

National Aeronautics and Space Administration



Goddard
SPACE FLIGHT CENTER

Power Source Global Summit: Vision to Reality Interactive Demo

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NASA Goddard Space Flight Center (GSFC)

February 28, 2024

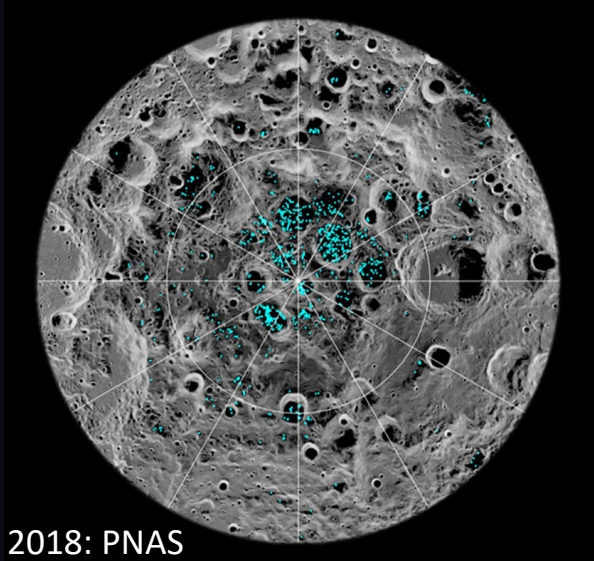
Vision to Reality



V2R team looking to design a demo, but we need some help.....from you!

Science: What gases (volatiles) are released from the polar lunar surface when it heats up (from sunlight) (-55°F) and are trapped when it is cold (dark) (-315°F)?

Scenario: You are an astronaut near the lunar south pole on a sample collection mission to gather <0.5 kg (~ 1.1 lb) of lunar volatiles. What can you make to hold your collection containers?



Design Constraints

- Some kind of mechanical structure to hold your collection containers
 - Forces/loads that can be estimated?
 - Possible to be made as a single part? Reasons why it shouldn't be?
- Total mass with sample(s) < 31kg (~68 lbs)
- Ideally ~shoe box sized (23" x 15" x 3.75")
- No electronics (possible hazard to astronaut)
- Can you use the environment to help collection?
- No weapons



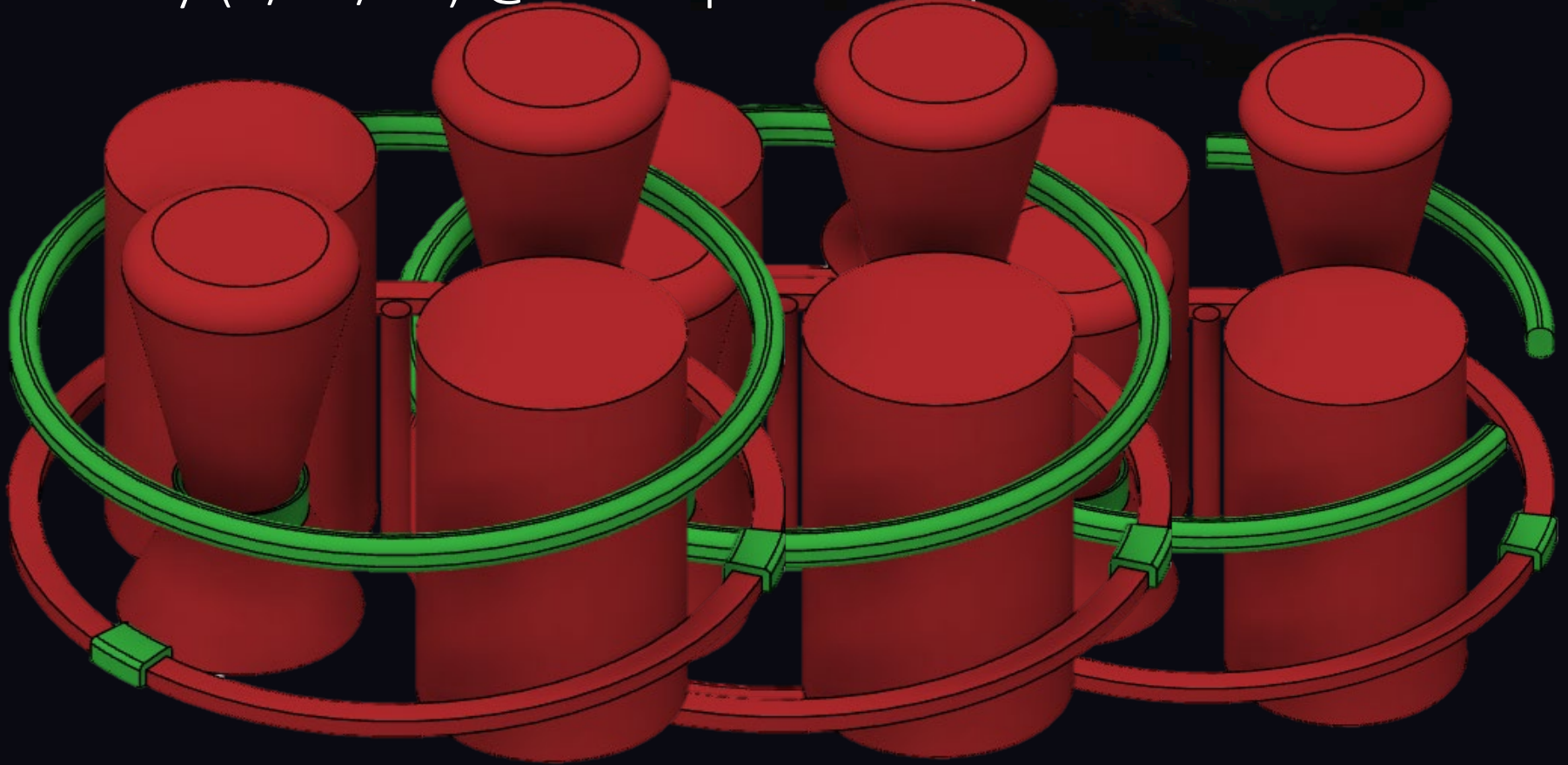
Audience Added Constraints/Requirements

Monday (2/26/24) @ 10:30a – 12:45pm



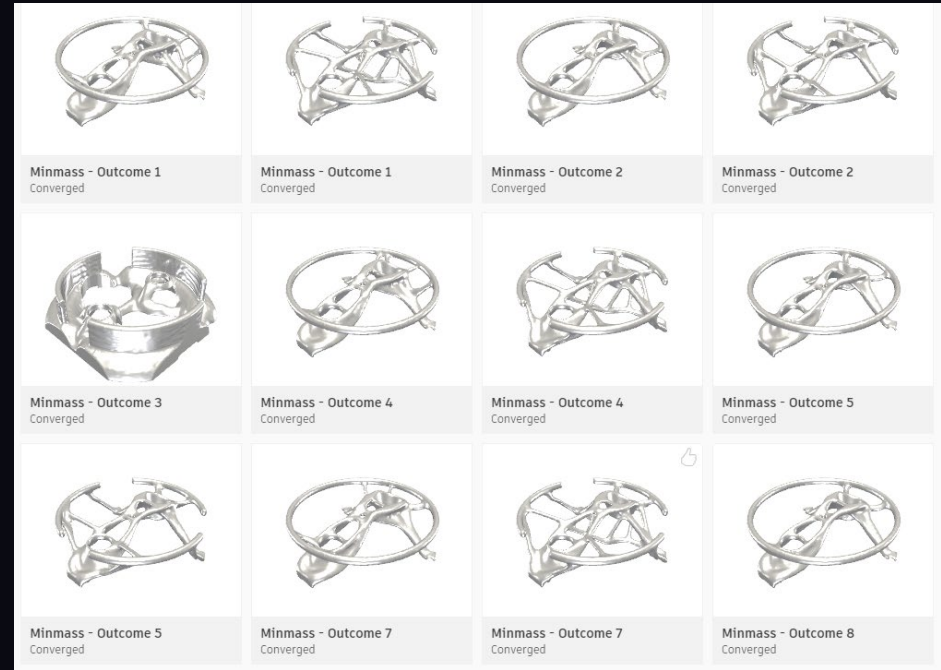
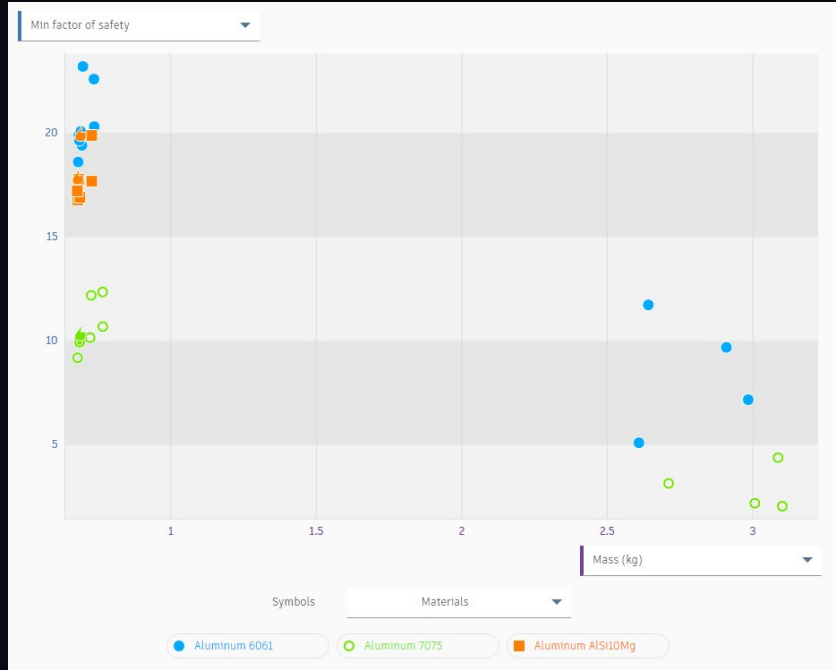
- Utilize temperature range (-315F to -55F)
- Multiple simultaneous samples
- Stackable/modular
- Ability to be placed on a sloped surface / self-balancing (stability)
- Machined from two sides
- Reconfigurable
- Scalable
- Able to be handled by astronaut or robot
- Survive the ride to space
- *Able to be made in <19 hours

CAD, requirement insertion, iteration
Monday (2/26/24) @ 12:45pm – 4:00pm



“Final” Evolved Structure Computation

Monday (2/26/24) @ 4:00pm – 4:54pm

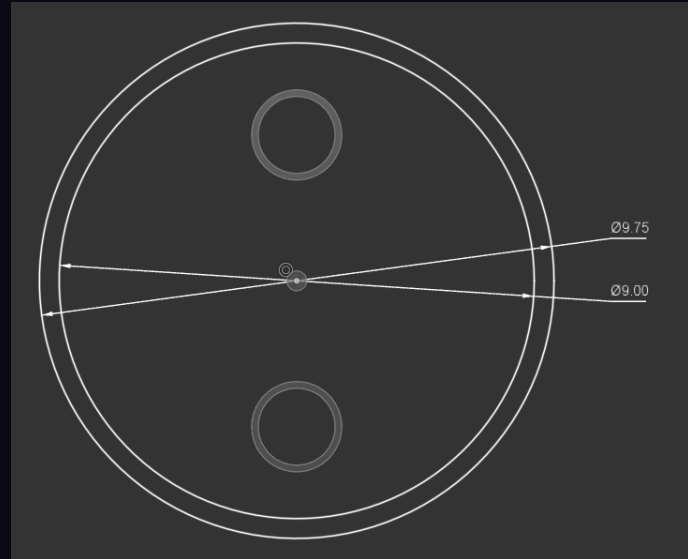


Quoting and problems with the 4th Dimension

Monday (2/26/24) @ 5:00pm – 7:45pm



- Part too large to be machined in time (needed to catch a flight!)
- Reduce size to reduce machining time
 - Shrink outer (non-critical) dimension from 12" to 9.75"
 - Shrink height dimension from 3.1" to 2.875"
- Change two dimensions in CAD
- Re-run and analyze!

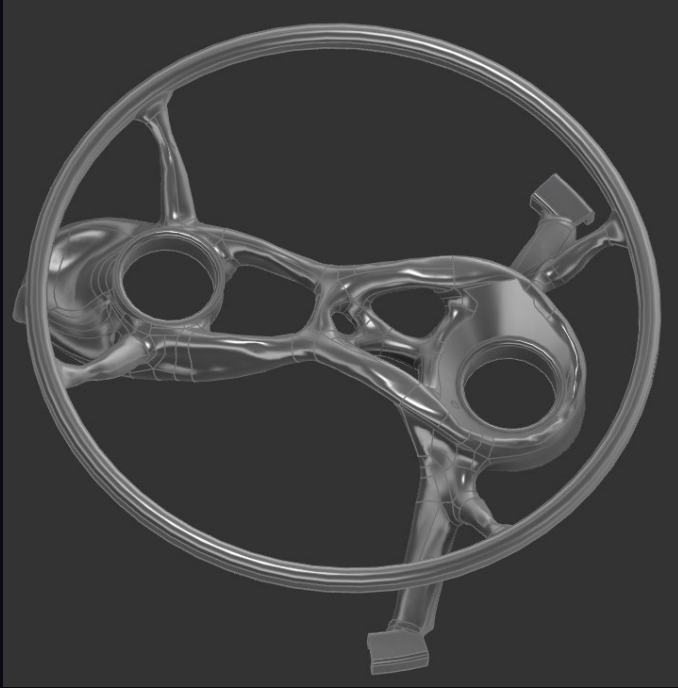


Success!

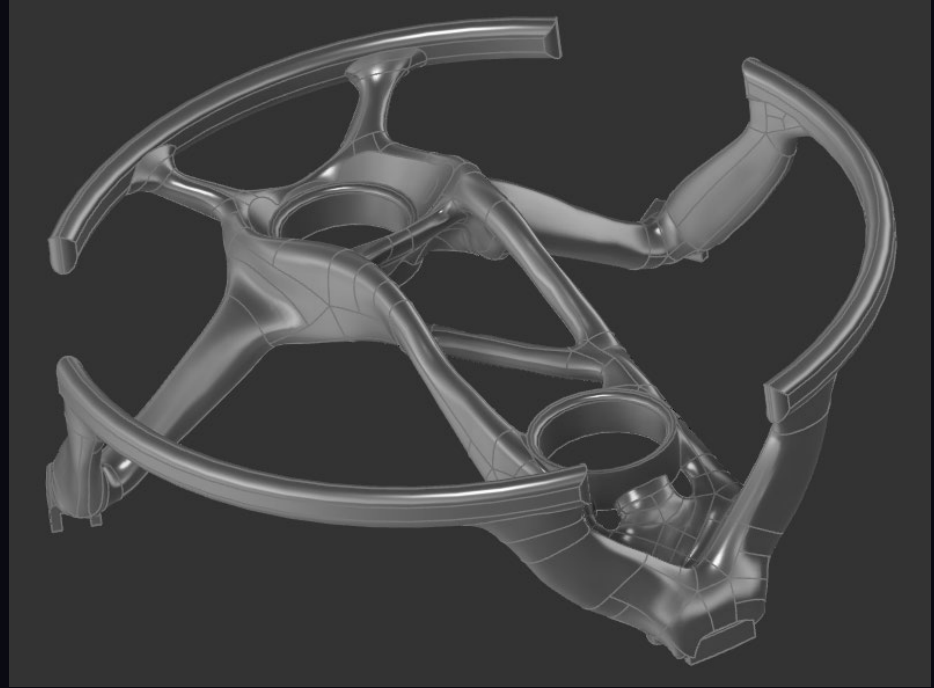
Monday (2/26/24) @ 8:15pm – 8:45pm



Additive

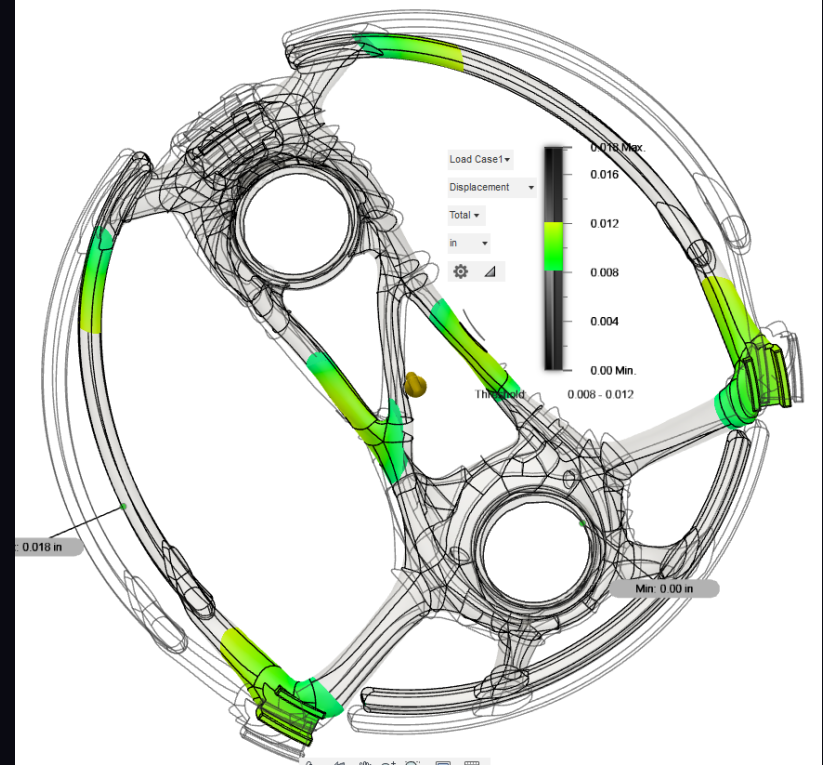
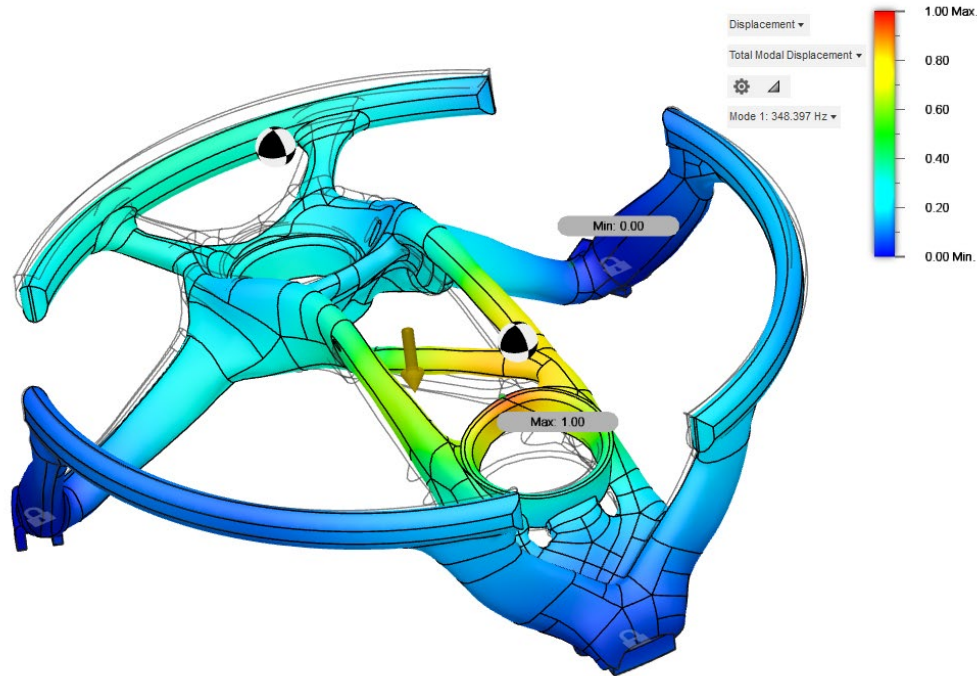


Machinable



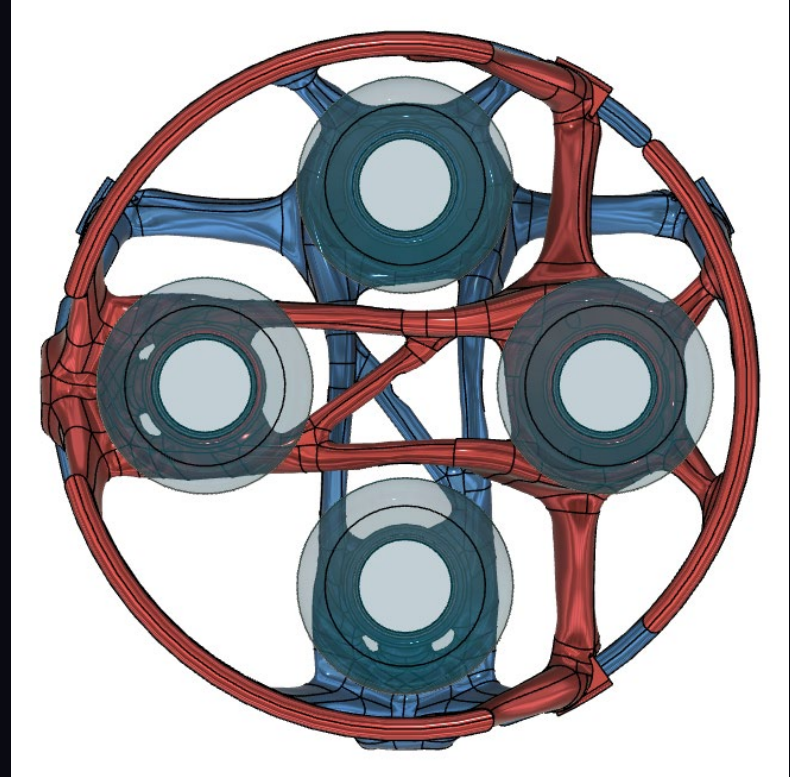
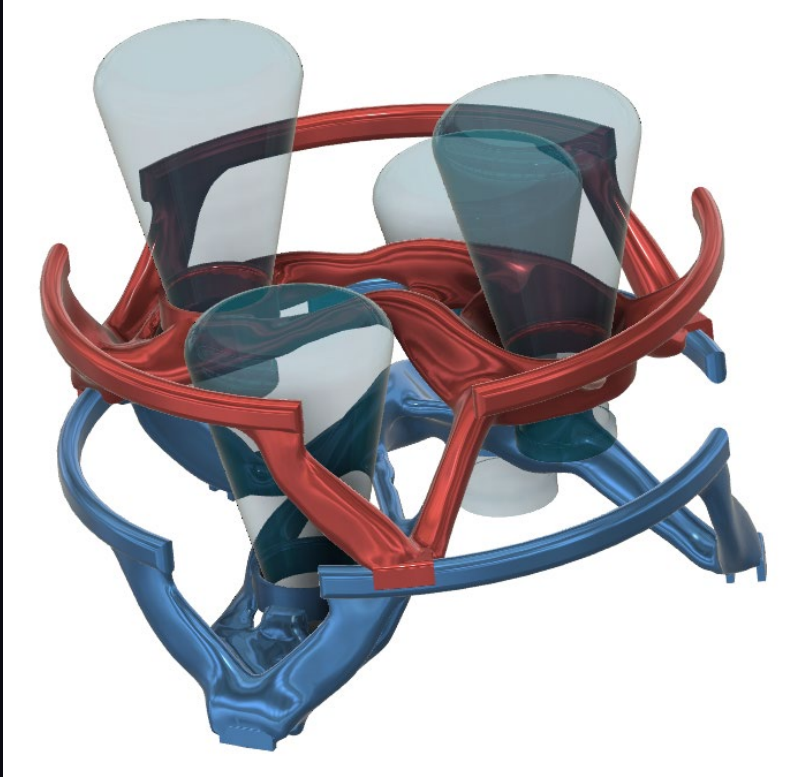
Analysis and problems with the 4th Dimension

Monday (2/26/24) @ 8:45pm – 9:10pm



Analysis and problems with the 4th Dimension

Monday (2/26/24) @ 7:45pm – 8:15pm



Order the part!

Monday (2/26/24) @ 9:10pm – 9:30pm

- Receive quote back
- Call home to order the part!

Machining

starts at 9:34pm on Monday (2/26/24)



Catching a plane!

Tuesday (2/27/24) @ 5:58 PM ET



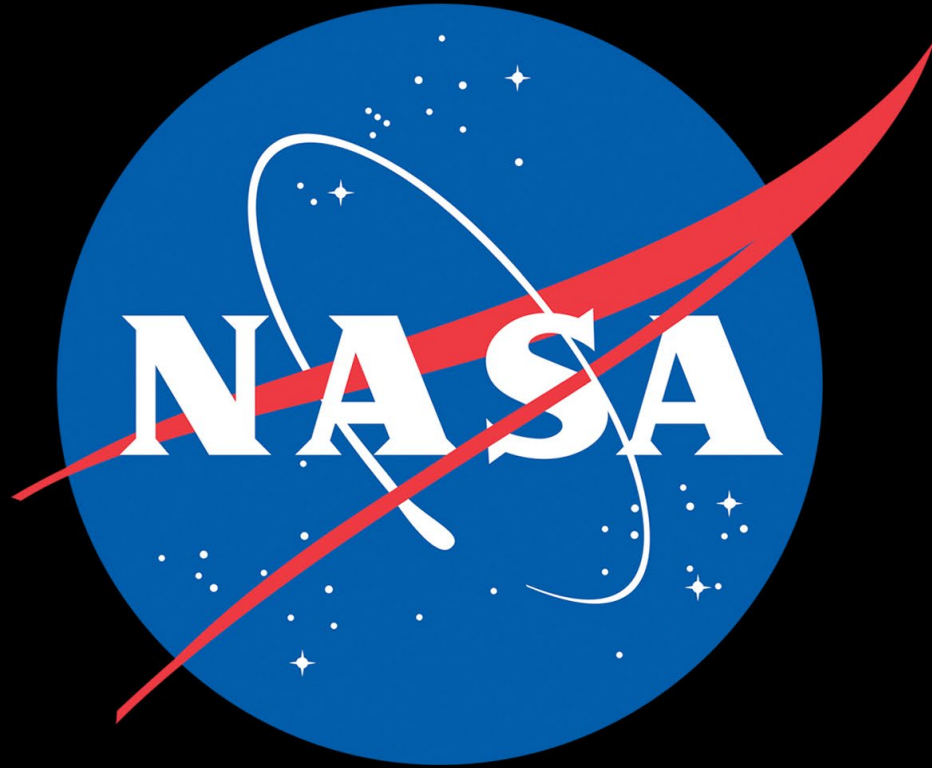
- Flight at 7:55pm

Fun fact: this can go through security!





Time for the Demo!



For more information, please visit our web site:
www.nasa.gov/goddard