12A Make It Real CAD Engineering Challenge Report

We are 12A from Potomac School Robotics, and we designed a 1 hole aluminum c-channel, and we are also currently using 2 1 hole c-channels on our team’s robot, a 1x1x1x9 and a 1x1x1x12. Our created part, the 1 hole c-channel, is integral to the design of our mobile goal manipulator because we wanted a light piece that was also very strong. Interestingly, the 2 hole c-channel was too heavy and took up extra space, but a cut plate lacked the necessary structural integrity. On our robot, The 1 hole c-channel functions well at connecting the c-channels of our mobile goal manipulator without deformation or weight/space issues. This helpful part could also be utilized for many other mechanisms and scenarios, like acting as a support beam, part of a light chain bar, and more.

I created the 1x1x1x35 c-channel in Autodesk Inventor Professional 2018, and began by cutting a 1x2x1x35 c-channel, leaving 1 side with 1 row of holes (by making a rectangle 2D sketch and extruding it). I then measured the length of from the side of the c-channel to the middle hole, and extruded the length from the hole to the cut side to be equal, making sure both were 0.081 inches. After measuring the height and depth of the front of the side, I created a 2D sketch and used the arc and line tools to create a matching side. I then extruded the sketch, first the arc, then the rectangles. To make the holes along the new side, I projected geometry from the other side and extruded to delete the extra material. I then cut the 1x1x1x35 into a 1x1x1x9 and a 1x1x1x12. Lastly, I projected geometry onto all surfaces and sketched circles in square holes.

This is my first year using Autodesk Inventor, and previously I had only used the design software to assemble mechanisms, not create new parts. In the making of the 1 hole c-channel, I used some of the tools from before, such as Extrude, but in different ways, and I also had to rely more heavily on 2D sketches. So far, the use of Autodesk Inventor has been very advantageous for our team to see the exact point(s) of weakness from stress tests so that we could reinforce them in the real life version, or see the strong and weak parts of different designs in order to choose the best option. Applying the knowledge we gain from Inventor to our robot is helping our team do the best we can in competition. In the future, we plan to continue using Autodesk Inventor to critically examine the mechanisms of our robot. Additionally, in practicing and mastering this type of 3D design software we can gain the skills necessary to fill needed careers in engineering and animation fields. As we apply Autodesk Inventor to solve engineering problems and design prototypes, it prepares us to be the engineers of the future.