

# THE DIFFICULTIES & POSSIBILITIES OF RAPID PROTOTYPING USING ADDITIVE MANUFACTURING ON MARS

Omer Bowman

# WHY WE NEED ADDITIVE MANUFACTURING WHEN WE GO TO MARS

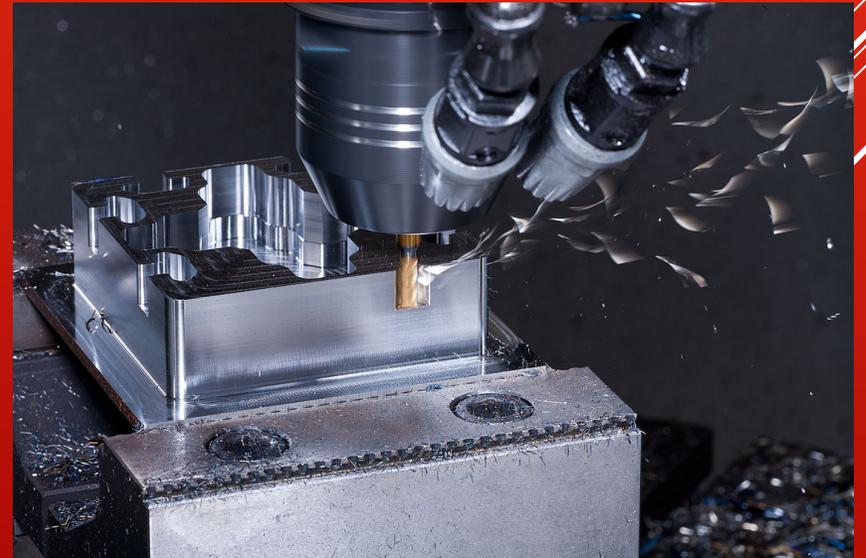
- Allows for rapid prototyping of tools and equipment
- Can create custom-made tools that can be used to solve specific problems that may arise
- Requires little machining knowledge and is safer to use than operating machining tools



# OVERVIEW OF CONVENTIONAL MANUFACTURING

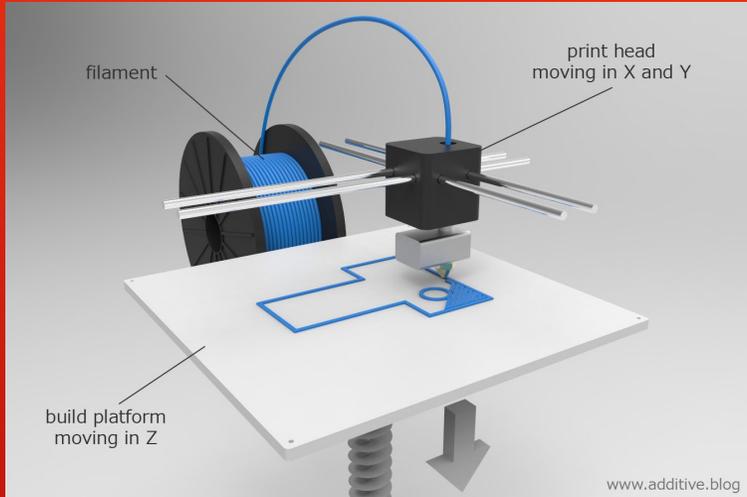
## SUBTRACTIVE MANUFACTURING

- Uses more material than the final product requires
- Requires large and potentially dangerous equipment
- Not efficient and usually cannot recycle discarded material
- Limited shapes and designs to what the tools allow



# ADDITIVE MANUFACTURING METHODS

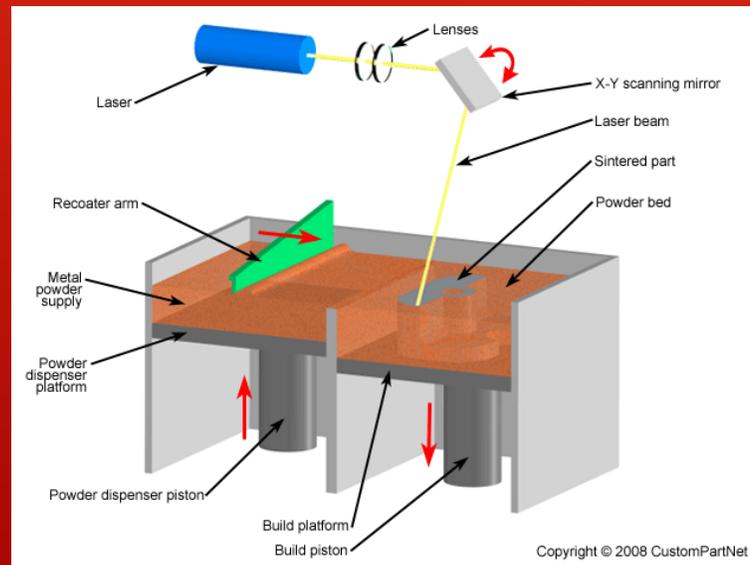
## Fused Deposition Modelling (FDM)



## Stereolithography (SL)



## Direct Metal Laser Sintering (DMLS)

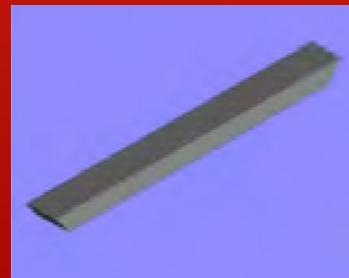
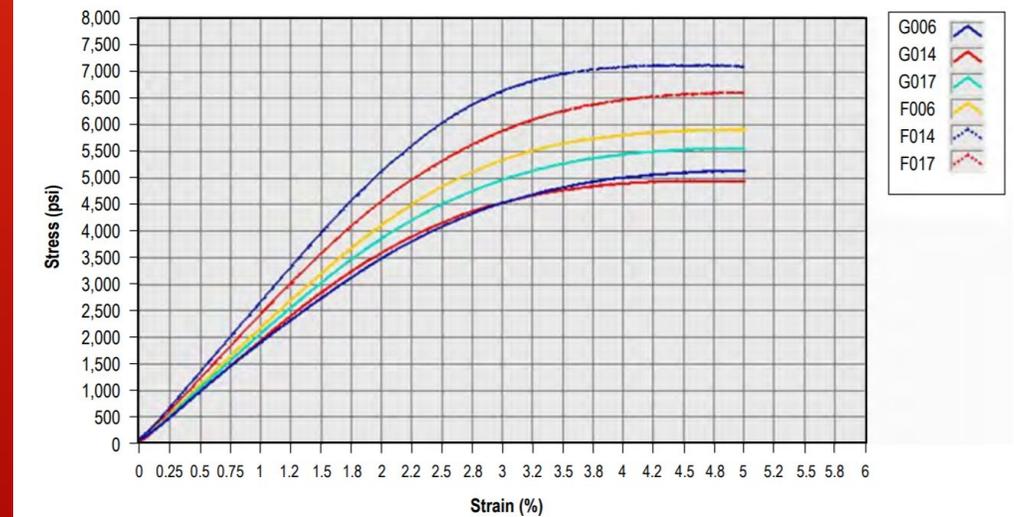
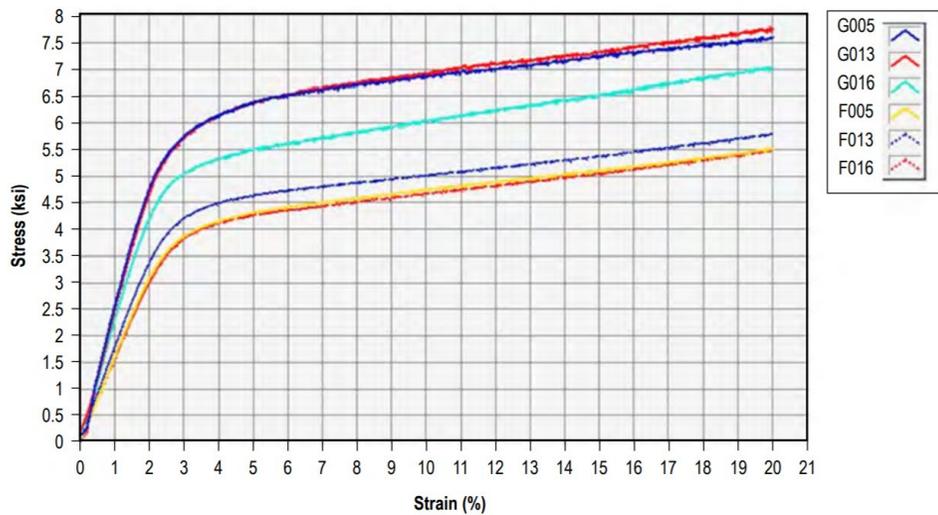
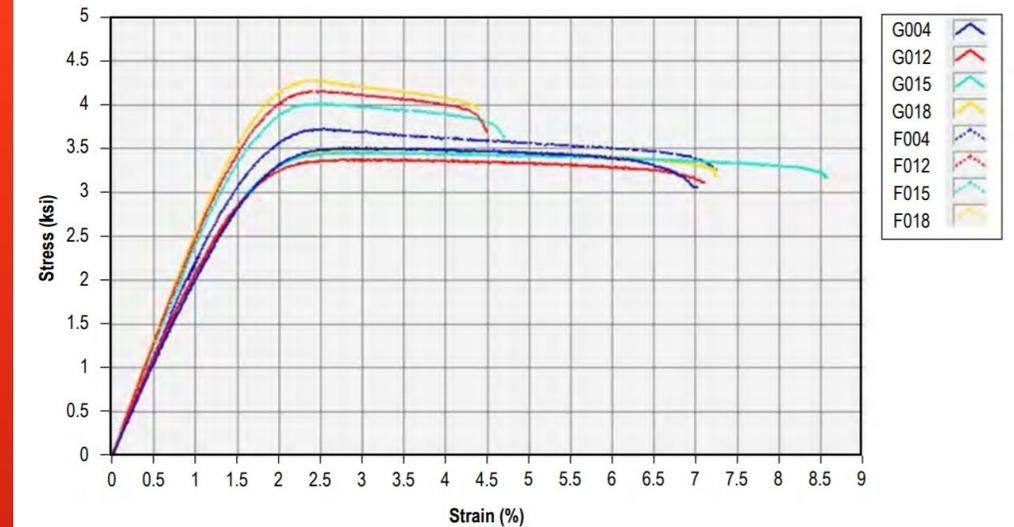


# MADE IN SPACE



# THE TESTS

- Tensile Test
- Compression Test
- Flexure Test



# RESULTS

- No statistically significant factors that will need to be considered
- More research being done on FDM 3D printing in microgravity
- Other methods of 3D printing are being tested
  - Digital Light Processing, Forced Metal Deposition, Electronics 3D Printing, Bio-Printing

# WHERE TO GO FROM HERE

- Keep on developing new technologies
- Figure out how to utilize other methods of additive manufacturing in microgravity

