**The Anti-Tip System**

The most common flaw among all of the Vex Robots is a lack of stability, and balance. In order to combat the issue, we used the CAD Challenge as an opportunity to create the solution. We call it the Anti-Tip System, which is being proposed as a kit that provides the teams with options that can accommodate almost any robot.

As common practice among engineers, we started out on paper. We brainstormed solutions to the issue, and then we sketched out the designs and did the calculations to find the dimensions that would allow our parts to be compatible with the Vex part measurements listed in the Vex Store.  After our plan was completed, we moved into the CAD stage.  We used SolidWorks 2014 to create the parts.

We began with wheel design. We based the general design off the Vex wheels, but sized it down to a one inch diameter. The wheel is compatible with the current axle shaft size, which also leaves allows for usage outside the Anti-Tip System. The wheels are optimal for robots traversing rough terrain, or for long-term utilization.

To make the wheel, we had to first make one half of the outer rubber part and then mirror it.  This was done by making a cylinder and then filleting it to the correct curvature.  The plastic part that has a hole for the shaft was created using the extrude-boss and extrude-cut features.

The second component to our kit is the bracket, which has a different and innovative design from most Vex structure pieces. The holes on the top face of the bracket are parallel, while the side faces have holes in a diamond formation. This was done for best attachment, and adjustability. As an additional option, the Rack Gearbox Bracket accommodates the parts. Said bracket fits best in situations where the bracket will need to extend the stability component to the field surface.

The bracket was created by making a rectangular prism and extrude-cutting the inner bracket.  Next, we cut the square holes that are featured in all Vex Parts.

   The second stability component is designed to emulate a ski, or sled. It glides across the field with low friction, so not to reduce the robot’s velocity. It is best suited for smooth planes, and being used just for touch-downs and realignment. The ski also offers more adjustability. It has three different heights to which it can be adjusted.

    The ski was created by extruding up from the first face with a larger rectangle then extrude-cutting down from the top face with a smaller rectangle.  The larger rectangle was then filleted to give it the ski shape.

   We 3D printed our parts at school, so we were able to test our parts. They all met their goals, and were able to sustain a lot of force. The Anti-Tip System allows the robot to stay in the competition, and go for the big points!