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Digital Fabrication of an Aerosol Impactor

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Digital Fabrication of an Aerosol Impactor

SURI 2016

Stefan Vincent



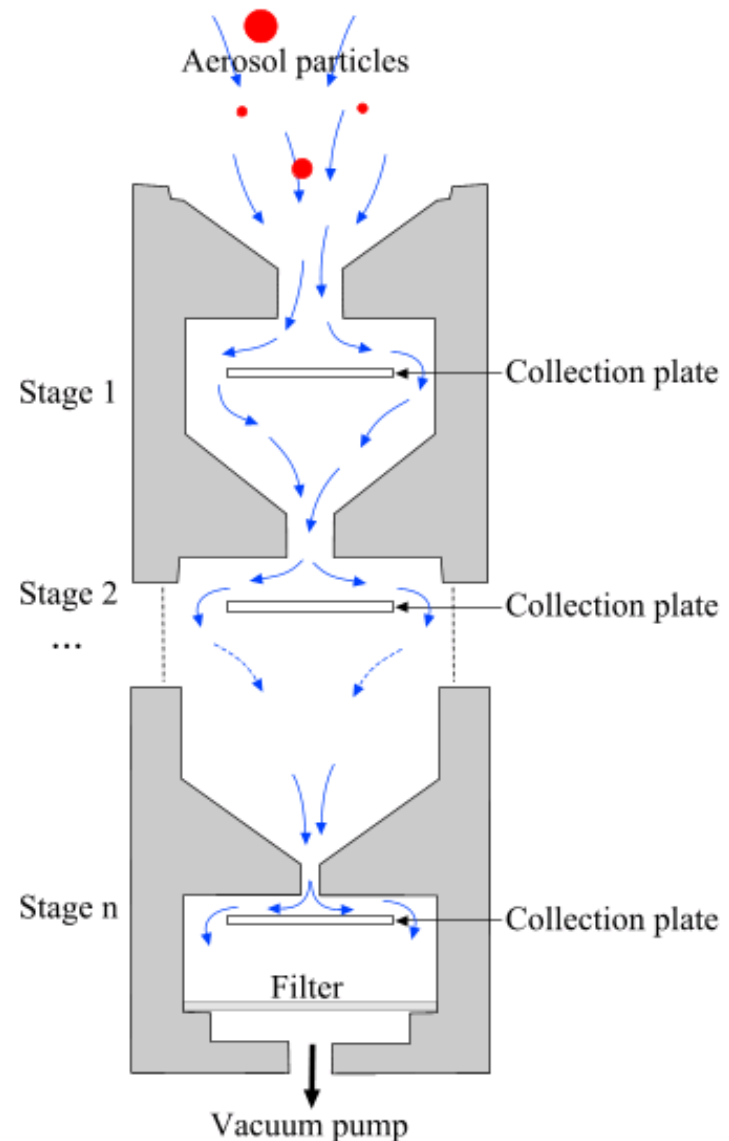
Particles

- $PM_{2.5}$; $PM_{1.0}$
 - Anything smaller than $2.5\mu m$
 - (1 micrometer (μm) = 1 millionth of a meter)
- Significance?
 - Small enough to bypass the upper respiratory system

Particle Collection

- Aerosol Impactor

- >>>>>>>



Cascade Impactors





Design

- Utilized AutoCAD (CAD = Computer Assisted Design)
 - Many similar programs used in various CAD classes



Previous Experience

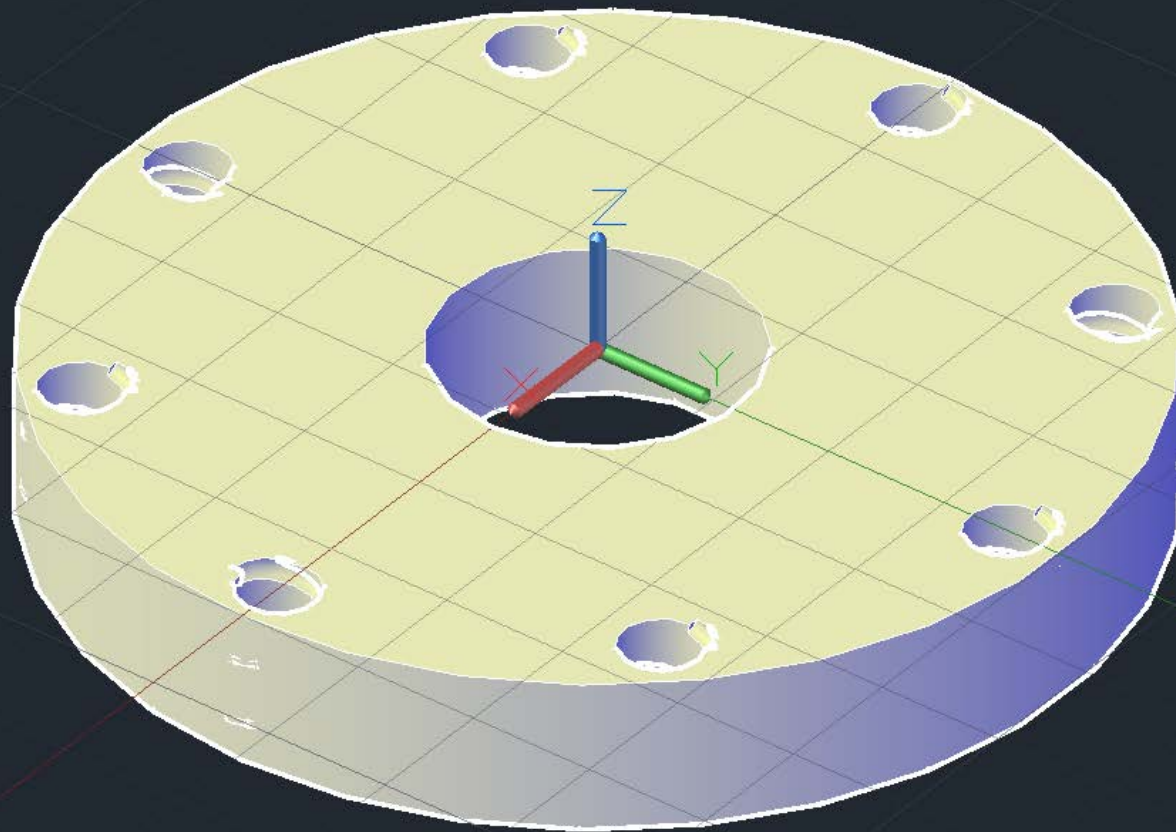
- No experience with any CAD programs
- Not exactly what you would call “computer savvy”

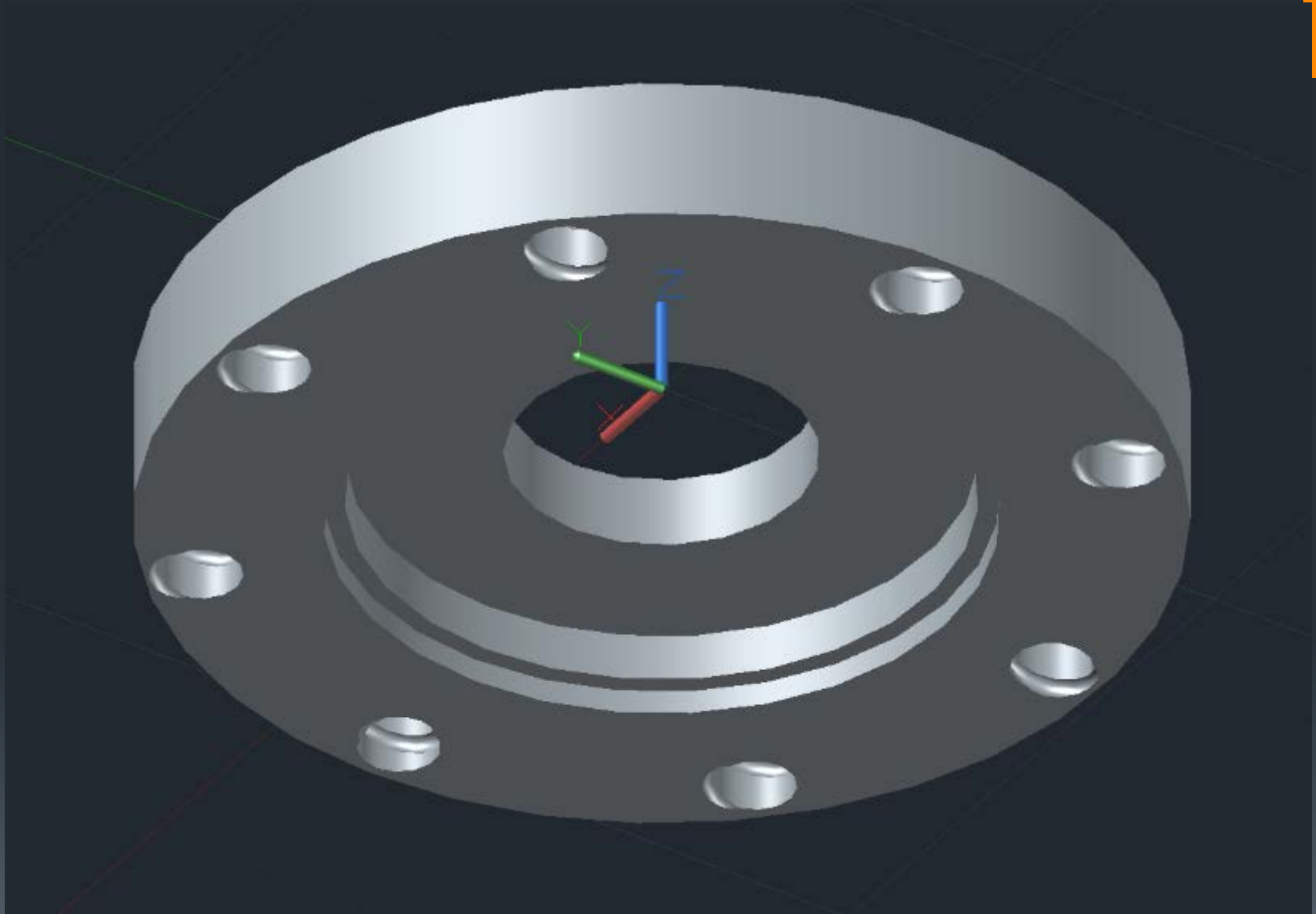


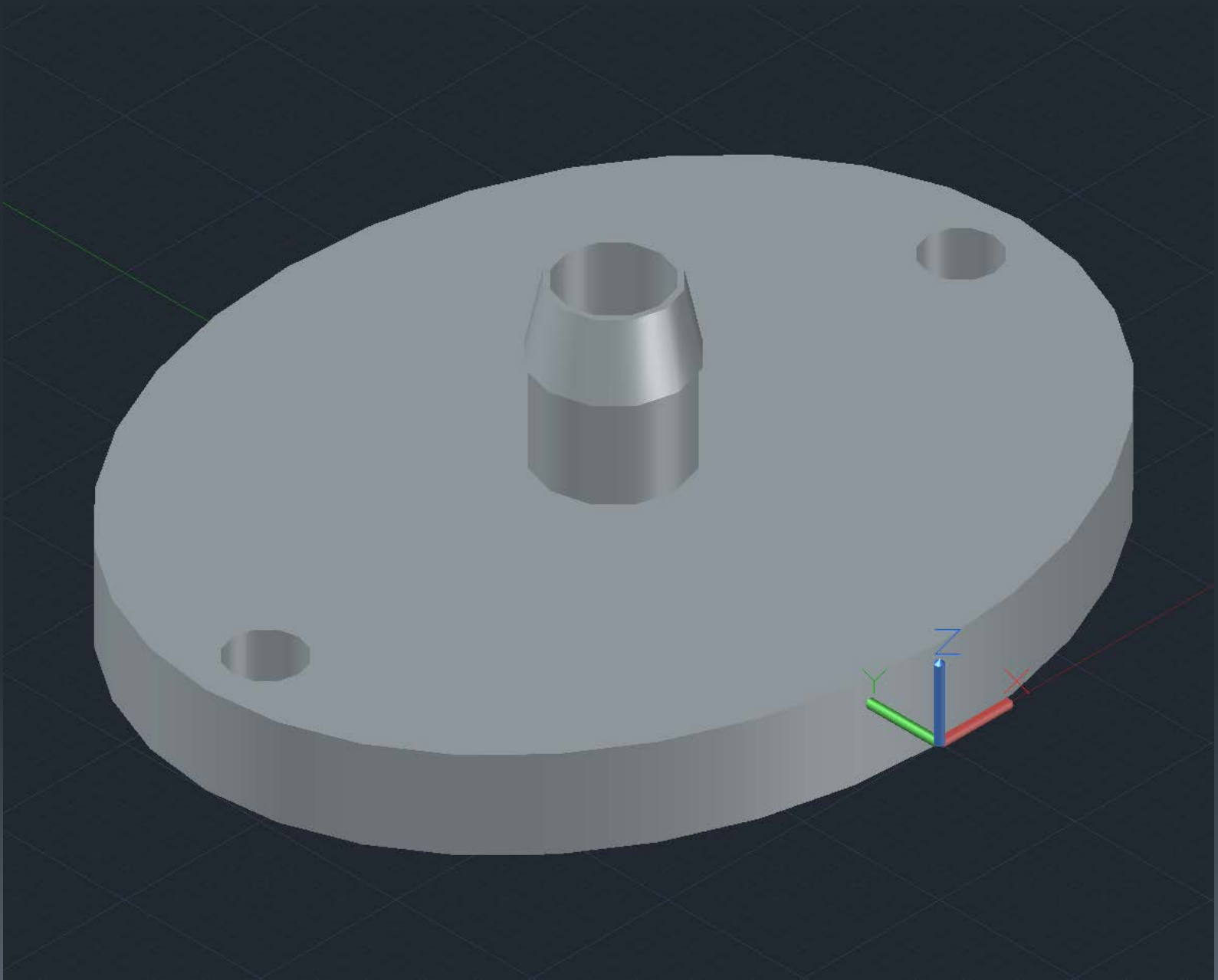
Learning the Basics

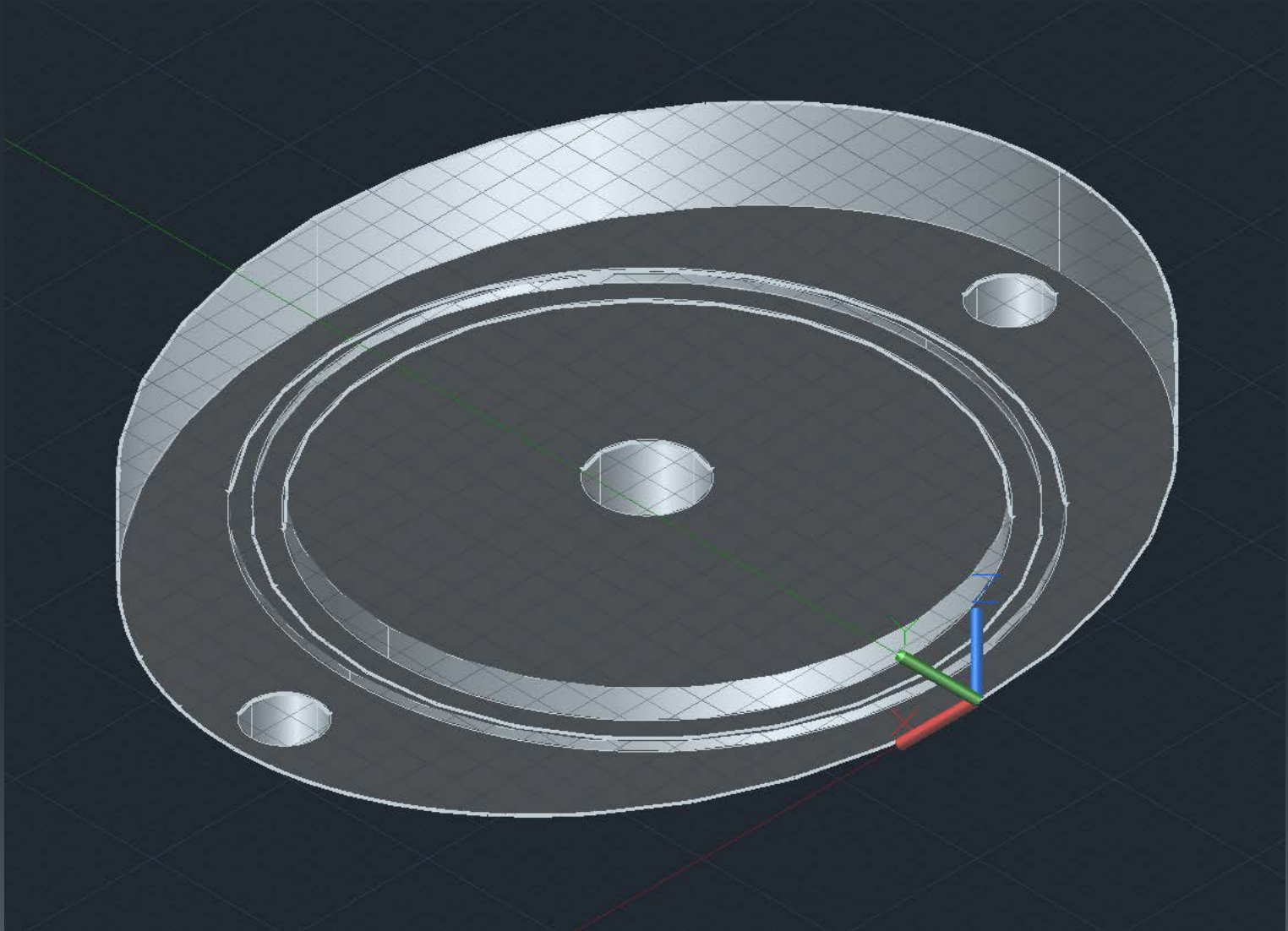
- Began reading...
 - Quickly ditched this method for YouTube videos
- Learned how to perform basic commands
- Learned how to construct simple shapes

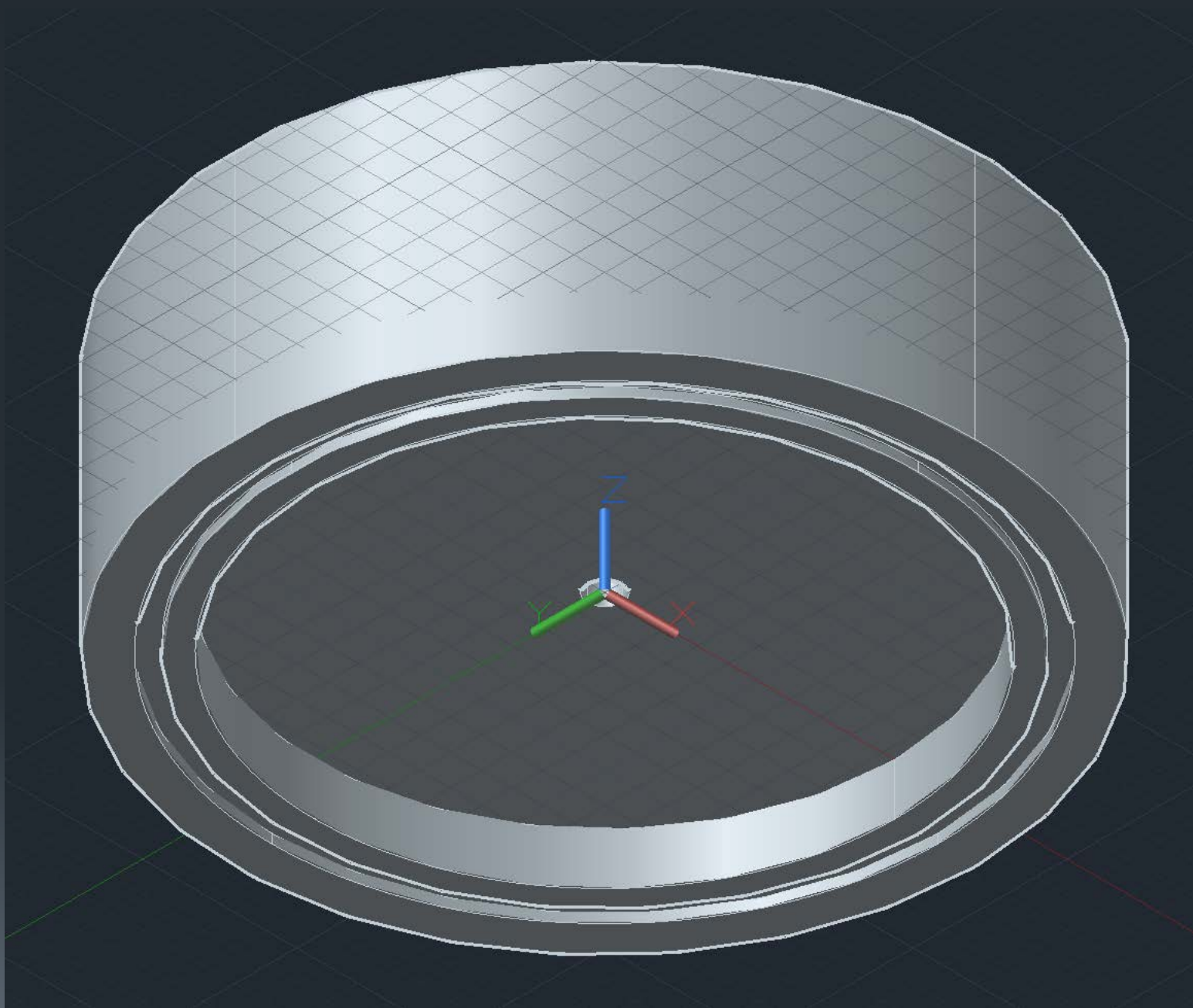
Preliminary Designs

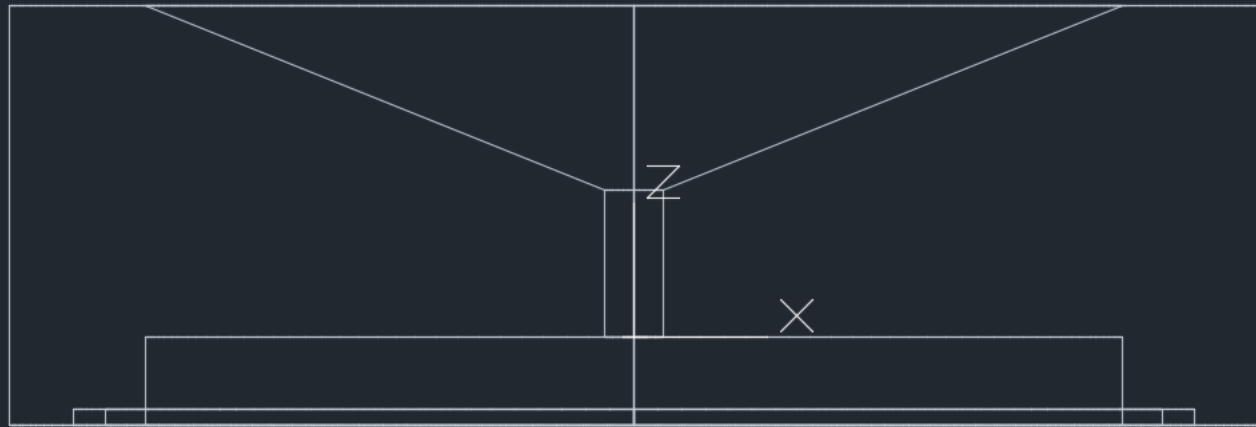


















Printer Effectiveness

MakerBot Replicator

- FDM (Fused Deposition Modeling)
- Plastic filament is heated and deposited layer-by-layer
- Builds bottom to top
- Resolution capability: 100μm



Printer Effectiveness

Formlabs Form 2

- SLA (Stereolithography)
- Utilizes a curable photopolymer (Typically a liquid resin) that is cured by applying focused light or UV light
- Builds top to bottom
- Resolution capability: 25 μ m





What Next?

- Print whole impactor
 - Either by attaining a new printer that can do it, or by outsourcing the production
- Characterize it
 - Utilize equipment at PNNL to test collection efficiency