

## **FNL Moon and Mars (Gateway as applicable) - Simulation Accuracy**

Things to consider to improve the accuracy of your simulations (and to improve your motor selection and required altitude objective), as observed upon review of RockSims.

### Weights of Components

Ensure the weights of the existing simulation primary components are accurate.

This involves weighing the components you have on hand and verifying.

You may use the tabular weights given by FNL after PDR, if you don't have a rocket.

Do not assume the simulation weights are accurate.

This refers to the primary structural components (nosecone, tubes, fins).

This may increase or decrease your overall weight (change your altitude).

### Include All Components (and Weights)

Ensure that you account for all components (weights) in simulation.

This involves adding mass objects for all components in your simulation.

Usually not all objects are accounted for in simulation weight (but should be).

(Quick links, eyebolts, retainers, adaptors, avionics, batteries, epoxy)

If you want more weight for flight, you may select larger recovery hardware.

(Longer, or wider shock cords, thicker material, for example)

This usually increases your overall weight (decreases altitude).

### Surface Drag

Ensure that you account for drag in your simulations.

Ensure the finish of your outer airframe / fins / nosecone is 'matte' or 'unfinished'.

Opposed to 'polished' - (this will produce more accurate drag).

Ensure you have rail buttons in your simulation (will produce more accurate drag).

This usually decreases your altitude.

### Ballast

**Ensure FNL Tech Team is aware of (and approve) your use of ballast (in reports / virtuals).**

You may add up to 10% ballast weight (i.e. you may add 1 lb of ballast to a 10 lb rocket).

Ballast can be a metallic object bolted to centering rings, bulkplates.

Ballast can be sand, poured (sealed) into airframe sections between fins.

Ballast can be sand, or metal sealed in the nosecone.

Add epoxy/silicone/small amount of activated foam (minimal expanding type) to secure ballast from displacement during flight.

**NOTE:** Adding ballast should be a **LAST RESORT** – to decrease altitude, if above options do not achieve objective.

**\*\*Note 1:** Use of the COTS fiberglass motor mount tube (MMT) is required as stated in Handbook Challenge Requirement 1-d (1-c). Many simulations had changed this.

**\*\*Note 2:** You must then purchase (or fabricate) a motor adapter to use the smaller diameter motor.

Example can be found here ([Aero Pack > Motor Adapters](#)). Many simulations did not have this.

**\*\*Note 3:** You must also purchase (or fabricate) a motor retainer for the MMT diameter. Example can be found here ([Aero Pack > Motor Retainers](#)). Many simulations did not have this.