THE STAR TREK™ REPLICATOR CHALLENGE

DESIGN GUIDELINES

Here are some guidelines to keep in mind when designing your Space Food Object. We understand that making a 3D model is tough for beginners! We encourage participation first and foremost, so don't forget that a great Space Food Object Idea is worth more points during judging than an expertly crafted 3D model. (But having both will score big!) You won't be disqalified if you submit a model that doesn't comply with every guideline below, so if you're a beginner don't fret if this seems overwhelming. Before you know it you'll be a pro!

GOOD LUCK!

STAR TREK™ REPLICATOR CHALLENGE DESIGN GUIDELINES

The intended location and 3D printing feedstock for your design should be identified in your text description.

- 3D Printable in a 6in x 6in x 6in printer volume
- Designed for one of the following space environments
  - Earth's Moon
  - Another Planet: Identify which planet
  - Another Planet's Moon: Identify which moon
  - A long duration spacecraft other than the ISS: Specify where your spacecraft is going and why. If you choose to design for a spacecraft you will be judged as if your design is being 3D printed in a microgravity environment.
- Advances long-term human space exploration
- Designed to be printed with ONE non-edible printing material (feedstock) of your choice. The feedstock can exist today or it can be a theoretical future feedstock that you think would be useful on long-duration space missions. Options to consider include: Material brought from home, recycled material, & material found on another planet/moon like soil. (NASA calls this martian/lunar regolith.)

DOES IT HAVE TO BE 100% 3D PRINTABLE OR JUST A PART OF IT?

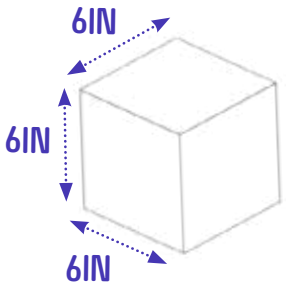
Your space food object needs to be 100% 3D printable, but it can be a component of a larger assembly.

DOES IT HAVE TO BE ON AN EXTRUSION (FDM) PRINTER?

No, it can be intended for any kind of future space 3D printer, but we have provided guidelines for extrusion (FDM) printers as those are most common in classrooms, and representative of the current NASA 3D printer.

3D PRINTING GENERAL GUIDELINES

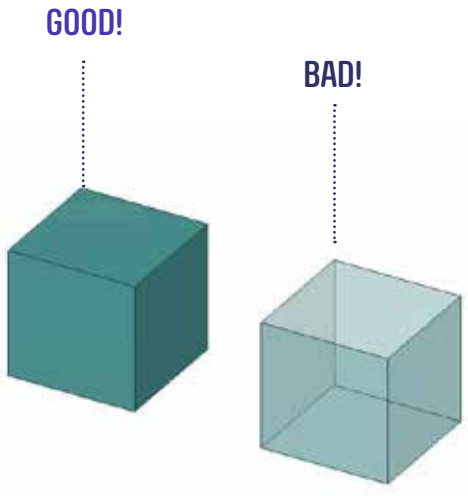
FOR EXTRUSION PRINTING (FDM)



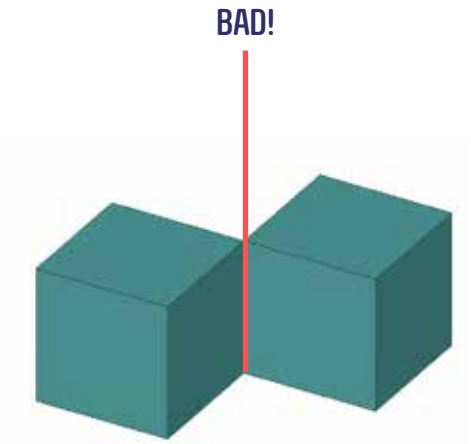
Maximum Space Food Object 3D Print Dimensions are 6inches wide x 6inches long x 6inches tall. All entries will be judged as if they were scaled down to print and function in this volume.

Multi-part assemblies are allowed. All parts must fit into ONE 3D print session - max 6in x 6in x 6in print volume.

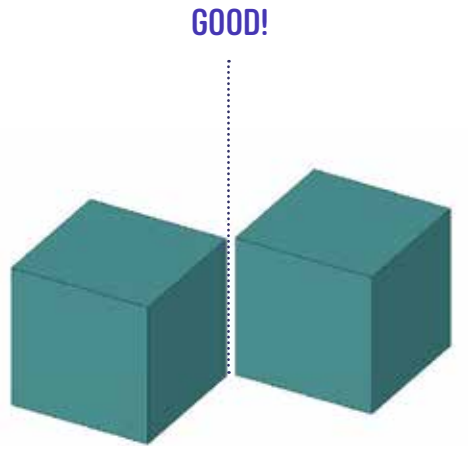
Assemblies that are created in print are allowed and welcome.



Your 3D model should be solid geometry. For example, the model on the right has no top surface and zero wall thickness. This is not a 3D printable model. If in doubt, upload your model to Meshmixer to analyze your STL file



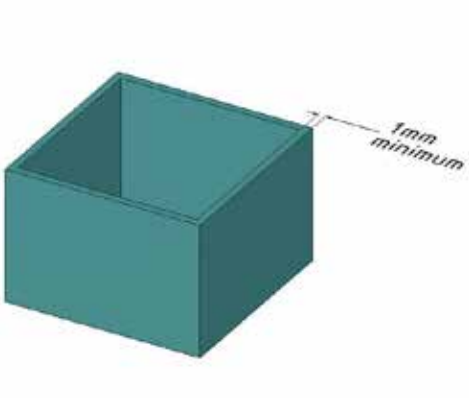
No shared single edges (lines) like above.



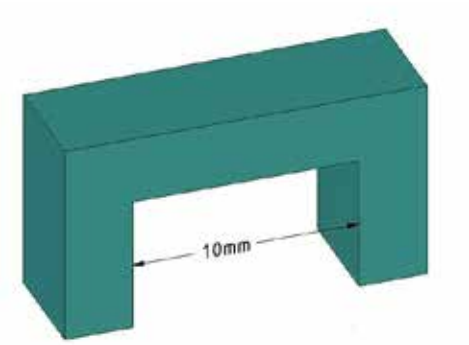
If you have multiple parts to print at the same time, make sure there is at least 1mm of spacing between the parts.

3D PRINTING GENERAL GUIDELINES

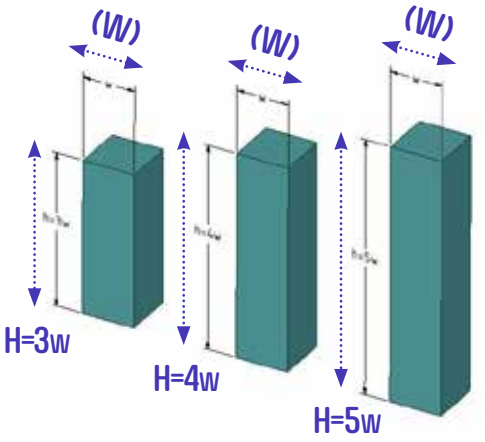
FOR EXTRUSTION PRINTING (FDM)



Minimum recommended wall thickness is 1mm.

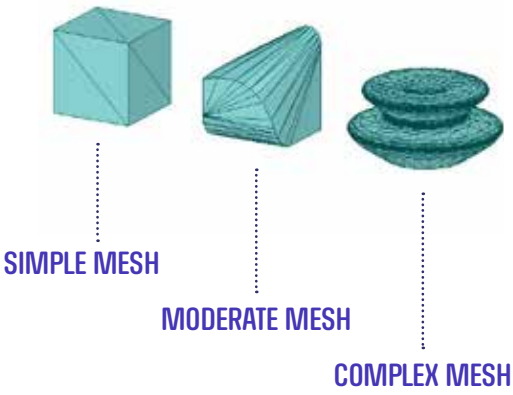


Most consumer 3D printers can bridge material. The maximum recommended bridge distance is 10mm.

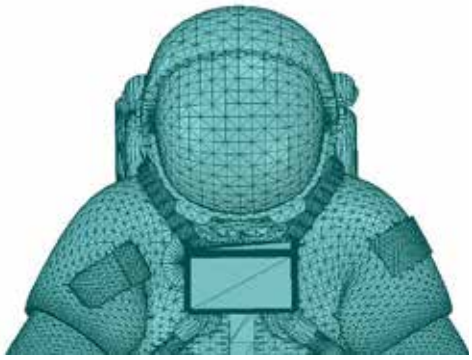


It is generally advised that support structures have a height to width aspect ratio of 4:1 or less.

Avoid pointed or rounded bases. If a base is needed, opt for a mouse ear base or a base plate instead. More surface on the print bed is advised for a more stable design.



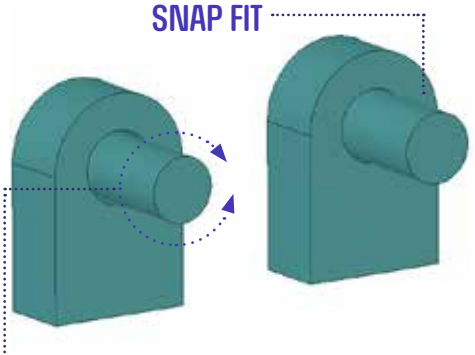
Maximum STL File size is 20MB. STL files are mesh geometry (triangles). A simple box may be a few KB, whereas a complex model that requires a mesh with more triangles will be a larger file. We encourage advanced designs and have given you a large file size limit!



For example, this mesh is complex, but is under 20MB if exported properly. Chord Tolerance or Angular Control can be modified in some 3D software packages to change the resolution of your STL file export. Otherwise, in Meshmixer you can upload your STL file and re-export it using the **STL Binary Format** to reduce file size.

3D PRINTING GENERAL GUIDELINES

FOR EXTRUSTION PRINTING (FDM)

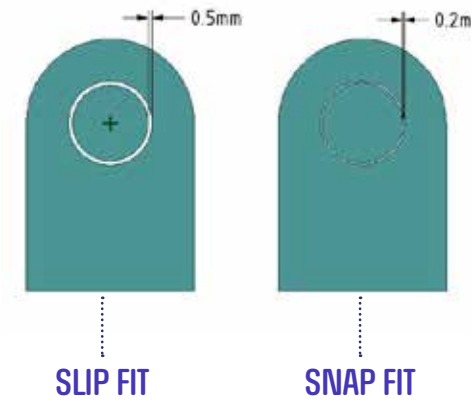


SLIP FIT =

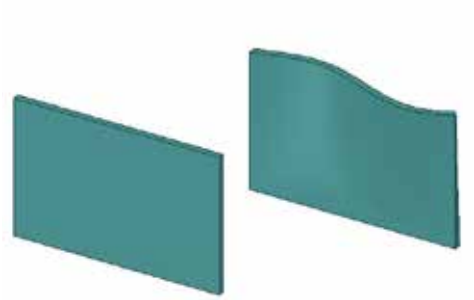
A part that is designed to rotate or slide within another part.

SNAP FIT =

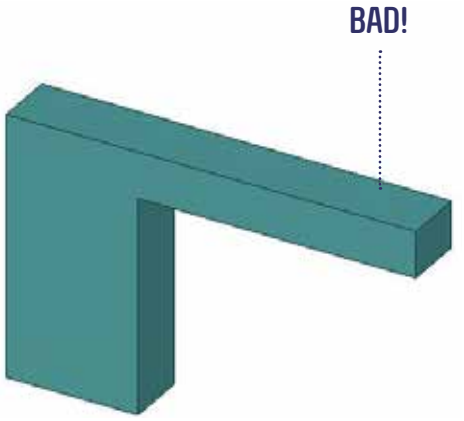
A part that is designed to press or snap into another part and does not move.



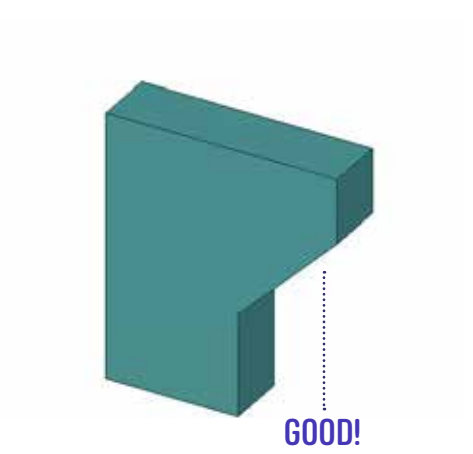
Slip fit guidelines are: .5mm on every side. (1 mm diameter difference if an axle) Snap fit guidelines are: .2mm on every side (.4mm diameter difference if an axle).



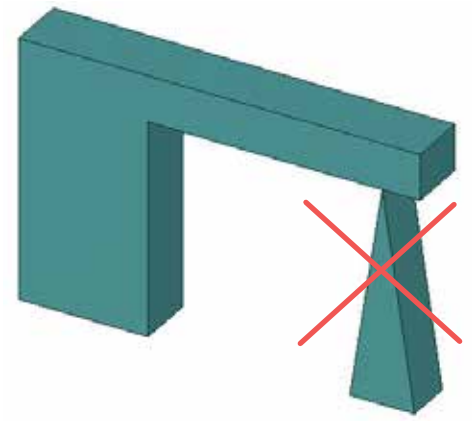
Avoid big, thin flats because they may tend to warp.



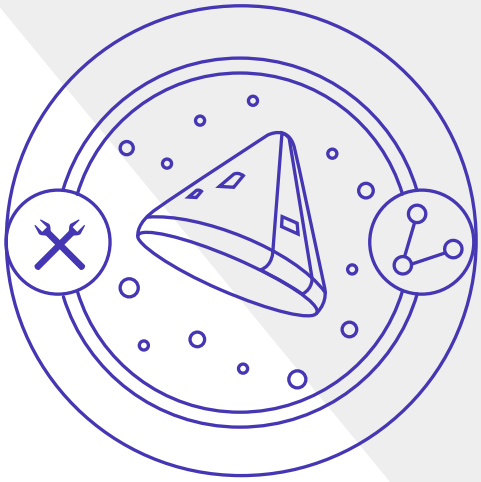
THIS IS A ZERO-G SPECIFIC GUIDELINE! Are you Designing for a Spacecraft? Then you probably don't want to include unsupported, hanging geometry. The maximum overhang angle in



THIS IS A ZERO-G SPECIFIC GUIDELINE! Are you designing for a spacecraft? Then you probably want to build outward from the layers below at a maximum recommmended overhang angle of 45



THIS IS A SPACE SPECIFIC GUIDELINE! Are you desinging for a spacecraft? Then you don't want to use removable supports. This is one of the current NASA guidelines with 3D printing in space. Floating debris that breaks away is dangerous and could be inhaled by



Just a reminder that we reserve the right to tweak, edit, or re-create all submissions for our program needs - i.e. make sure its perfect to print in space or here on Earth. It's in our Official Rules, but we wanted to say it again!

WE CAN'T WAIT TO SEE YOUR SPACE FOOD OBJECTS!