Element G

Problem Statement

One in six women are a victim of sexual assault. Women from the ages 18 to 24 who don't have the physical means to fight back are the ones most commonly attacked. The victims afterwards then suffer mentally, physically, and financially for something that they weren't responsible for.

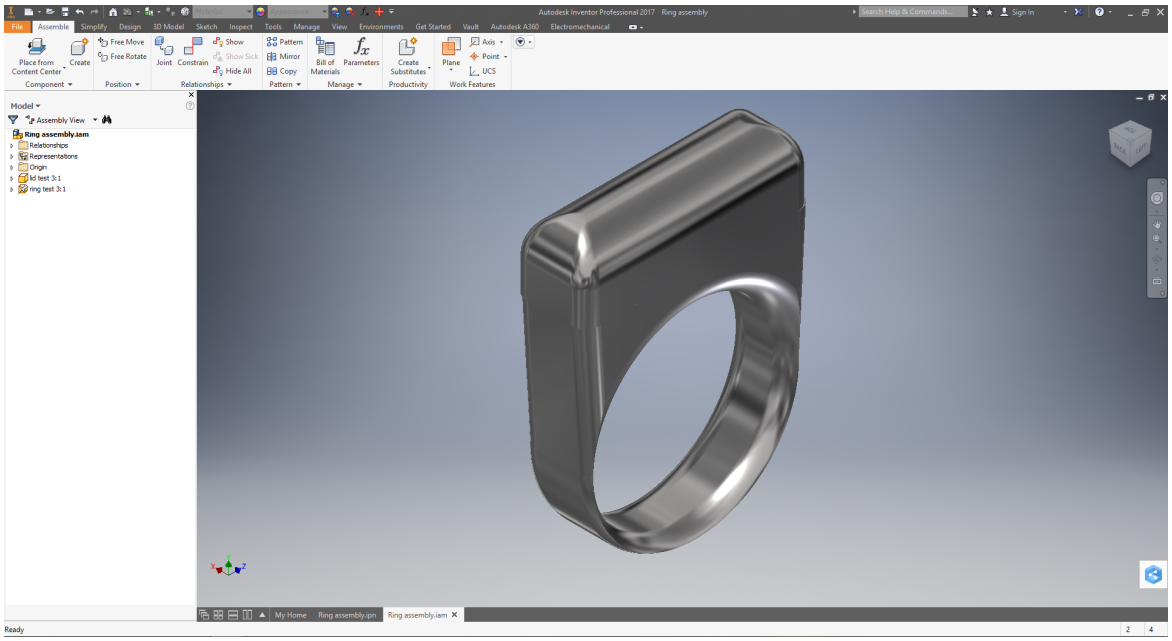
Introduction and Background Information

We used the 3D modeling software called inventor to create a prototype. In order to create a prototype at such a small scale and accurately we had to use the software. The first step was to create three different prototypes to see which one would work best. Two prototypes were eliminated because of an issue to where the 3D printer can not print a hinge on such a small level, it was too brittle. The final design had to undergo some changes in measurements because there was not enough tolerance between the pieces and the prototype needed to be in various sizes.The prototype was made out of abs plastic because of its availability and use in 3D printing. The actual product would be made out of stainless steel.

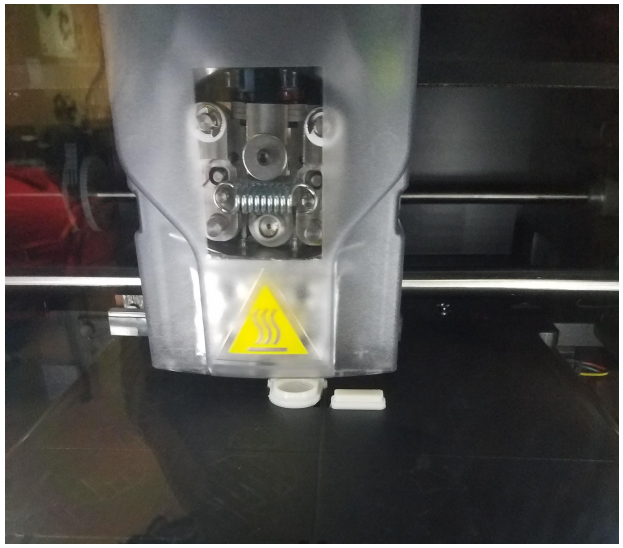
In the design requirements we listed the the prototype needed to be compact, easily accessible, durable, harmful but non-lethal; inexpensive, and easy to use. The prototype is compact because it is the size of a normal ring plus only a centimeter above the finger. It is easily accessible due to it always being on hand. Durable because when made out of metal it will not break; Harmful because it will leave minor cuts and bruises but does not have the potential to kill due to the small blade. Inexpensive because of the small size. Most importantly easy to use because all it takes is the removal of the cap and a punch to be of use.Therefore it meets all the design requirements set out.

Prototype Fabrication/Construction

The first step of the construction process was to use 3D modeling software to create a digital model. After the correct measurements for ring size were found,a 2D sketch of the side of the ring that was then extruded to include depth. Small holes were then cut out of the design to provide room for the lid. Then the sides were filleted to create a smoother design. Another piece, was then made in the same manner with a 2D sketch that was extruded and pegs extended from the design, and curved.The pieces were then assembled in the software to check the size of the pieces compared to each other and the tolerance between them.

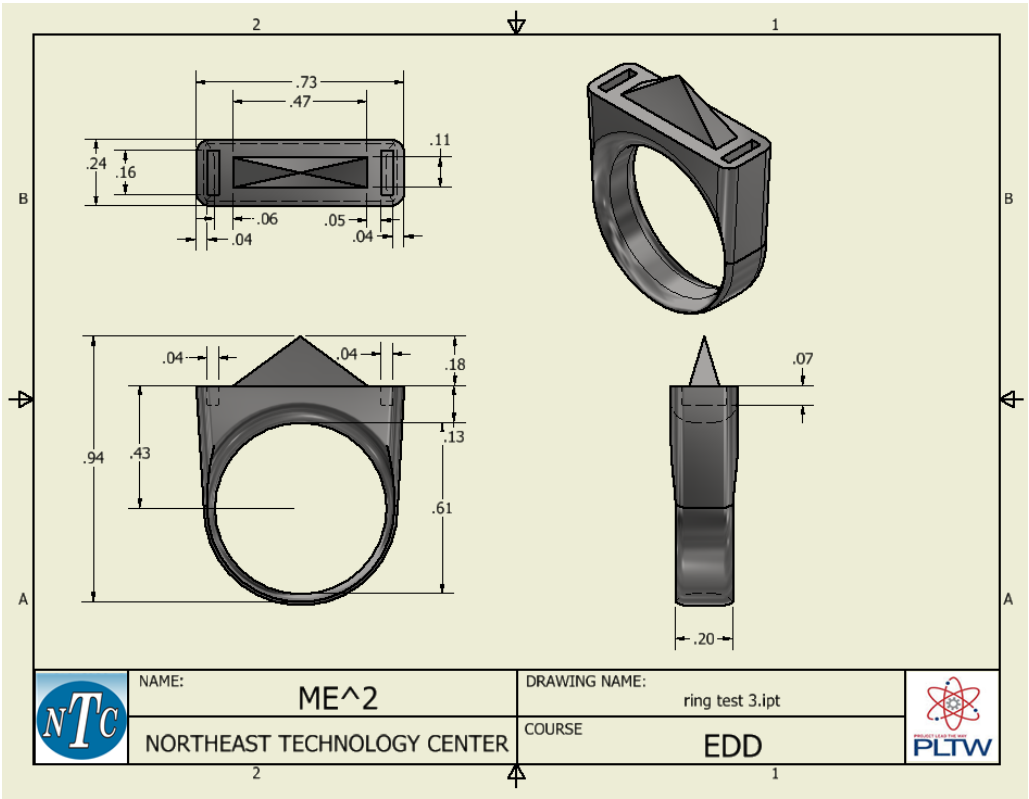


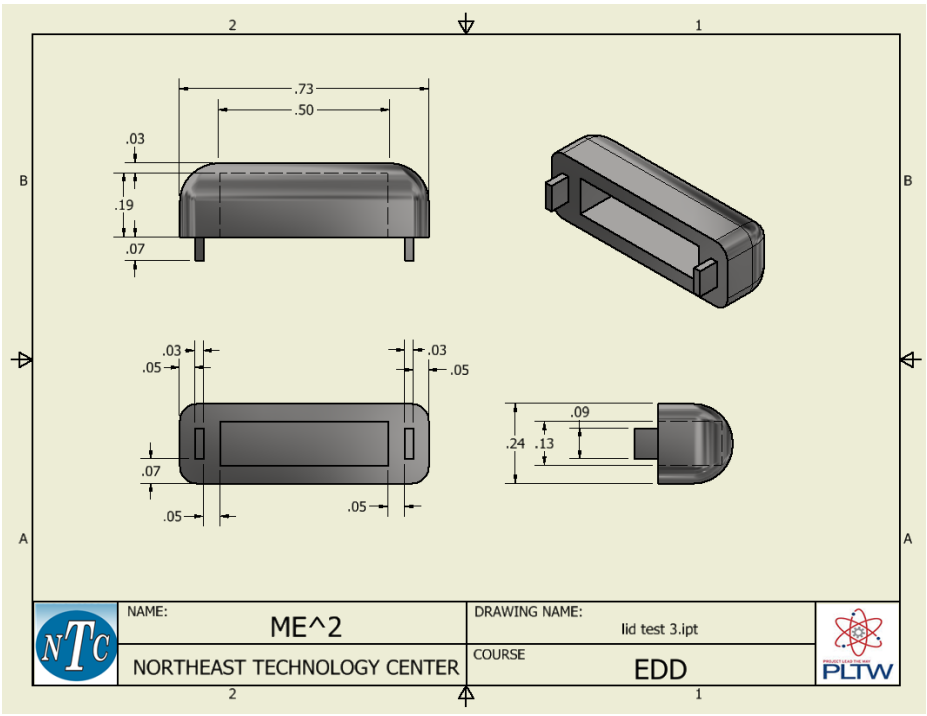
The second step was the actual creation of the prototype. The files of the two pieces were converted to stl files and then put into the software for a Stratasys UPrint SE+ (3D printer). The pieces were then printed and put into a soaker to dissolve the support material. Leaving the prototype behind.



Detailed Drawings

The drawing is of a self-defense prototype. It has a removable cap that can gets pulled off to reveal the inside. In which a small blade attached to the ring is exposed. The lid is attached via two pegs that do into holes on the ring.

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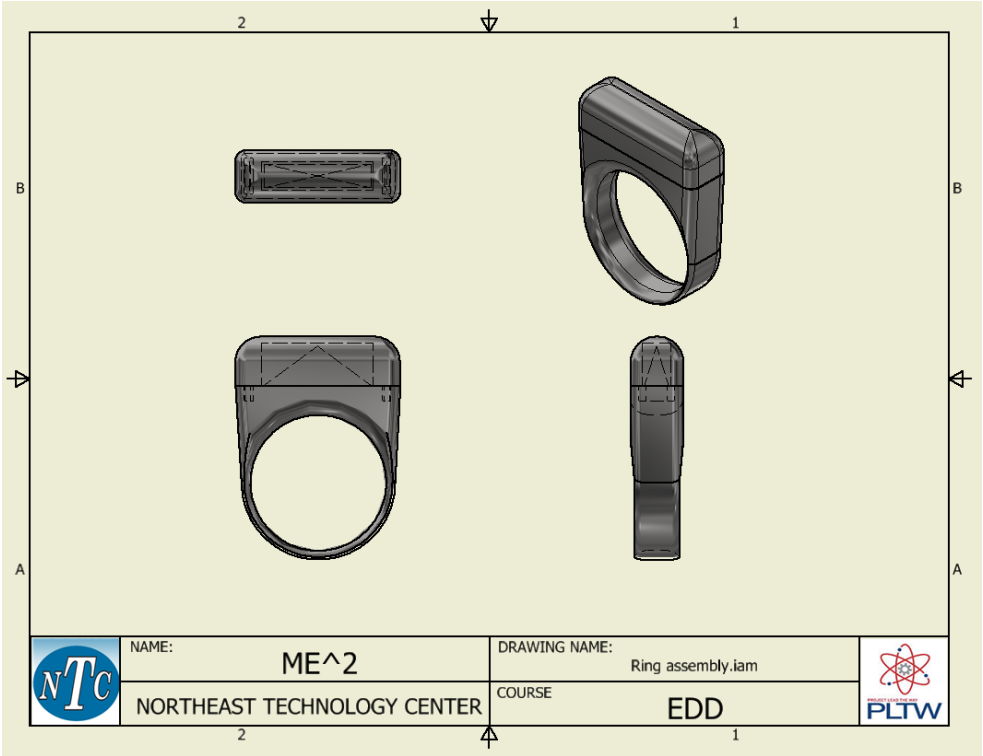
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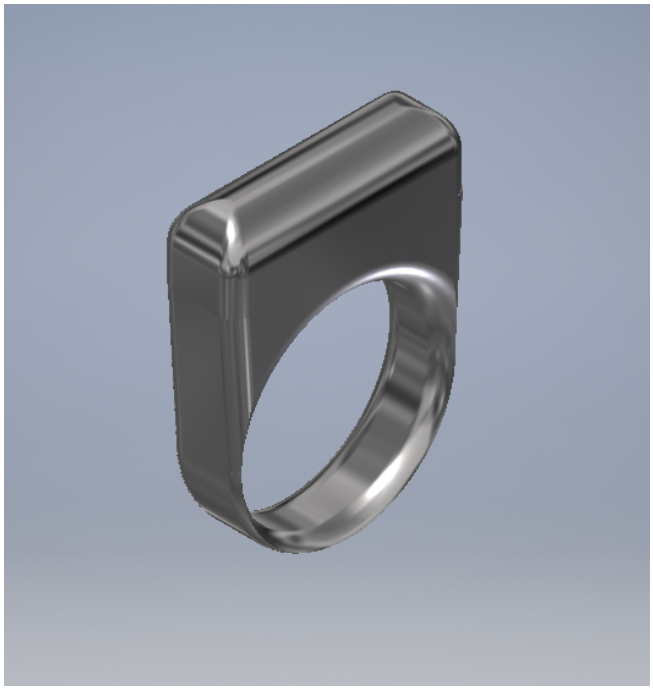

Conclusion

The prototype was created by using inventor to create a model and then printing it. There were several problems with the dimensions and tolerance of the ring. Changes had to be made to fix the pegs so the lid would stay on the ring. This required multiple prints to get the dimensions correct, which they did after about seven prints. Finally adjustments were made to have rings that fit multiple people. The next step of the process will be to test our prototype with our design requirements.