

# 3D Printing of Senior Project Satellite Design

Presented By: Mike Gentile, Mike Wright, Dan Leighow, and Jimmy Cosgrove

## Materials

There are many different materials to make a satellite out of that are effective. Picking between wood, metal, and plastic the answer was obvious that plastic had a better strength to weight ratio along with easy design process. Printing with PLA and ABS was the final decision and ABS came out on top with strength and durability.



Figure 2: ABS vs. PLA 3D printing plastic

## Time of Production

3D printing time depends on the size and complexity of the print. A prototype will a finer, higher resolution print will take much longer, but will look very much smoother.

Printing on campus is faster than spending the design out to a 3rd party for printing. After a design is sent out, the waiting begins. The prototype must be printed, the print would take the same amount of time on campus, but then there is additionally waiting time; waiting for the company to have a printer available, packaging, and shipping.

The satellite frame design was submitted to [www.nextlinemfg.com](http://www.nextlinemfg.com) for a quote. The quote was 1-3 days for printing plus standard shipping, 2-8 business days. The satellite was printed on campus in 19 hours.

## How It Works

3D printing begins with the basis of design of the object you want to create. Our satellite was designed in various pieces and printed individually. The printer takes the program design and creates the 3D object by applying layers of coordinates.

## Advantages/Disadvantages

Manufacturing is an essential advantage due to easy production, where products could be manufactured fast at low cost and be warehoused. 3D printing creates has also made a innovation to the medical field by creating customizable organs.

A delay in the practice of using 3D printers comes with the ability to create dangerous objects and the problem of copyright of products being nearly impossible to determine to be utilized.

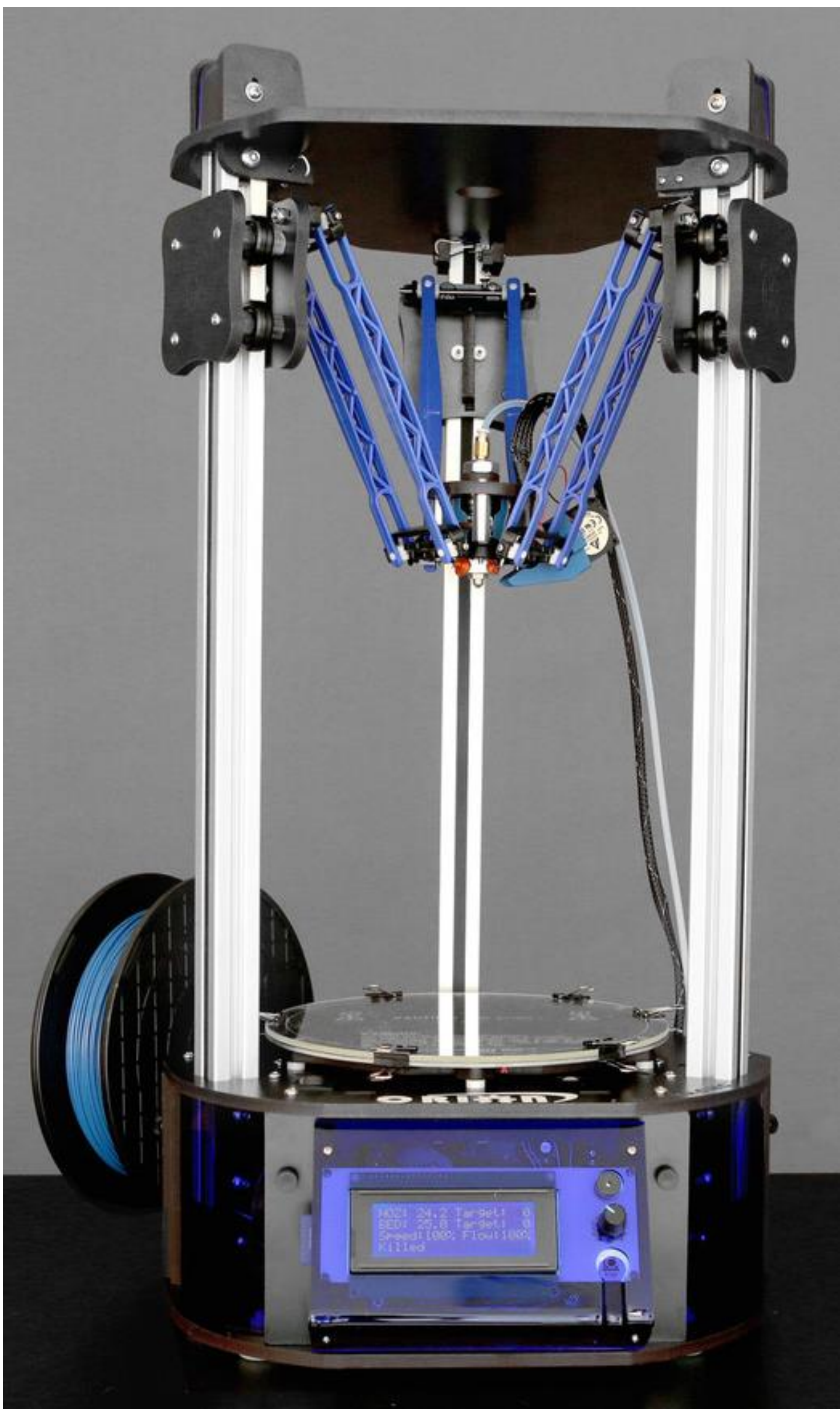


Figure 1: Delta 3D printer used to produce satellite.

## Cost

The comparison between in house printing and outside prototyping includes set up cost and cost per piece.

### Set up cost

Prototyping Free Vs. In house Printing \$1160 (Grant Awarded)

### Cost per piece (Example piece shown in Figure 3)

Prototyping \$271.05 Vs. In house printing (Shown in Table 1)

Material	Cost per roll	Approximate Area	Cost Estimate (Figure 3)
ABS	\$16.00	800 cubic cm	\$1.05
PLA	\$16.00	800 cubic cm	\$1.05
LAYWOOD	\$35.00	200 cubic cm	\$9.17
LAYBRICK	\$36.00	200 cubic cm	\$9.43
Nylon	\$47.00	800 cubic cm	\$3.08
PVA	\$45.00	400 cubic cm	\$5.90
Bendlay	\$75.00	600 cubic cm	\$6.55
TPE	\$75.00	600 cubic cm	\$6.55
Polycarbonate	\$75.00	600 cubic cm	\$6.55
Polystyrene	\$39.00	800 cubic cm	\$2.55
Conductive ABS	\$48.00	400 cubic cm	\$6.29

Table 1: Cost for 1 print of satellite frame shown in Figure 3

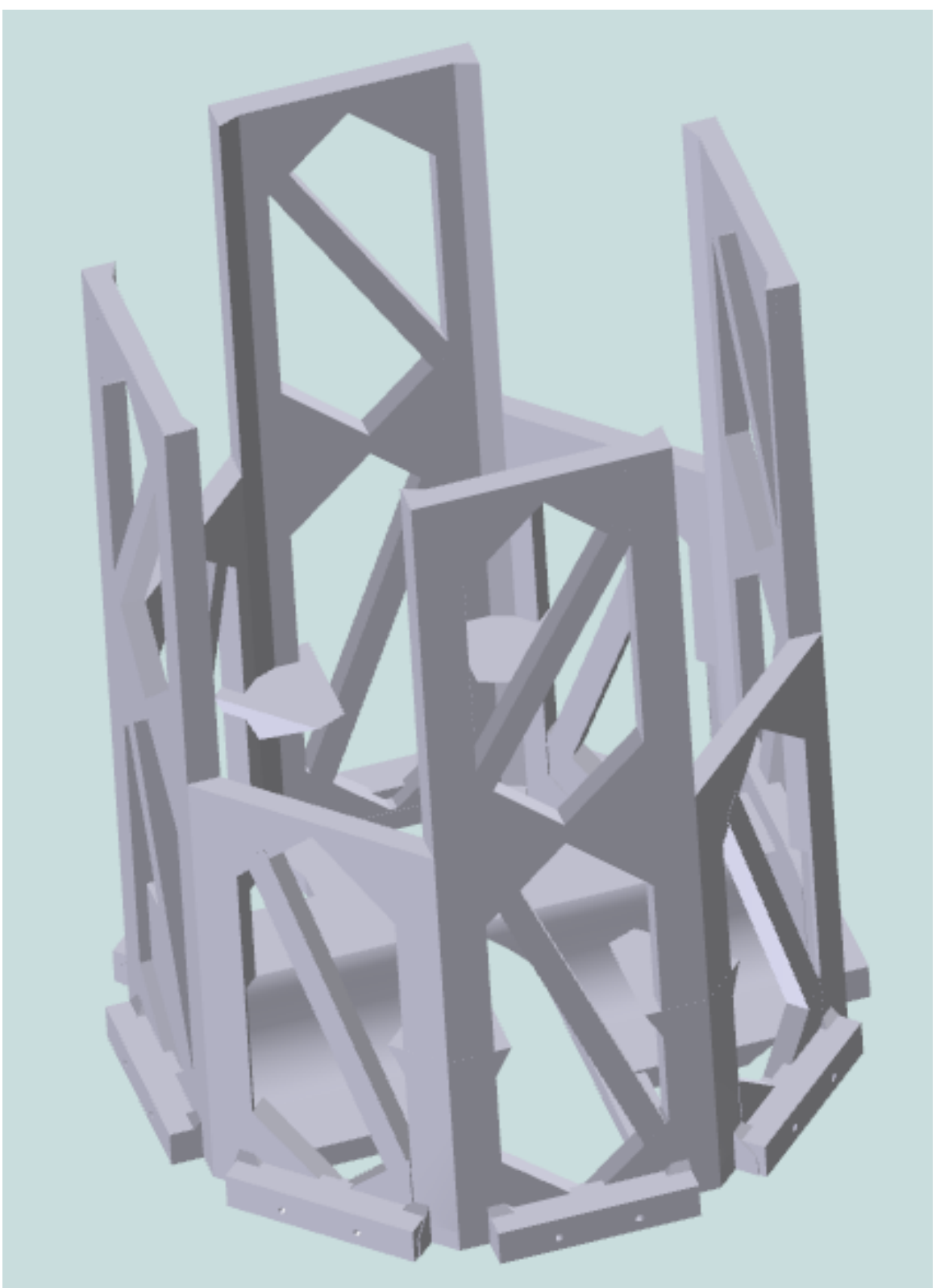


Figure 3: Piece of satellite

## Grant Information

The grant is for \$5000 and is planed to be spent on three 3D printers and on 40 rolls of plastic.

