

## VEX ONLINE CHALLENGE AUTODESK ESSAY:

TEAM 7870 E

As any robotics participant can attest to, the shaft collar is one of the most challenging parts to work with. Reasons vary from the fact that the set screws are often lost or broken to the fact that collars tend to fall off easily during a competition. For this reason, our team designed a new shaft collar, based off the original, in order to optimize its use in the everyday robotics and to fix the issues mentioned previously.

Our new part would end up fixing all these problems by a very simple solution. We accomplished this goal by adding an additional three screws onto the original shaft collar design. The screws now go along a two-axis plane (with the center being the center of the collar) where each screw is perpendicular to one it's adjacent to. By doing this, the force applied to the collar is quadrupled as each screw applies the same amount of force as the original design perform. By our estimations, the original shaft collar included within the vex starter kit can apply 50 pounds of force on the adjoining axle. But with our new design, the collar has the potential to apply over 200 pounds of force to its connected axle. This then solves the problem of collars falling off during competition, since the force of the new collar should be to always keep a tight hold. Also, since there is more than one screw applying force to the axle, if one was to fall out than the other three would be able to keep it in place until the end of the competition, fixing all the problems from the original design.

When designing our new part, we used the revolutionary software **Autodesk Fusion 360 (Version 2.0.5119)** to design our new part. We began designing by drawing two circles, sharing the same origin, with two different diameters (11mm and 4mm). Next, we drew a square with the dimensions of 11mm x 11mm sharing the same center as the two circles. This was done to help us create the screw holes when it came to that point. Then, we extruded all three shapes 10mm along the z-axis, creating 3D figure. Next, we changed the viewpoint to where we were drawing on the z and x plane. This then allowed us to draw a circle with a diameter of 4mm on the side of this cube and on its other adjoining side. Once this was done, we extruded the two side circles across the cube to the other side. After this, we were able to delete the cube since its purpose was to help place the position of the screw holes. The last step in creating this part was to delete the 3 smaller cylinders from the overall larger (11mm) cylinder. From here we were able to 3D print a model of our new collar direct from the program (**see pictures attached of 3D printed part**). That is how Fusion 360 allowed us to create a model of our 3D part.

After completing this project, we learned how to apply skills we've learned in school such as various geometric theorems which we used to build the new part. Fusion 360 and other similar software's will be useful in the future since the majority of our team will be entering various engineering fields such aerospace engineering. These skills will be useful since all engineering fields require innovation, and this software allows us to create whatever we imagine and allows for various testing methods. In the end, this challenge allowed us the opportunity to learn how to use this program, which will become a life skill.