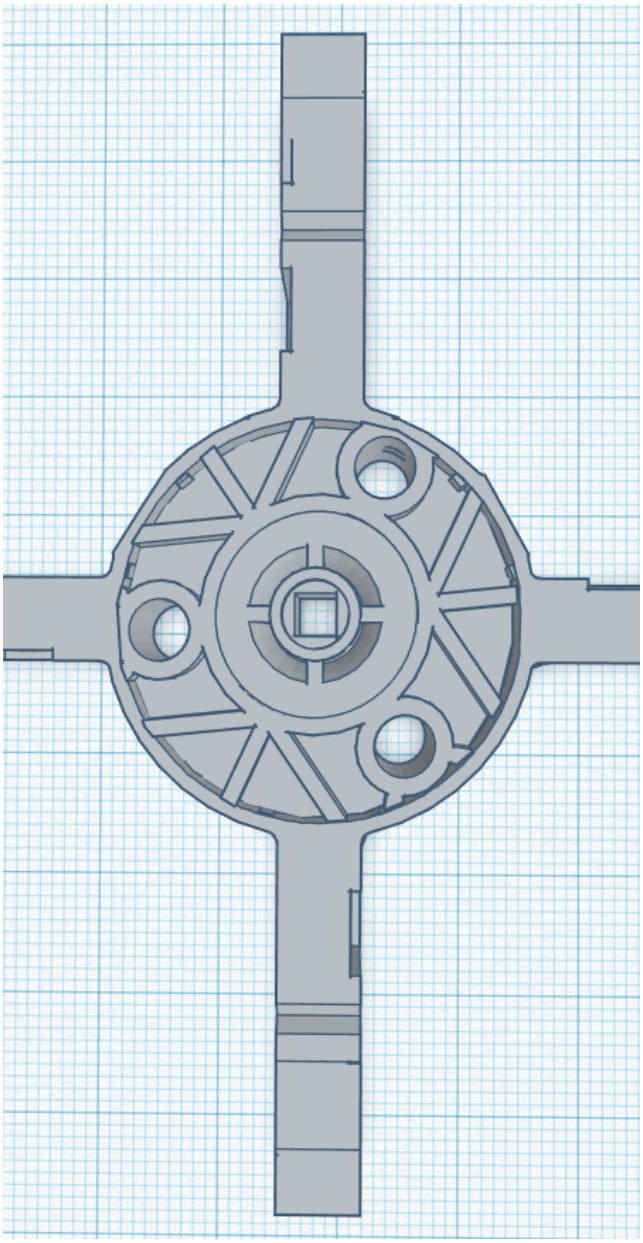
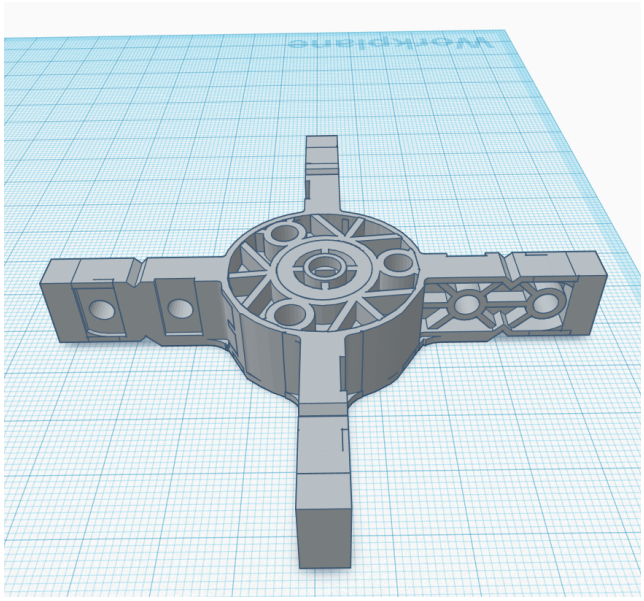
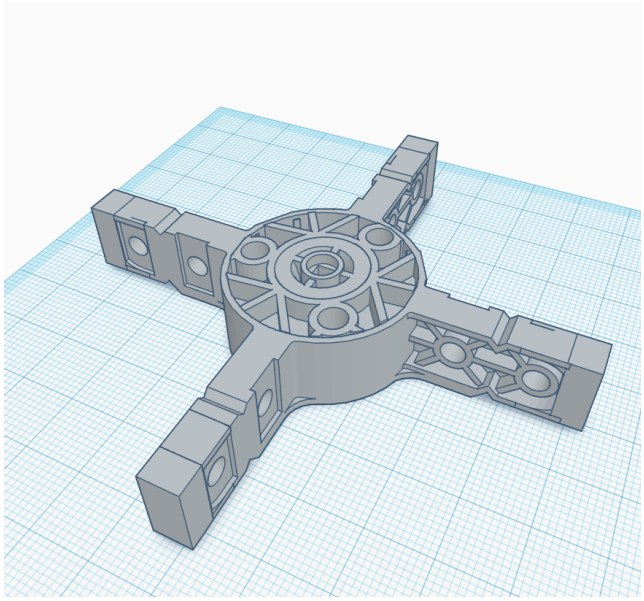






4-WAY PERPENDICULAR PLATE

Name of entrant: Riley Smith
Team: 74177Z "Lady Pirates"

SLOANCANYON ROBOTICS

VEX IQ Challenge "Make It Real" CAD Engineering Challenge Sponsored by Autodesk®

2021

INTRODUCTION

Vex IQ robotics kit offers many possibilities for building robots that can perform various tasks. While preparing for the competition last year, where a robot had to collect orange ball game pieces, we explored many designs for our robot, including designs with low friction rotational joints. Building rotational joints is often a crucial task to making the robot successful in a competition. One of the pieces that we, as a team, thought would be a great addition to the Vex IQ kit, is a perpendicular plate that would help improve stability during the swing, a rotational motion with respect to the shaft located in the centerline. We pictured a combine harvester, a real world machine designed to efficiently harvest a variety of grain crops. So why not "harvest" the game pieces? To create the piece we had in mind, we looked at existing legal parts, and decided that we could accomplish our task by fusing a few existing pieces together. At first, while designing a new rotary mechanism for our robot, I looked at lock plates that are designed to attach to a gear. I looked through a variety of beams and gussets. I was able to accomplish the design by combining together a 10mm Pulley (228-2500-163), a 3-way 2x3 plate (228-2500-304) and 3-way perpendicular 1x2 plate (228-2500-305). These were downloaded as STEP files and needed to be converted to STL before importing them. After figuring out how to combine these parts, I came up with what is a start to my design. I downloaded the STL file and printed the test part. After testing, there were some things that could be improved, Like the center could be taller so connector pins will work it better. After that modification it was downloaded and printed a second time. It was brought up that I should make the three "legs" squared instead of rounded and we agreed on adding another leg to the design for improved function. As a team, we think this 4-way perpendicular plate would make a great addition to the Vex IQ Kit.

PURPOSE

The 4-way perpendicular plate is designed to help improve function during the swing, a rotational motion with respect to the shaft located in the centerline and to add another versatile robot part to the Vex IQ Kit.

EXPLANATION

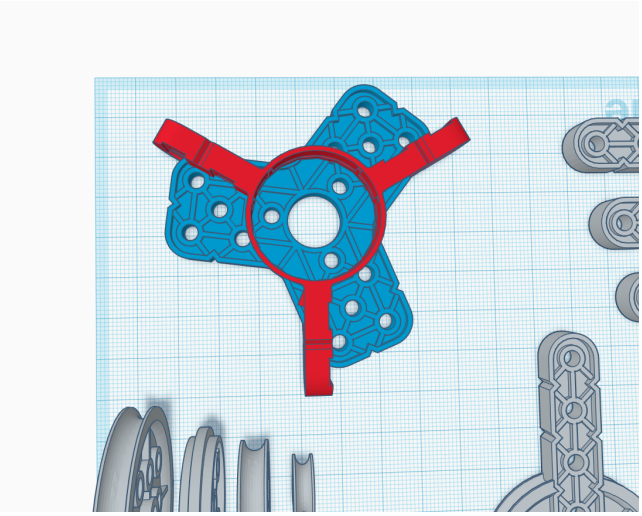
I used a 3-way 2x3 plate (228-2500-304), a 3-way perpendicular 1x2 plate (228-2500-305), and a 10mm pulley (228-2500-163). I removed the center of a 3-way plate. I removed the sides of the 3-way perpendicular plate. I combined the two parts together and inserted the smallest pulley to fit in the center.

The project wasn't complete there. For example, it was suggested by my team that I make the center taller, and I should square off the "legs" of the part. I also had to properly group the pulley to the test of the part.The part was tested and printed multiple times until I was happy with the result.

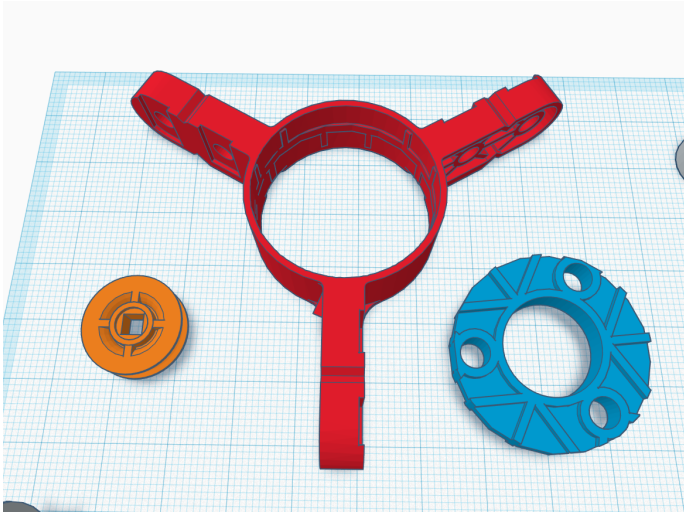
USE OF TINKERCAD

The 4-way perpendicular plate was modeled using Tinker CAD software. The design was created by downloading .STEP files of existing Vex IQ parts. These files were then converted to STL format and imported into the Tinker CAD project. Tinker CAD helped a lot when creating this piece with all the tools it provides. I enjoy using this program and I feel that it makes so many things possible.

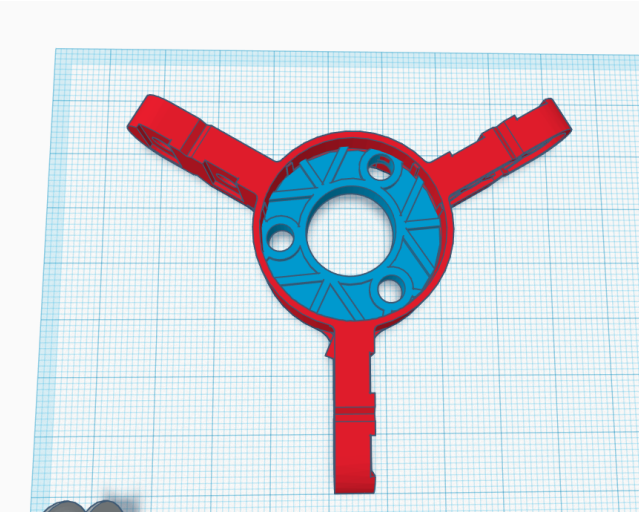
DESIGN PROCESS



I started the design process by downloading various existing Vex IQ pieces and importing them to Tinker CAD, the pieces I thought I would work best for the design I had in mind.

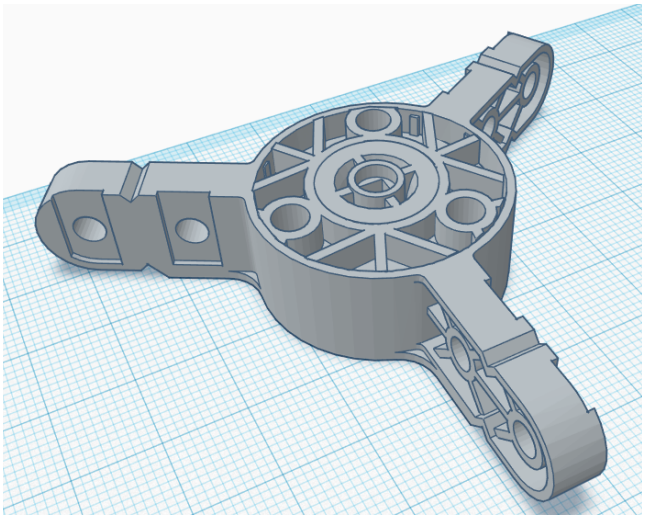


I started modifying the parts and added a 10mm pulley (228-2500-163) because this piece has a square in the middle that a shaft can be locked into to allow the 4-way perpendicular plate to spin or rotate.

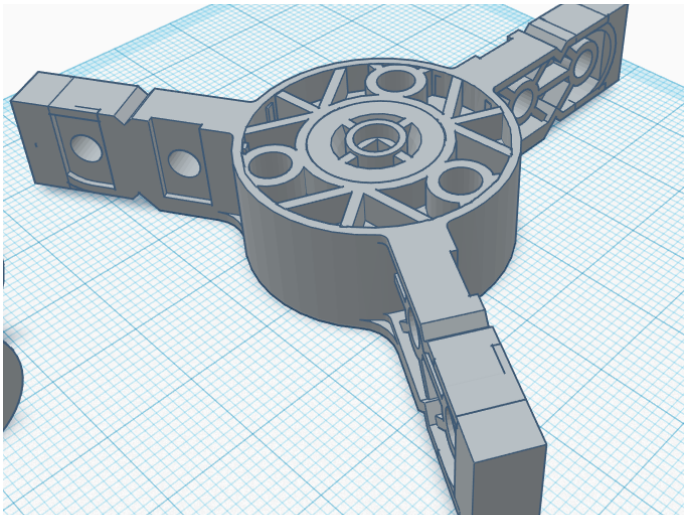


I started cutting the pieces and trying to add them together one piece at a time.

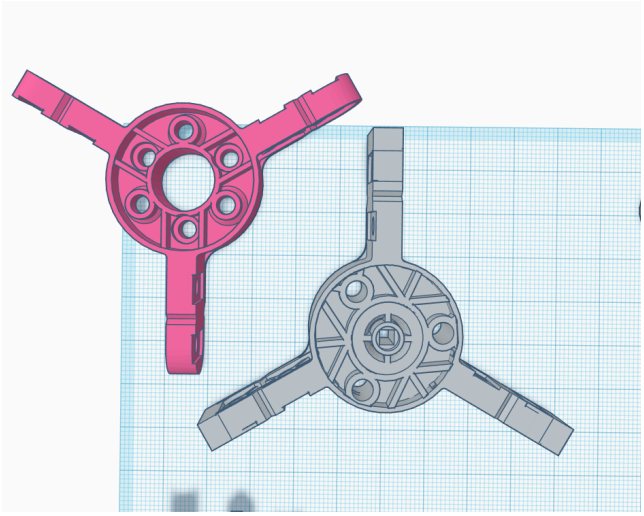
I added the 10mm pulley to the center.I made sure that it fit perfectly in the middlebefore grouping the objects, or it wouldn't be attached all the way when printed.



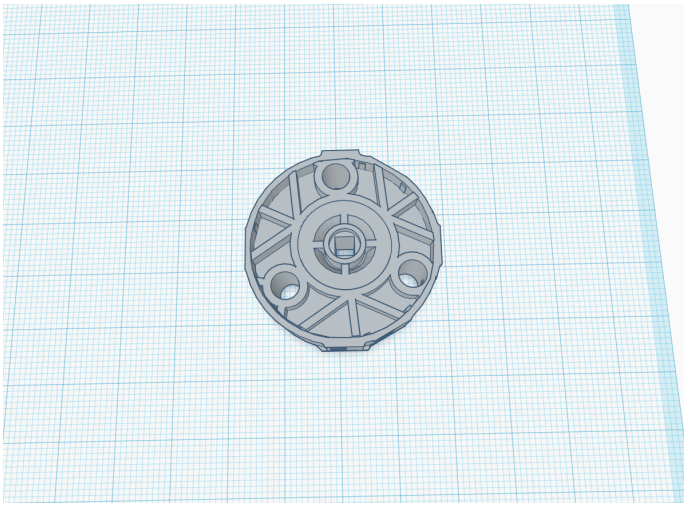
During the next step, I raised the middle section to be
taller. This is because in order for this part to work, connector pins needed to be able to work with this piece .



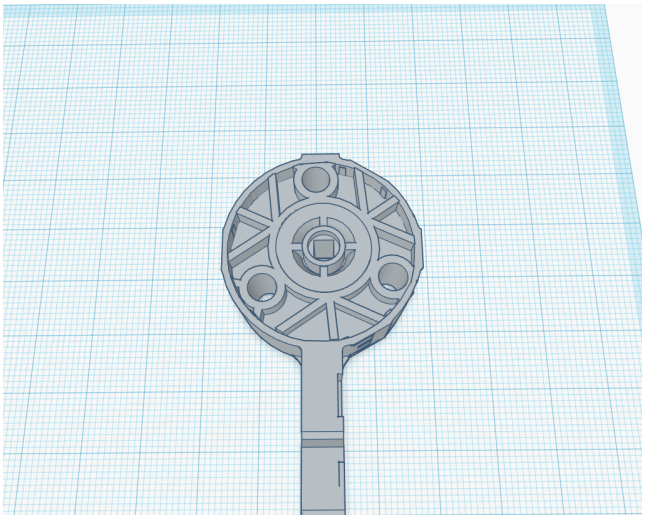
Next, I made the "legs" of the part squared instead of rounded. Not only did the part look better that way, I also had an idea in mind that the "legs" could eventually be extended with proper connection, by adding another squared beam on another side. This type of connection is another idea that I plan to work on in the future.

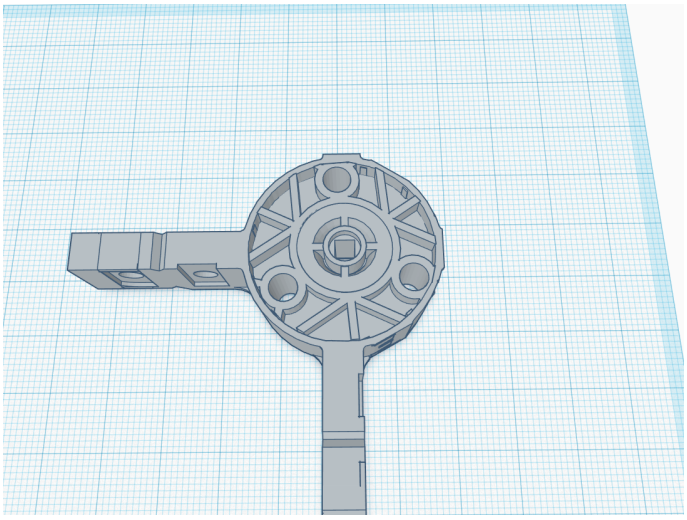


It was important to me that there was not anything like the piece I design in the Vex IQ arsenal yet, and my team thought that a "plus sign" type of plate would be more beneficial, so I decided to add 4 legs to my plate, instead of three.

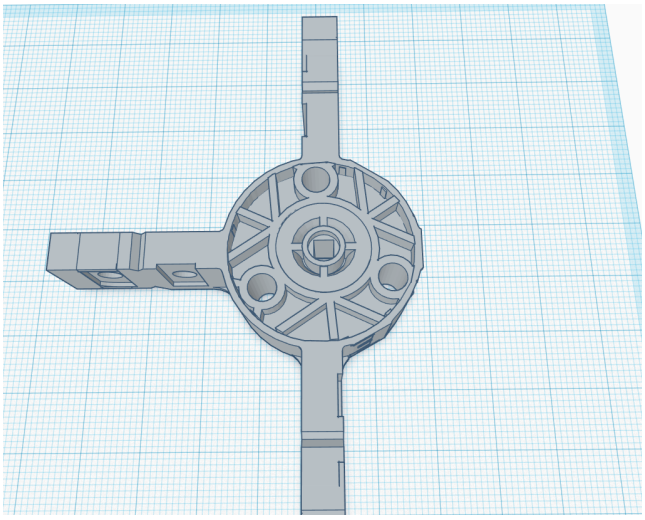


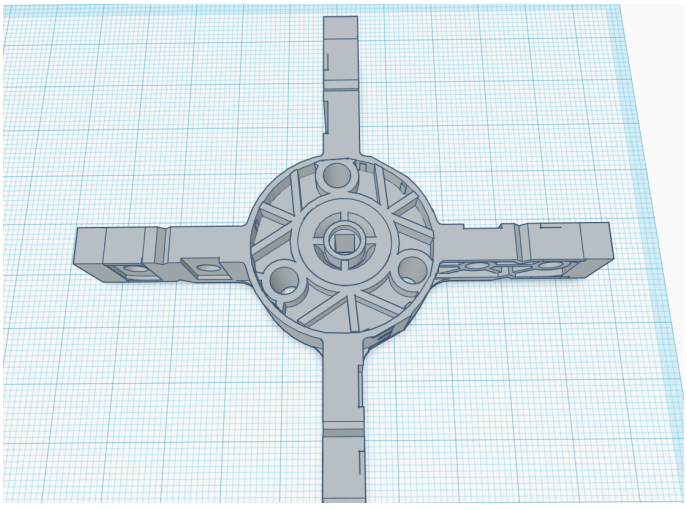
I cut the three "legs" off of the piece to start modifying it.



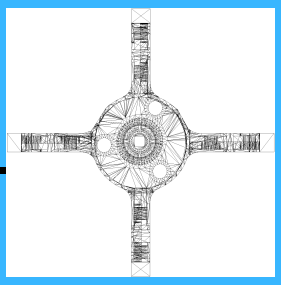


This is how I improved my model from a 3-way perpendicular plate to a 4-way perpendicular plate to improve function.



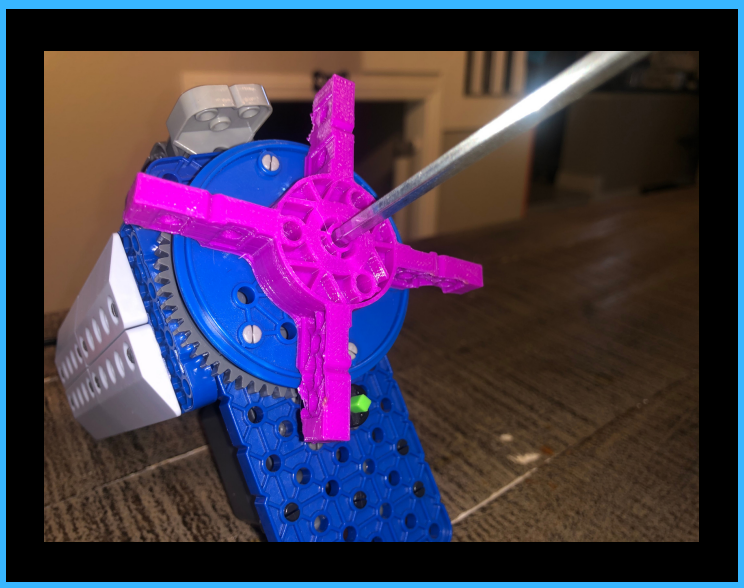


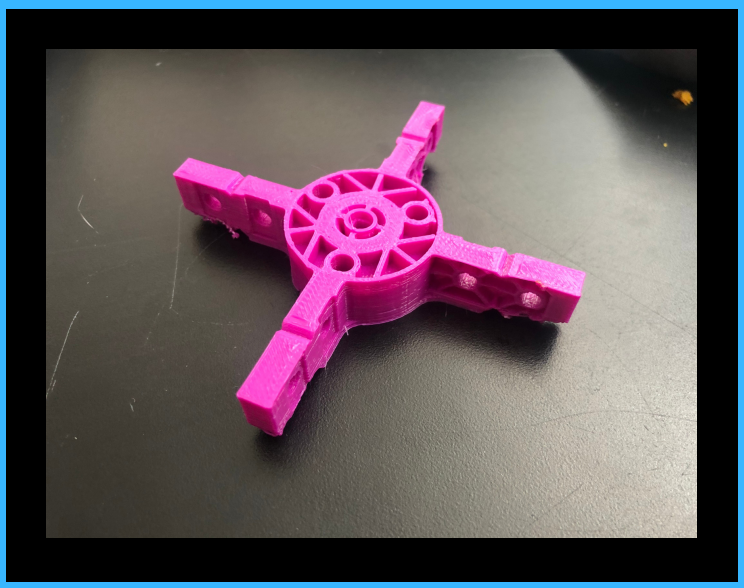
MAKE IT REAL



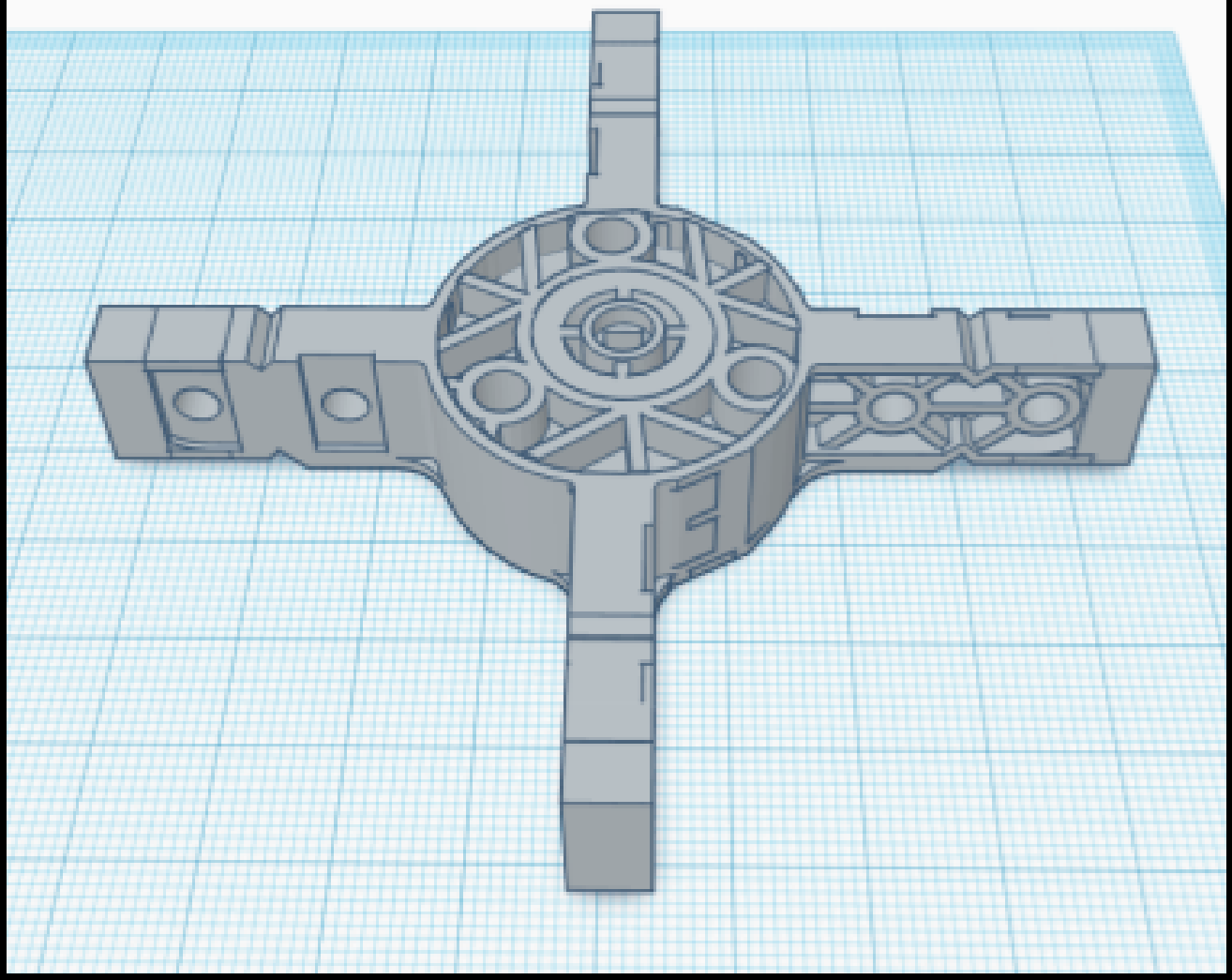
4-Way Perpendicular Plate - Convlusion!

I believe that this new part will be useful when it comes to building a robot. It took many modifications and 3D printing of the part before the design was finalized. The 4-way perpendicular plate will improve robots and their performance. During the design process, I learned that things aren't always going to happen right away and it takes time. Tinker CAD has helped me with a lot of my assignments and I hope it will be useful in the future as well. I want Tinker CAD to be used as a way to learn about 3D design and creating other useful things.





Software: TinkerCAD
Part name: 4-way perpendicular plate



Final word count: 953 words

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