

# Engineering NIMBUS



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# Problem Statements for our Challenge

- How to get sensors located at exact heights?
- How to collect air from only a certain place?
- How to avoid contamination?
  - During transport
  - During flight
  - After flight
- How to test for cross contamination?
- How to keep cost minimal?

# How to get sensors located at exact heights?



- Multiple ideas were discussed
  - Weather ballons
  - RC Planes
  - Real plane/helicopter
  - Drone

What are some Advantages/Disadvantages?

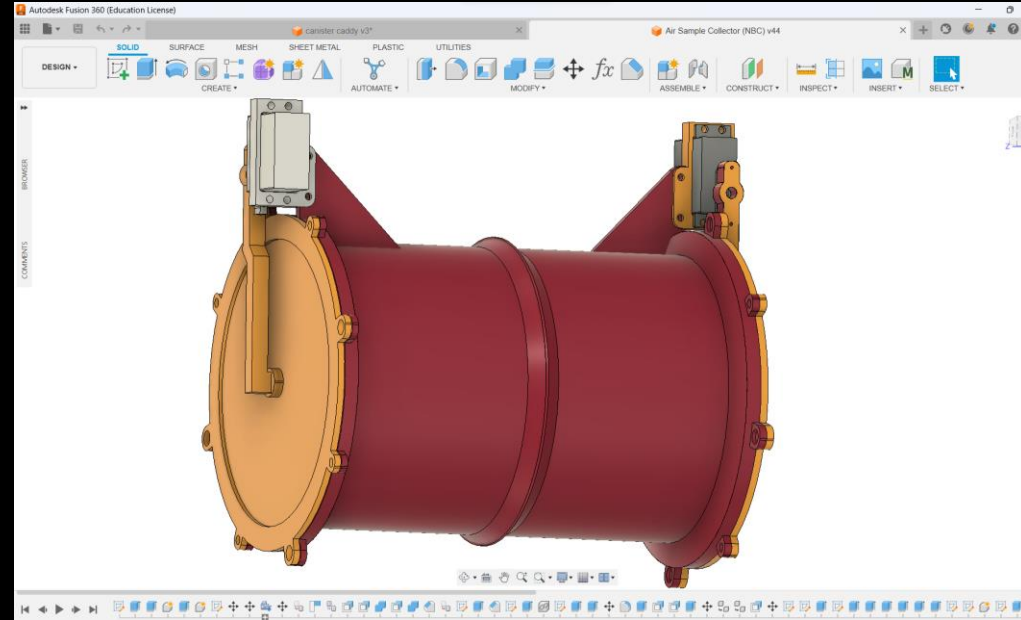


# How to collect air from only a certain place and avoid contamination?



- Must be a sterile environment to avoid contamination
- How to make it remote controlled?
- What devices need to be inside the container?

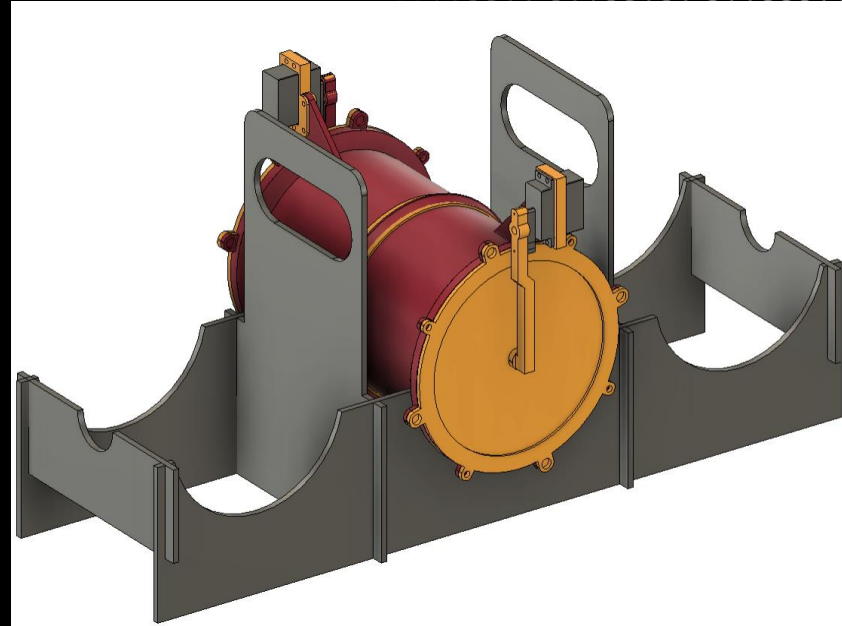
## 3D Printing to the Rescue!



# How to test results and keep cost down?



- Experimental group vs Control group
- How to test the control group
- Cost is always a major factor in a project
  - Drone \$2,000
  - Canisters ~\$50
- Laser cutting and 3D printing greatly reduced cost





# Fail Early, Fail Often, but Fail Forward

John C Maxwell

- With new cheaper prototyping technology such as 3D printers, the goal should be to get iterations of a solution and work towards a final outcome
- DO NOT EXPECT the first to be the final
- SpaceX Starship Program is a great example! Over 10 of their test ships have exploded
- <https://www.youtube.com/watch?v=K5Vw2ZDe-G0>
- Which has all led to this last launch!
- <https://www.youtube.com/watch?v=C3iHAgwIYtl>



# Resources to help think like an Engineer



- SpaceX 5 Step Design Process

- <https://modelthinkers.com/mental-model/musks-5-step-design-process>

- Solid Edge from Siemens

- <https://solidedge.siemens.com/en/resource/infographic/think-like-an-engineer-poster/>

- STEM Smartly

- <https://stemsmartly.com/engineering-design-process-for-kids/>