EE/CprE/SE 491 WEEKLY REPORT 05

10/09/2024 – 10/16/2024

Group number: 9

Project title: Space Cyclones - COSMIC CAPSTONE CHALLENGE 2024-2025

Client &/Advisor: Bo Varga, Benjamin Rupp, Rachel Shannon

Team Members/Role: John Beuter (Team Lead), Daniel Sprout, Maheeka Davarakonda, Tanvi Mehetre, Riley Heeren, Ben Swegle

- **Weekly Summary**

Week Objectives: Product Research and Idea Generation

This week we met with Ben Rupp and discussed different approaches to in-space manufacturing. Our team discovered new research opportunities in the realm of manufacturing. We narrowed our critical ideas to three: A fractal vice grip, a debris net, and a docking arm. With each of these areas identified, we divided our group to focus on all three areas and present our findings during the Thursday meeting.

- **Past week accomplishments**
  - John Beuter:

    I emailed Starfish Space to set up a meeting with some of their design engineers. I discovered research about electrically charged satellites and how our design could utilize the charge to attach to the craft. I as did some research on the Canadarm 2 servicing platform, which is currently being used on the International Space Station (ISS).

    Articles:
    https://ntrs.nasa.gov/api/citations/20110014828/downloads/20110014828.pdf
    https://www.nasa.gov/centers-and-facilities/nesc/understanding-the-potential-dangers-of-spacecraft-charging/

    Building a space arm: https://www.asc-csa.gc.ca/eng/iss/canadarm2/
    Completed Lightning talk

- Daniel Sprout:

  Worked on presentation for sunday meeting. Found list of open source software tools used by nasa that might be useful for the prototype or demo of the project.

  https://www.nasa.gov/smallsat-institute/space-mission-design-tools/

  Additionally researched into radiation hardening and how physical properties determine how things must be scaled due to Single Event Effects (SEE's) which can damage critical electronic systems.

  List of radiation testing data:

  https://radhome.gsfc.nasa.gov/radhome/RadDataBase/RadDataBase.html

- Maheeka Davarakonda:

  Sick

- Tanvi Mehetre:

  Attended the meeting with industry mentor Ben Rupp and collectively discussed possible ideas involving manufacturing in space. Continued research on possible ideas and any similar ongoing/future projects to gain more knowledge on the topics.

- Riley Heeren:

  Continue to hone in on a specific idea. Also reached out to ISU students and professors doing research about manufacturing electronics that could be useful to our project.

- Ben Swegle:

  Researched nets used in previous space missions. RemoveDEBRIS was a project that successfully used a net to capture a cube satellite simulating space debris.

- **Pending issues** *(If applicable: Were there any unexpected complications? Please elaborate.)*
  - John Beuter: N/A
  - Daniel Sprout: N/A
  - Maheeka Davarakonda: N/A
  - Tanvi Mehetre: N/A
  - Riley Heeren: N/A
  - Ben Swegle: N/A

- **Individual contributions**

NAME	**Individual Contributions** *(Quick list of contributions. This should be short.)*	**Hours this week**	**HOURS cumulative**
John Beuter	Researched more into how we can dock our satellite to other crafts. One area that I found particularly interesting was how spacecraft in orbit naturally become electrically charged. I believe that the company Starfish Space has used the spacecraft's natural charge to connect satellites in orbit.	1.5	6
Daniel Sprout	Researched into software tools tools Researched into radiation hardened technologies.	2	11
Maheeka Davarakonda	Sick		14.5
Tanvi Mehetre	Continued to research potential ideas for the design. Researched more about manufacturing.	3	12
Riley Heeren	Got in contact with ISU research group looking into way to print circuit boards of extremely cheap materials using lasers.	1.5	7.5
Ben Swegle	Continued research on the use of nets used in previous space missions.	0.5	7.5

- **Plans for the upcoming week:**

Prepare research presentation over group learning and finalize research.

- **Summary of weekly advisor meeting** (*If applicable/optional):*

Met with Ben Rupp and Professor Shannon to discuss in-space manufacturing and the challenges the group faces.