STUDENT GUIDE

Airplane Model Project

STEAM: Engineering

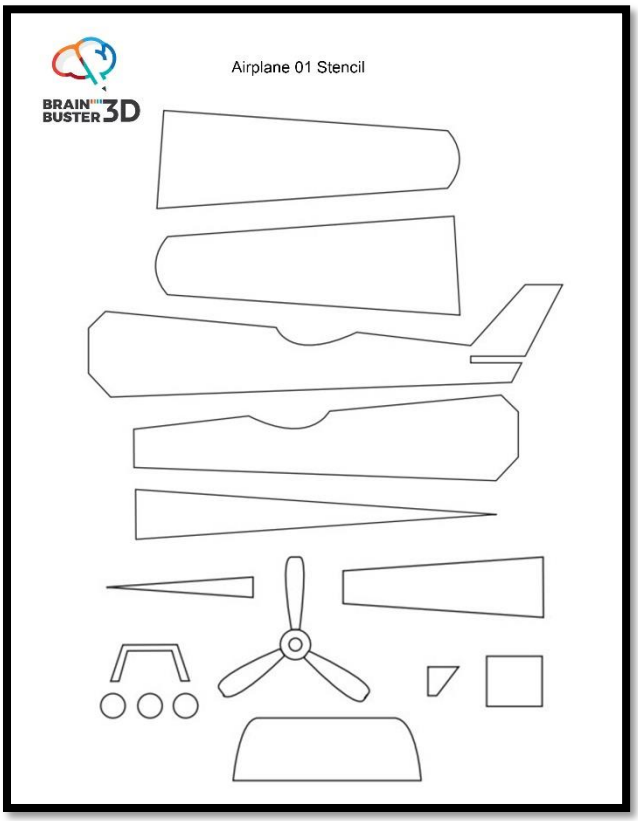
The engineering design process is a series of steps engineers use as they work to solve problems. There are five main engineering steps: **ASK** **IMAGINE** **PLAN** **CREATE** **IMPROVE**

Building an Airplane Model will help you learn Engineering Skills. How?

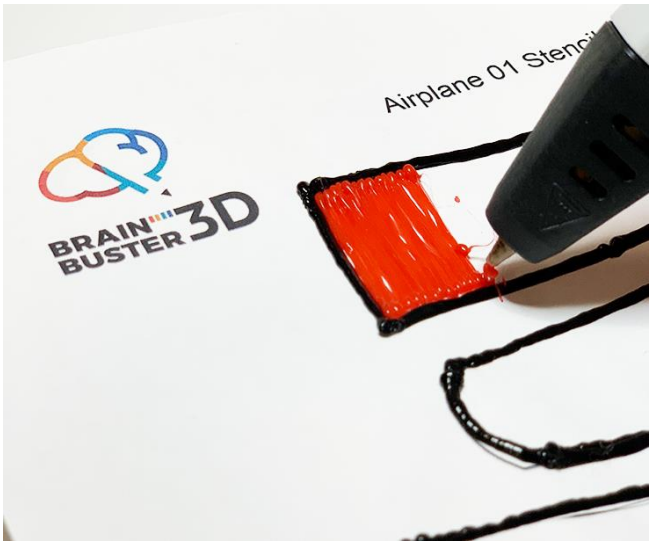
- You will be using the stencil which is your PLAN to create each part of the airplane.
- You will need to arrange the parts of the airplane as you would a puzzle, and determine which parts need to be welded together to CREATE the 3D form of the airplane.
- When you finish the model, think about ways you could IMPROVE the process or design.
- ASK and IMAGINE how you could PLAN and CREATE your own design for a 3D airplane model.

Materials Needed: Airplane 01 Stencil, 3D Pen, 2-3 colors of PLA filament, scissors silicon thumb & finger protectors, a paper towel or napkin.

Optional: To keep your stencil intact, place it in a plastic sheet protector.



STEP ONE:



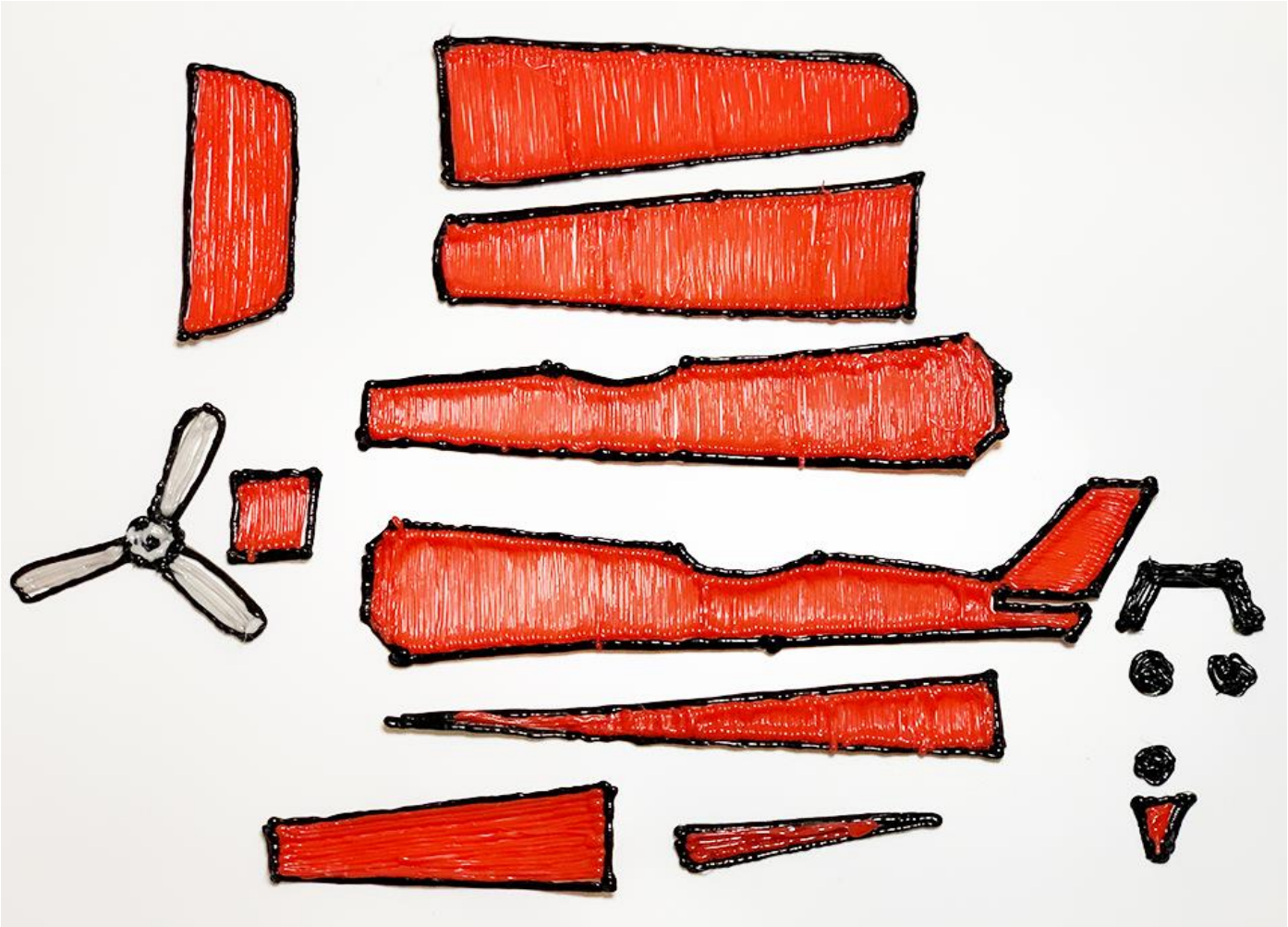
Find a starting point on the stencil to anchor your filament.

Move your 3D pen along the lines to outline each part.

Once all the parts are outlined, fill in each part by moving your 3D pen back and forth between the outline you made.

You can select any color of filament to create your airplane model. If you do not like the PLA filament colors' that you have, you can paint the parts with acrylic paint before you remove them from the stencil or paint your finished airplane model.

STEP TWO:



If you use a plastic sheet protector, the parts should peel off the stencil easily.

If you made the parts by extruding the filament directly on the paper stencil, some of the paper will stick to the back of the parts you made.

To remove the paper, rinse the plastic parts with warm water and dry them with a paper towel.

Arrange the parts as you would a puzzle to see which ones will need to be welded together to form your 3D airplane model.

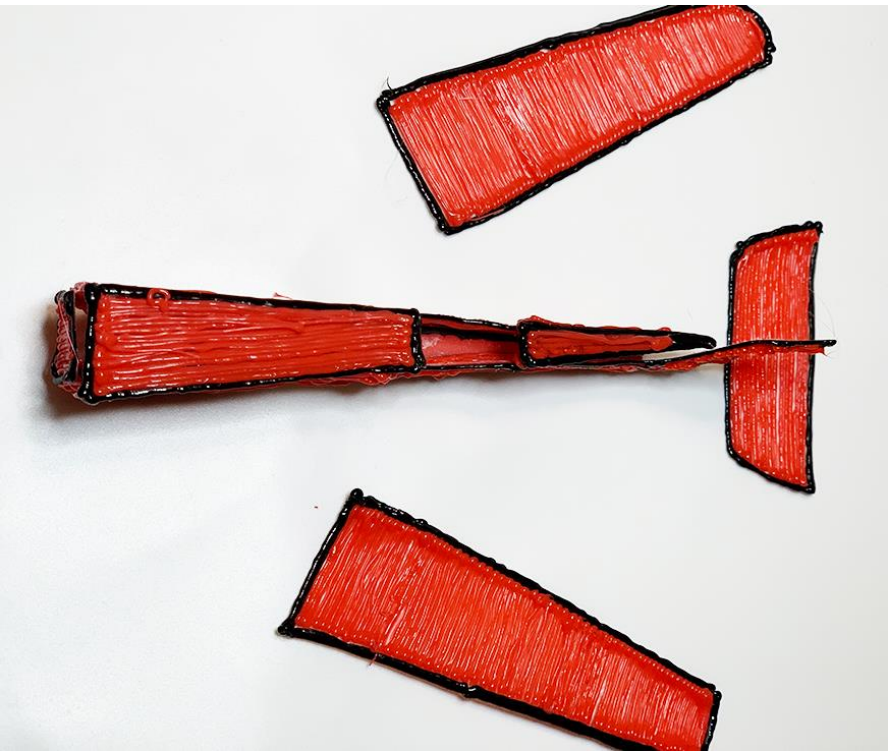
STEP THREE:

It is time to weld the body of the airplane together. Take the larger triangle. Notice that the larger end of the triangle should be welded to the front of both side panels with the small end of the triangle tapering towards the back.

Once you have welded these three parts together, take the shape as shown above right and weld it to the top front of the airplane.

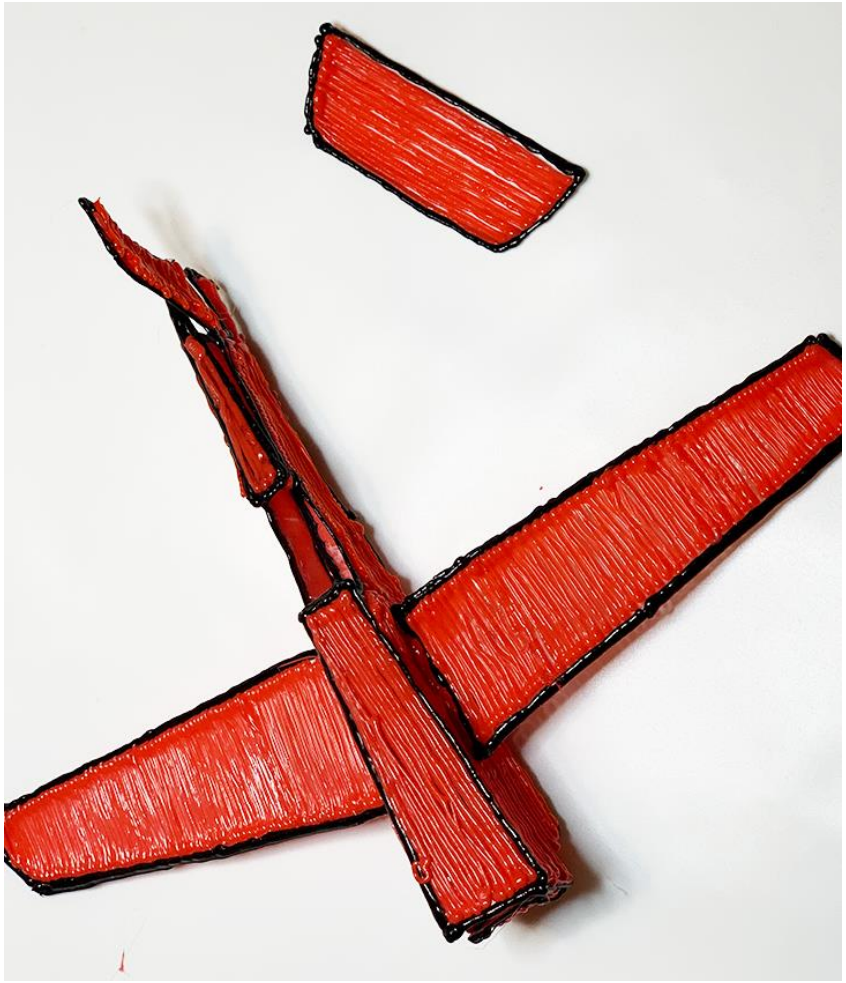
Take the small triangle as pictured below and weld the bigger end of the triangle just behind the cockpit and have the narrow end of the triangle taper towards the tail.

STEP FOUR:



To weld the wings to the airplane, use the tip of the 3D pen to melt the plastic on the side panel one at a time. While the melted plastic is pliable, quickly hold the wing firmly to the area. Once you have attached the wing, flip the airplane upside down and reinforce the wing by welding the seam. Repeat the process for the second wing.

STEP FIVE:



To attach the tail, slide it into the notch at the back of the airplane and weld it in place.

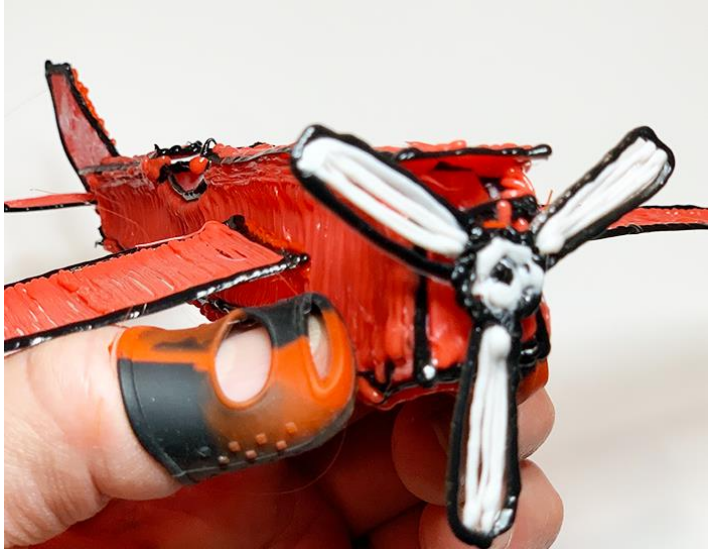
STEP SIX:

Weld the tire to the triangular part. Once the two pieces are welded together, attach the part to the underside of the plane near the tail and weld it securely in place as pictured above.

Weld the two wheels to the brace as pictured above to create the landing gear. Once the landing gear is welded together, attach it to the underside of the plane near the front and weld it securely in place.

STEP SEVEN:

On the front panel of the airplane, use a circular motion with your 3D pen and extrude a drop of filament. Once the drop hardens, weld the propeller to it. You may need to weld around the edges to reinforce it.



Be sure to add your own details, paint or even add a second set of wings to make a biplane.
Think about what you could IMPROVE.

Your airplane is now ready to take to the skies!

Airplane 01 Stencil