Perfecting Placement
How to position your 3D model on the digital build plate for optimal results
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This tutorial is excerpted from Fusion 360 for Makers, available at makershed.com and other retailers.
FUSION 360 IS A ROBUST 3D DESIGN PROGRAM THAT ENABLES YOU TO DO COMPUTER-AIDED DESIGN (CAD), computer-aided manufacturing (CAM), and computer-aided engineering (CAE) tasks. It can animate (make videos), render (add lifelike colors and textures), and display the model as a set of scaled, 2D drawings. It also lets you arrange the model's parts into an assembly. Whether you’re new to modeling, a hobbyist, or an experienced engineer, you’ll find this software useful.

You can export any Fusion 360 design as an STL for 3D printing. However, it won’t necessarily print, or print well, even if it looks good on the screen. For best results, all designs should be optimized for printing — here we will focus on orienting the file on the digital build plate.

**NOTE:** Some suggestions may conflict with others, depending on the model. You may need to ignore one suggestion to implement another.

**ORIENT TO AVOID OR MINIMIZE SUPPORTS**

Supports are structures that hold up overhangs (parts with empty space below). Slicing software generates supports, but you can finesse by adding, deleting, or moving them to other locations. After the print is finished, remove supports by snapping them off, cutting them off with a craft knife, or dissolving them, if they were made with dissolvable filament.

Supports are often difficult to remove, or fail during the printing process, so try to orient the model to avoid or minimize them. Features that are at a 45° or greater angle don’t need supports, because each layer is built onto the one underneath it (Figure A). Simply rotating the model can also cut down or eliminate the number of supports needed (Figure B). You may be able to incorporate supports in the design, or slice the design in half with the Split Body tool to allow each part to lie flat on the build plate, and then glue the printed parts together.

**ORIENT FOR STRENGTH**

Print items that need to be strong laterally on the z layer, not vertically across multiple layers. For example, if you print the screwdriver handle in Figure B vertically, it will easily snap at each layer. But printed horizontally, the layers span the entire length, making the handle stronger.

**ORIENT TO MINIMIZE WARping**

The build plate is most level at the center, so parts printed there will warp less than parts printed closer to the edges. Heated build plates are also hotter at the center. Cooler print locations contribute to warping.

**ORIENT TO AVOID STAIR-STEPING**

Print sloped and curved surfaces horizontally. Printing them vertically results in a stair-stepping effect, especially when the surface has a shallow angle (Figure C).

On a printer with a moving bed, layers close to the build plate print best because they sway less than layers higher up. This means that highly detailed features print better if they’re oriented closer to the build plate. For example, the mane on the lion in Figure D will print best if it’s close to the build plate as shown.

Supports often leave scars when removed, so orient a file that has detail you don’t want ruined in a manner that avoids supports resting on them. Figure E shows how tilting the file 45° eliminates most of the supports that would otherwise mar the detail.

**ORIENT FOR SMOOTHNESS**

A glass build plate gives the bottoms of prints a very smooth finish. Most of the time, this nice finish is wasted on the bottom of the print’s base. If you have a file with a long outside face, such as a phone cover, you might want to orient it so it rests directly on the glass.

**GOING FURTHER**

To learn more about the software and other best practices for successfully printing your digital model, pick up a copy of Fusion 360 for Makers at makershed.com or other retailers.