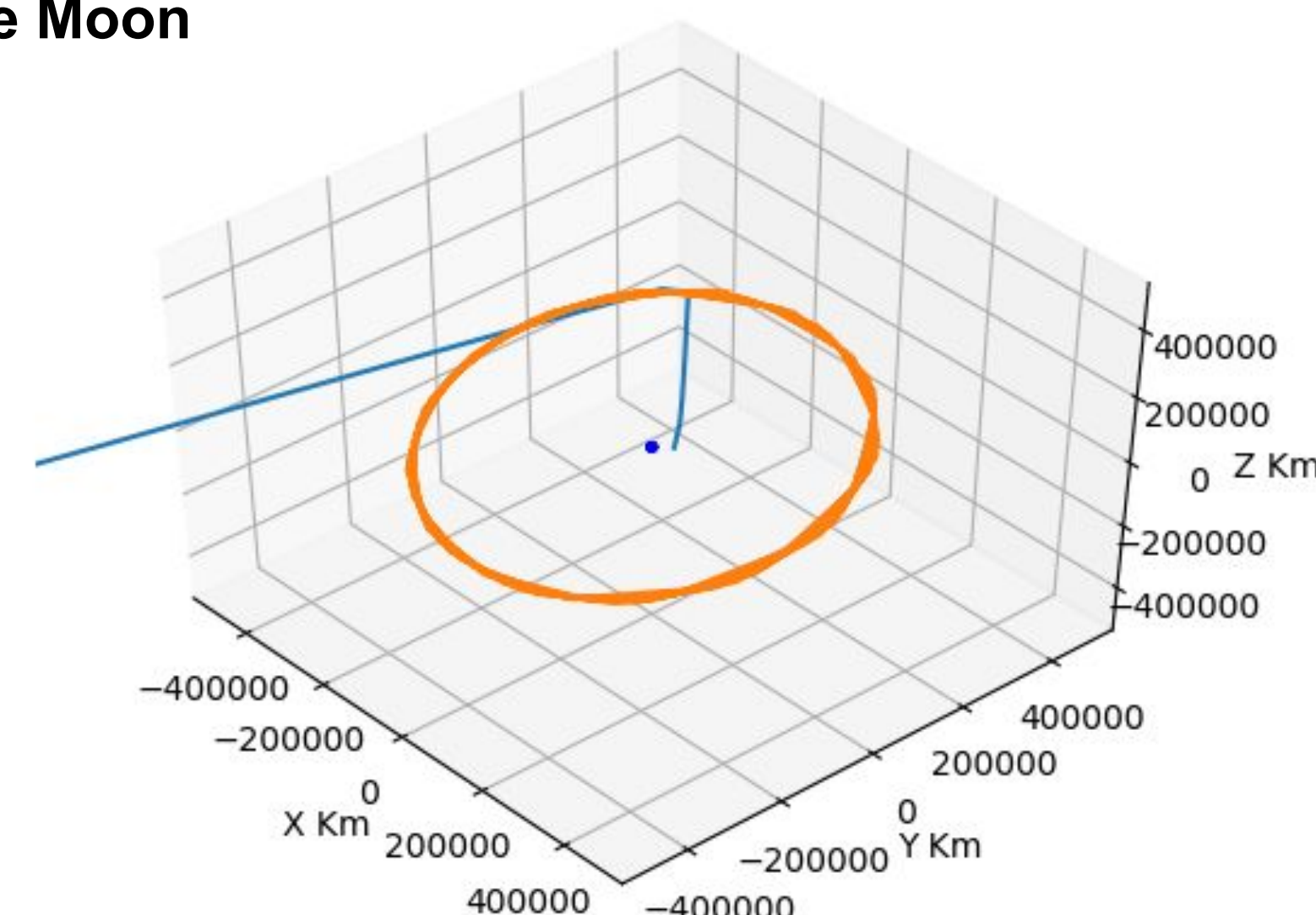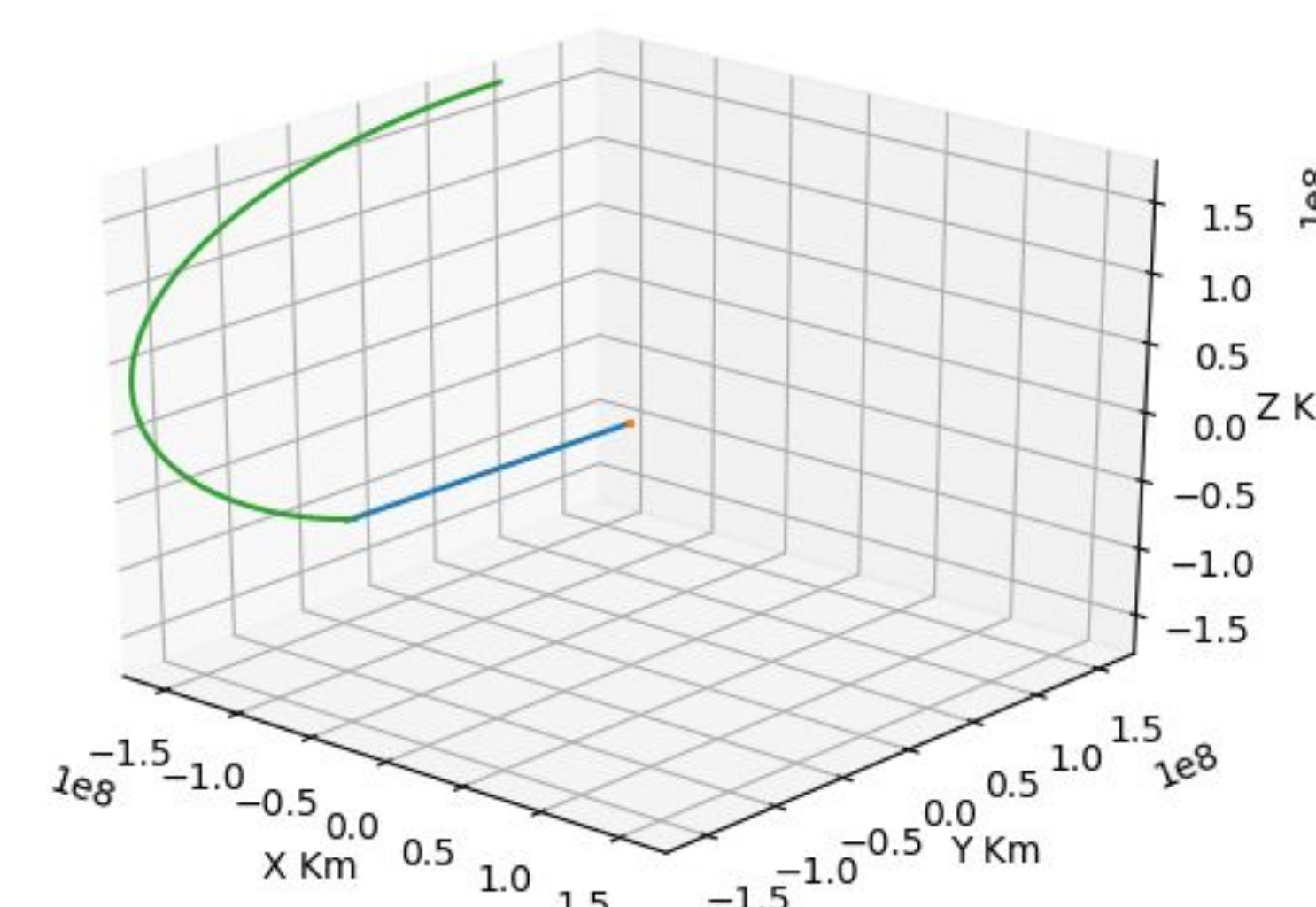**Figure 6 : Simulated Slingshot around the Moon**

Figure 7 : Travel Path from Earth to Mars

Progress Completed

- Decision of Frame material (80-20 Aluminum)
- Placement of linear actuator and motors
- Modular, simple ship design
- Fine tuning of code
- Model of Craft Articulation

Future Work

- Synchronize the code with motors for desired outcomes
- Finalize frame design and assembly methods
- Mount linear actuator
- Test exhibit as a whole
- Fine-tune audience experience
- Connect a controller using an arduino to see how the controller affects the craft in motion

Acknowledgments