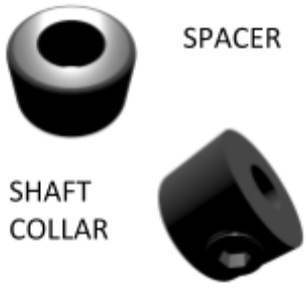
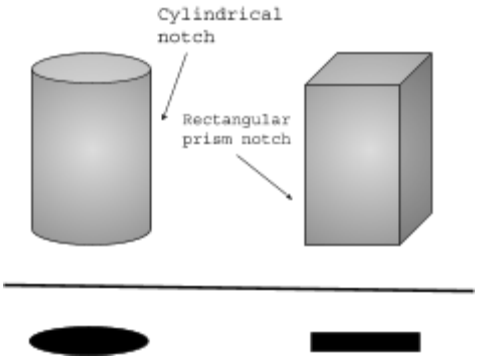
**Snap Together Kit Final Report**

Parts like spacers, shaft collars, gears, and wheels play very important roles in robot design. Almost all sections of the robot will require at least one of these parts, and often all of them at once. It can be very frustrating while building to take a whole shaft off just to put another spacer or other part in. The problem with these parts currently is that they are enclosed shapes, meaning that you must put them on by sliding them through a shaft. When a shaft is through two points of contact (like c-channels), you must slide them out in order to put a part mentioned above through them. To fix this problem, we have brainstormed and CADed...the Snap Together Kit, in which the enclosed shapes have been redesigned to snap together onto a shaft. This way, you won't have to take a whole shaft out to put something on the shaft - simply snap the piece on!

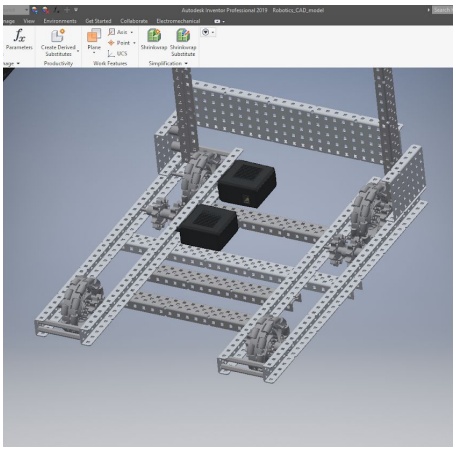



The current Snap Together Kit has only four redesigned parts: the 4.6 mm spacer, the 36T gear, a regular shaft collar, and the 3.25" traction wheel. In the future, we would envision the Snap Together Kit to have all types of spacers, gears, wheels, and shaft collars. The Snap Together Kit's parts can be used in all aspects of our robot design. For example, when building the drivetrain, we would use the Snap Together Kit so that spacing could be easily managed when altering the design. We could use the Snap Together Kit in our arm mechanism, which has a long shaft running through several c-channels. Here, we could use the Snap Together gears, spacers, and shaft collars. The possibilities are endless!




To make the Snap Together Kit, we first had to brainstorm. We drew out the parts we wanted to include in our design. In this way, we decided on the final parts: spacers, shaft collar, gear, and wheel. Another aspect of the design that we brainstormed was what kind of notch to have. We looked at cylindrical notches and rectangular prism notches, and used a decision matrix to decide. We ultimately decided on rectangular prism notches because they scored high in strength and frequency of use.

The software we used was Autodesk Inventor Professional 2019. We were relatively new to CAD, so our design was simple. To make each part, we started by importing the original part given by VEX Robotics. Then, we cut the part in half using the extrusion tool by extruding negatively into each part. For the top half of the part, we added notches by drawing rectangles and extruding them. For the bottom half of the part we copied the top half but extruded rectangles negatively to create a hole (the notches would snap into the holes). We used this process for all the parts.



We learned a lot from this project. Of course, how to CAD is one thing we learned, but we also learned the importance of design (earlier versions of this idea failed) and brainstorming before CADing. We discovered how useful CAD can be when actually prototyping a design. We will definitely use CAD in the future to design our robot because we can see how our designs can look before we build them. We could also use CAD to design more helpful parts like battery holders, wire clips, and license plate holsters. Overall, this was a great project to undertake and it really helped introduce our team to CAD. As well as being engineers, programmers, and drivers, we will now take our first steps towards being 3D designers.

Captions:
1st picture - “Spacer and Shaft Collar”
2nd picture - “Digital Brainstorming Sketch”
3rd picture - “Now CADing Our Robot!”