The part is a modified version of the pulley that we have designed following the Skyrise competition at our local high school. It features a 3 x 3 x 3 U-shaped box containing a pulley connected to an axle through the left and right plates and 2 shaft collars. The pulley is static. Please see the attached diagram for more clarification. Detailed below are explanations for how this new part can be used, how it can be integrated and how CAD was used.

**Usage**

A very common usage for this part would be in building linear elevator lifts out of linear slides. Instead of the more commonly used chains, this method uses rope. In a cascade style setup, this part would be attached near the top either directly to the linear slide or to a metal plate connected to the linear slide. The rope would then be threaded around the pulley and latched onto plates near the bottom. The plate that is attached directly to the top of the pulley is to circumvent the problem where the rope falls off when the lift is coming down. This part can also be used in the establishment of a continuous setup, although greatly more complicated than a cascade setup.

**Interaction**

This part can interact with other VEX parts in 3 distinctly different ways. The first way is connecting axles to the shaft coupler and securing that axle to a plate via an axle bearing and shaft collars. Another way that this can be connected is being bolted down via the 3 by 3 plate from the left, right and top plates. This way, the pulley has additional structural support and would be less volatile compared to before. Furthermore, the part mainly interacts with the rope to create lift systems capable of ascending to tall heights with game objects.

**CAD**

CAD Software, AutoCAD, was heavily used to facilitate and design this new part and a sample application on a robot. One of the major features of AutoCAD that I used was the “Import” feature in which I could import pre-existing VEX STEP files for the various components that I needed for the creation of the new part and the robot. Furthermore, I heavily relied on the EXPLODE, CONVTOSURFACE, UNION functions in order to be able to modify VEX’s preexisting models of the various parts. Building on that, I also used AutoCAD to be able to visualize and see how the part could be used with other parts and functionality through experimentation of the placement of certain models. As an example, I contemplated using a 5 x 5 x 5 U shaped model. I ran the model through AutoCAD and realized it might be a bit too big and unwieldy, leading me to finalize on a 3 x 3 x 3 U shaped model. As such, I used CAD software to not only finalize the design but to also actually virtually make the model and view its interaction with other objects.