

# 3-Dimensional Printing for an Innovating World

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## Introduction

3-dimensional printing has been a new technology that is increasing in popularity due to its convenience and accuracy. Stratasy's who manufactures 3D printers, anticipate that this industry is projected to double in size every three years.

The purpose of this research was to investigate the how this technology can be used in different sectors and to attempt to create a design for educational purposes. Aerospace, healthcare, and education are a few sectors that have expanded their usage of this technology.

## Aerospace

NASA has started to explore different materials to use to design and test for the anticipated use for their rockets. This thrust chamber is 3D printed using a metal additive process known as Laser Metal Deposition (LMD).



Figure (above): 3D printed thrust chamber. Credit NASA

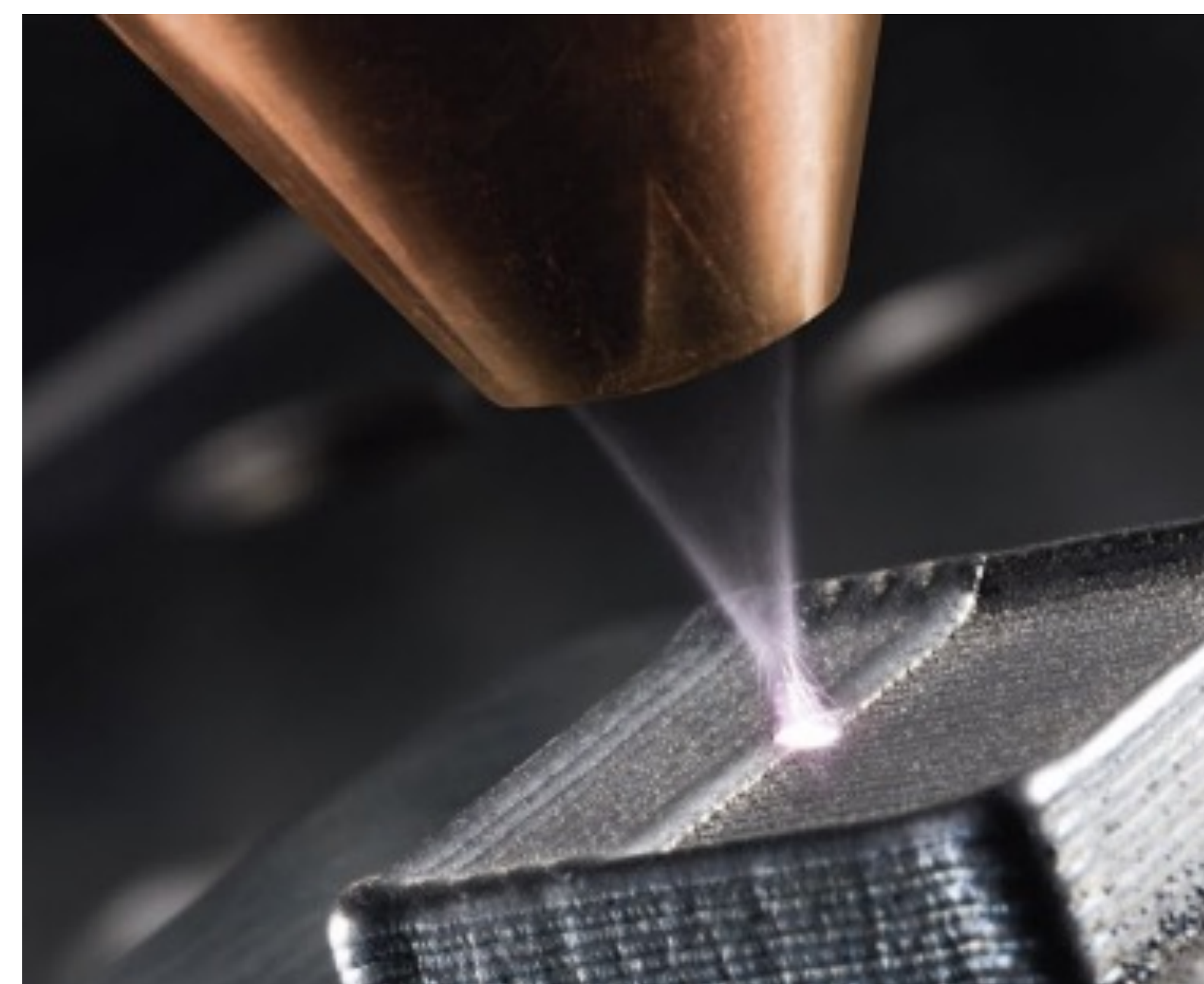


Figure (above) : An example of LMD in use. Small beads of metal are lasered as they come out onto the object. Note the layers being bonded on top of each other. Credit Trumpf



Figure (above): Shows the rocket chamber being tested. Credit Aerojet RocketDyne

## Medical

The Centre for Biomedical Technologies in Australia has utilized the use of 3D printing to design accurate surgical guides to allow surgeons to adequately plan their method of approach prior to surgery. This approach has proven to be convenient and safer than the traditional methods.

Figure (below) : The J850 Digital Anatomy printer. Credit Stratasy's



Figure (above) : The method of Polyjet printing allows various colors and textures to mimic the human anatomy. Credit Stratasy's

## Educational

Computer aided design (CAD) allowed me to create a physical object of an x,y,z vector for the demonstration in an introductory physics class. The freedom of design and function without the limitation of traditional manufacturing makes 3D printing very appealing approach.

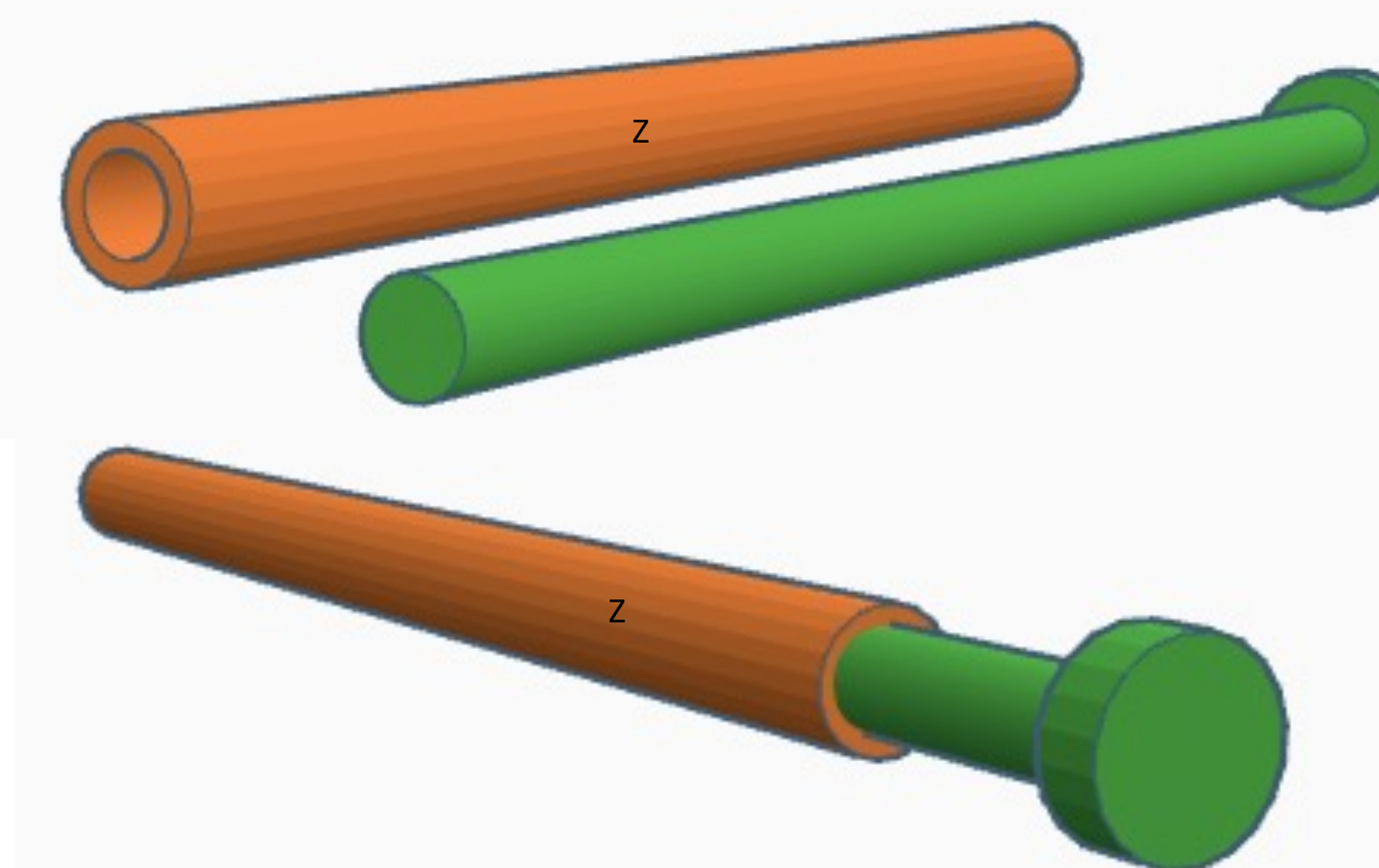


Figure (above) : This design was created on a free online platform called Tinkercad. Most shapes are part of their free library. This is the "z" vector that will shorten or lengthen depending on the angle between "x" and "y".

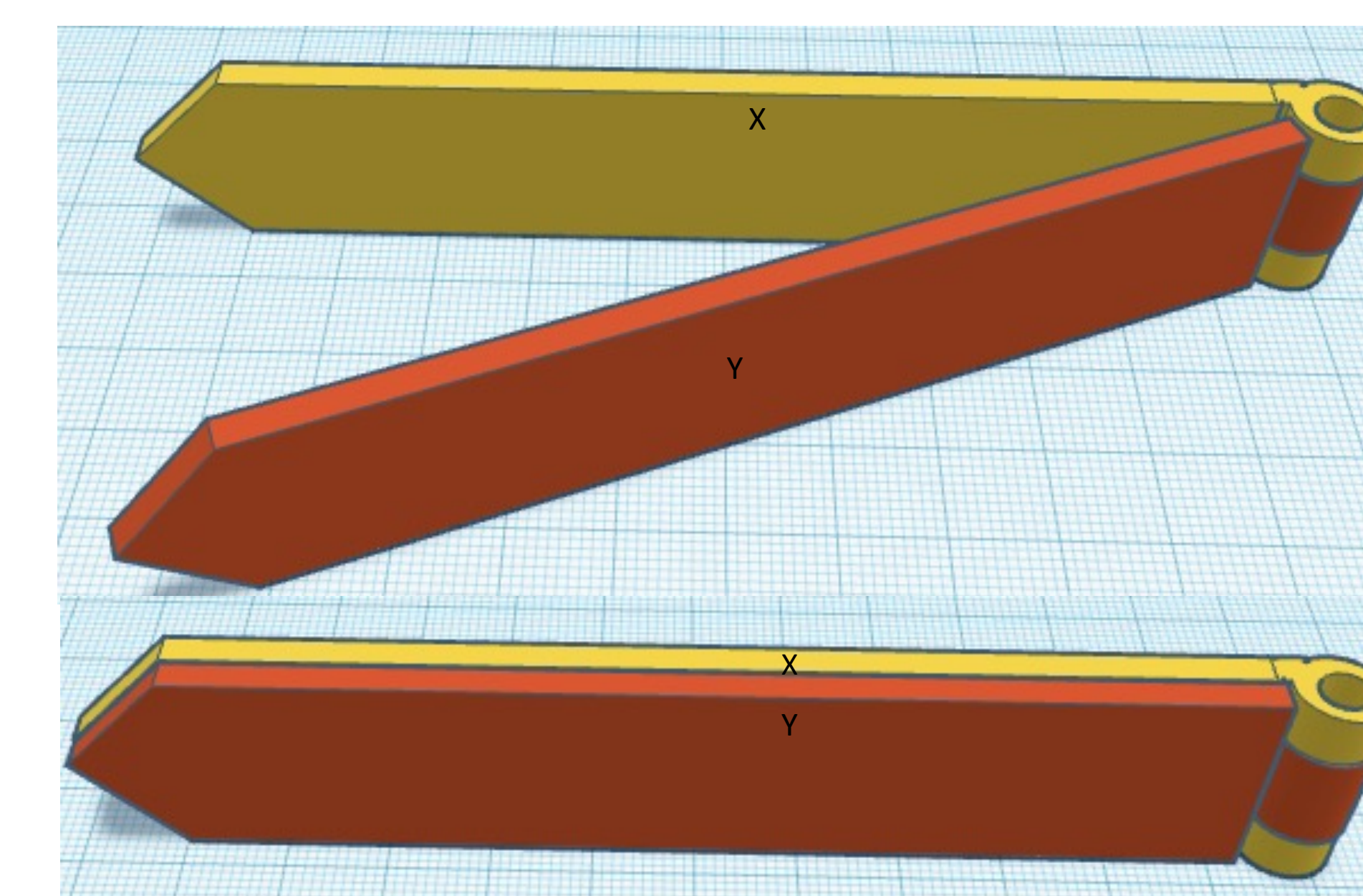
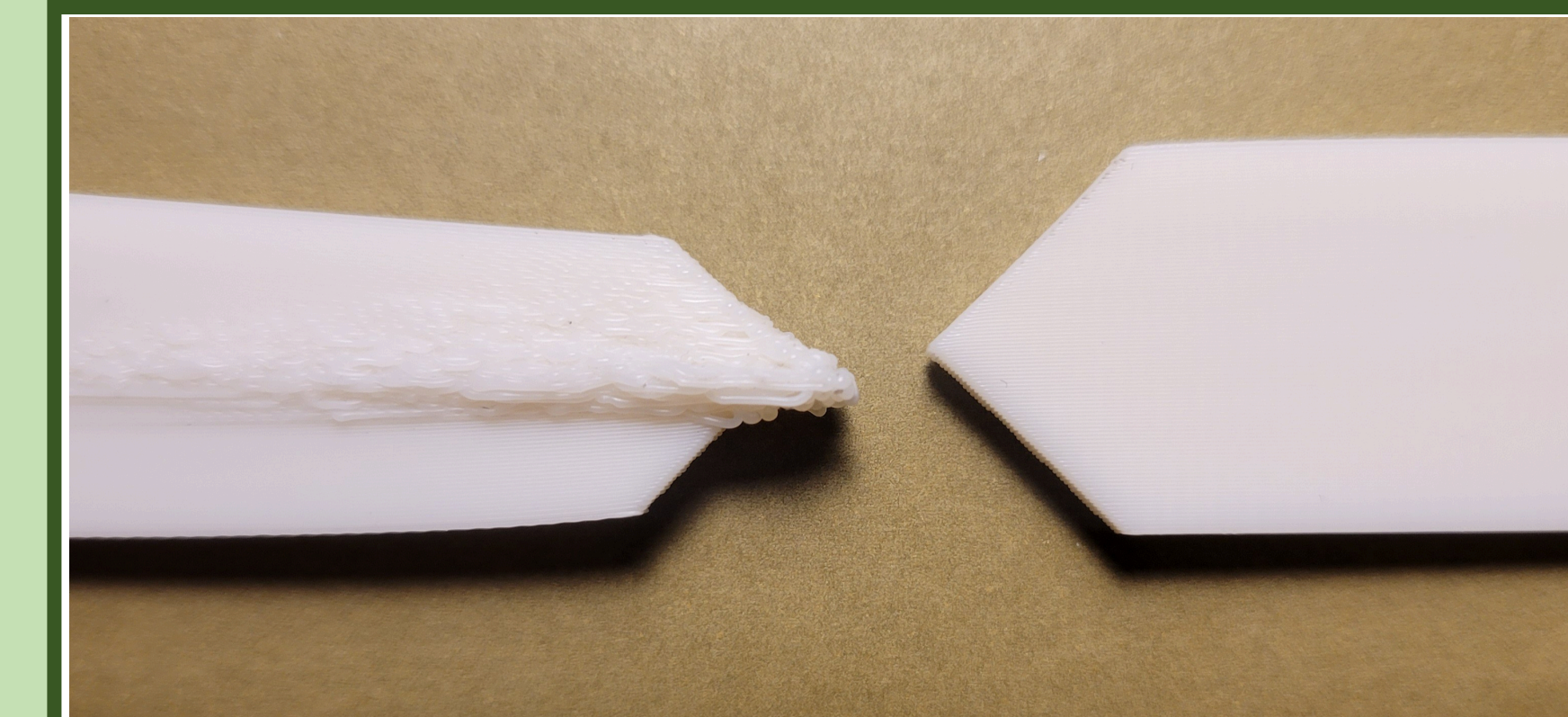


Figure (above) : This is the "x" and "y" vectors. The open and close on a hinge.

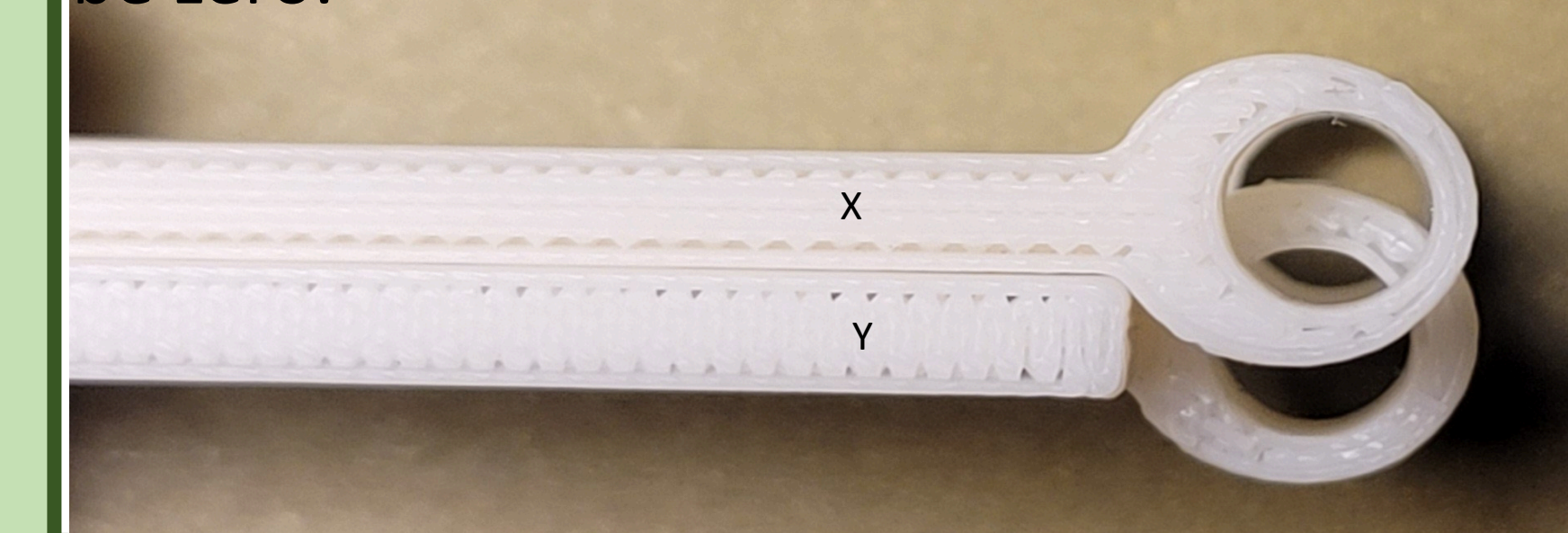
## Results



We had a total of three attempts and each attempt deemed non-functional. These issues can be categorized as a printer or a design issue.

The picture above demonstrated a printer calibration issue. Notice that the left vector is malformed compared to the right vector which was printed as it was designed.

The picture below demonstrated a design issue. The hinge prevented the pin (z vector) to go through both holes and the "x" and "y" vectors wouldn't fully close to get the angle to be zero.



## Conclusion

3-D printing is an emerging technology that can further develop for the possibility to perform any function we choose. These sectors are a few of many that have started to implement this technology to further advance. The beauty of this technology is that it can be learned with the will and determination to turn a novice into an expert. These printers can range from the hundreds to the hundred thousands depending on the function you would like it to perform.

We still do not have a functional prototype, but I believe with each design that is printed I will be able to finalize our educational object.

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