



Background

- High power densities up to 1400 W/cm² are expected to be produced by electronic subsystems in next gen aircrafts
- These expectations present a significant thermal management problem for these components that would degrade under their own power generation
- Air Force Research Laboratory has partnered with universities to actively research cooling solutions to address the issue

Goal & Objective (Winter 2020)

- **Goals:** Test how high Rod temp can get, design a user friendly cooling technique for Liquid Nitrogen, create a labview code to read multiple temps in real time
- **Objective 1:** Conduct heating test to determine average temp Rod reaches in an hour
- **Objective 2:** Design a technique for liquid nitrogen cooling so user does not have to continuously deal with -40C Nitrogen directly
- **Objective 3:** Learn LabView fundamentals and create a multi temp reading program

High Heat Flux Thermal Management



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Current Rod Design

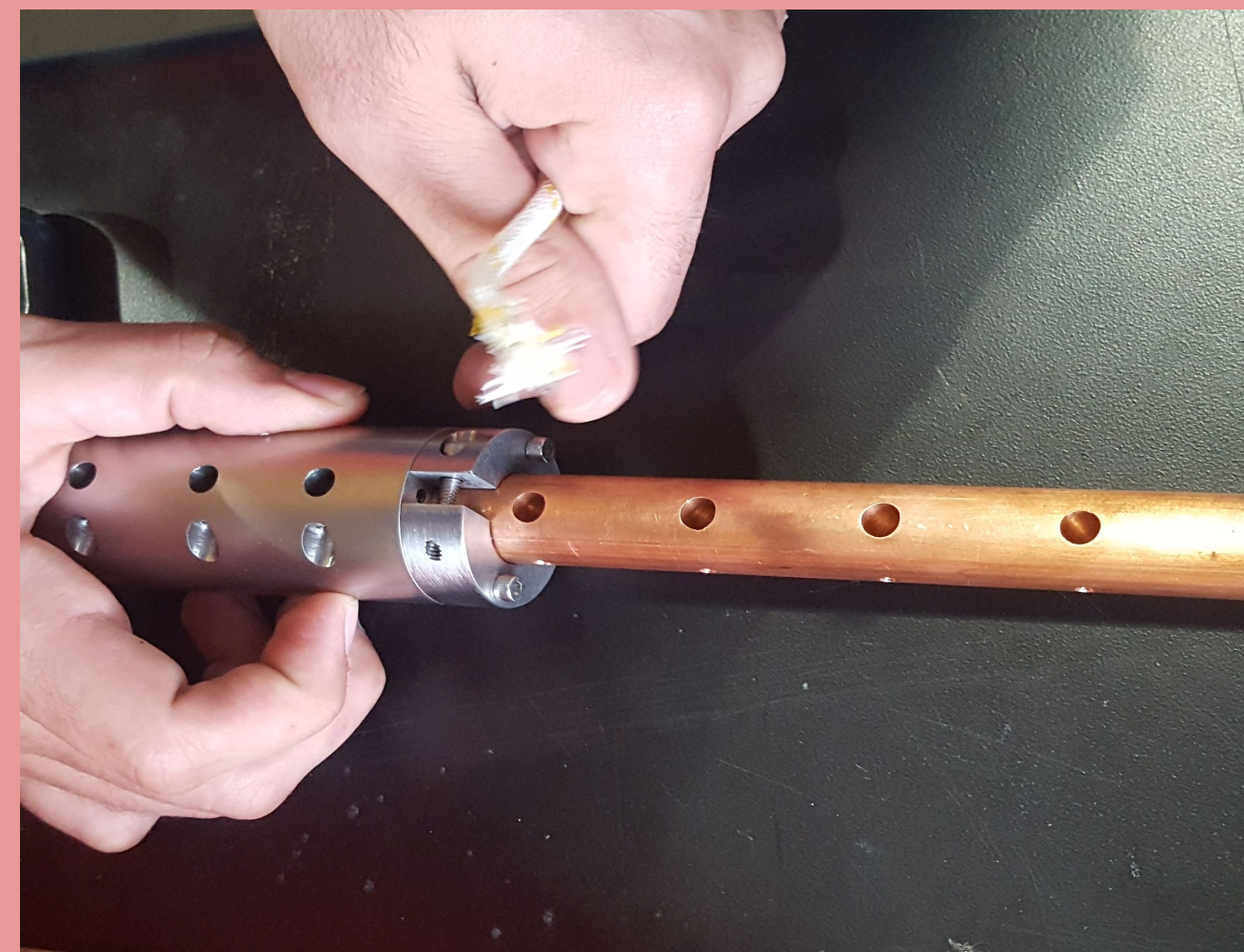


Figure a: Current Copper Rod design and heat cartridge holder. Cu rod diameter is 0.75 inches, and has 4 holes for thermocouples

Budget

We are funded by UROP and Samueli School of Engineering at UCI. Awarded \$830 until June 30, 2020.

Cooling Solution

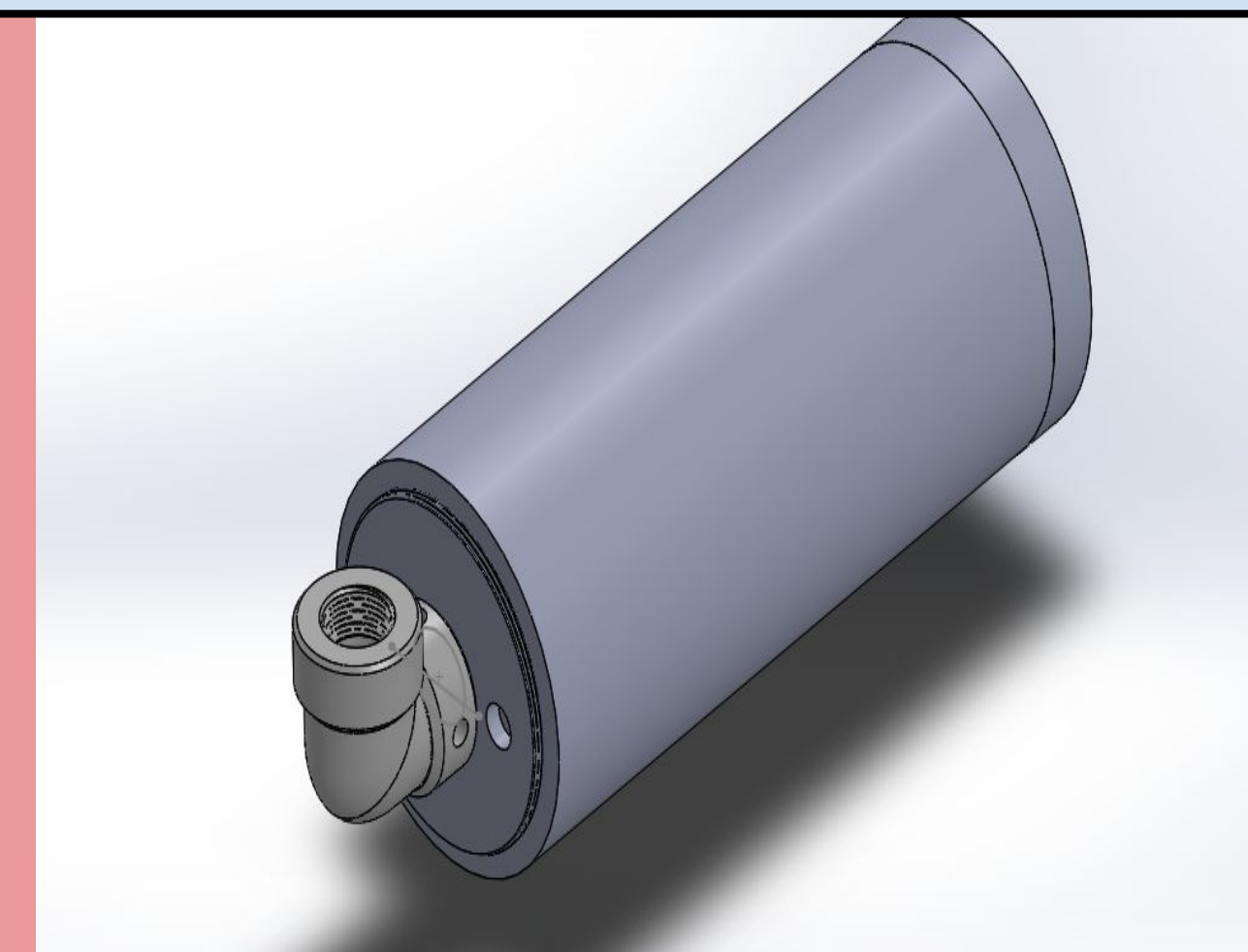


Figure b: Isometric CAD view of cooling solution and vacuum chamber assembly

Vacuum Insulated Chamber

Vacuum insulated chamber that can handle cryogenic and high temperatures (400C+) on a structure made using calcium silicate.

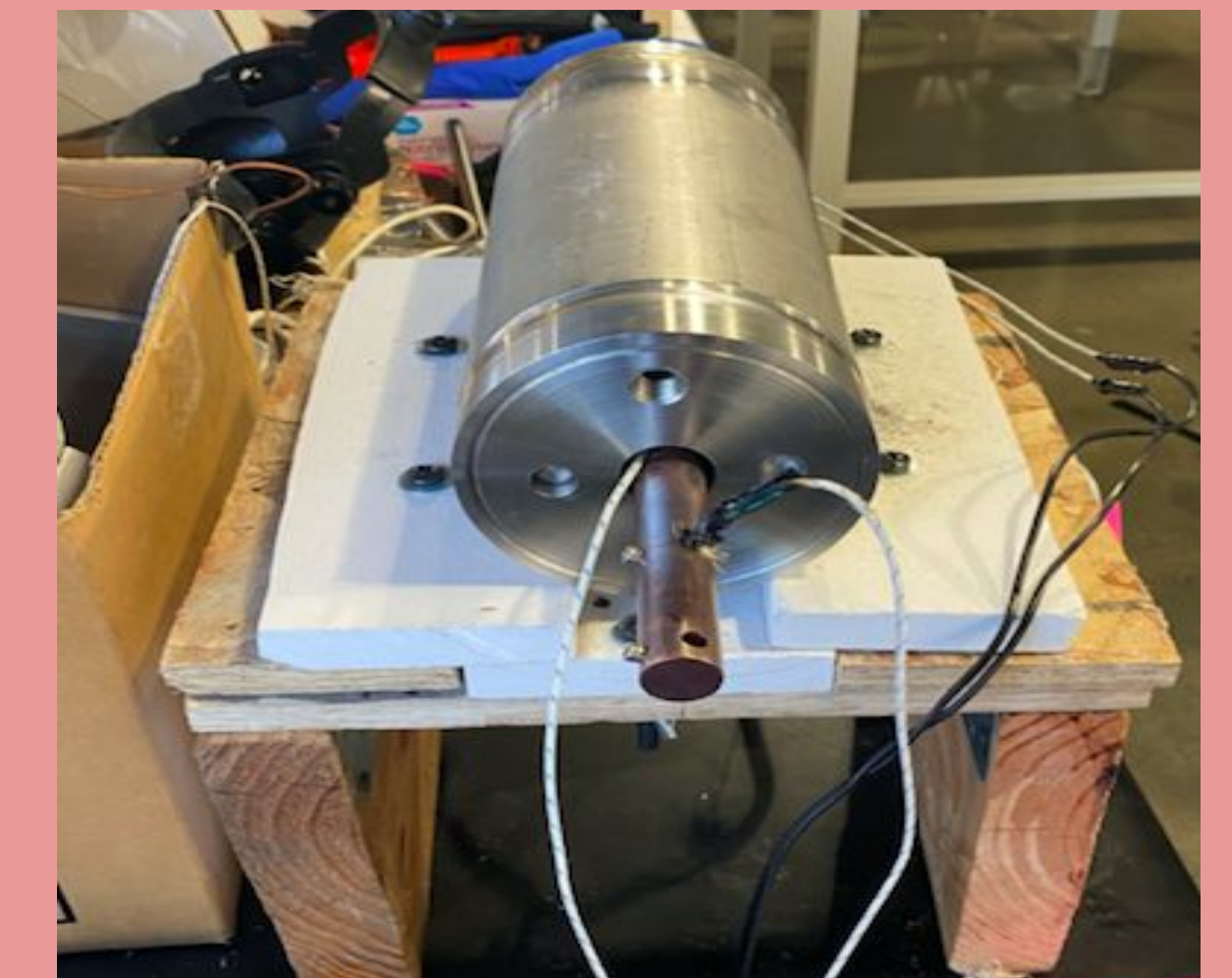


Figure c: Vacuum chamber and Cu rod test bench set up

General A.Y. Project Timeline

Fall 2019

Winter 2020

Spring 2020

- Develop project and Cu Rod design understanding
- Order new heat cartridge and adjust rod design

- Develop a cooling chamber for LN2
- Create a LabView code to acquire multiple temperature readings

- Work with LN2 dewar tank and vacuum pump
- Continue tests and adjust design to better results

See HHF member for any questions/comments