Team Members/Role:
Alec Sutton – Design and Power Team Lead
Cullen White – Power Systems and Logistics Manager
George Cleaver – Communications and Controls Advisor
Lex Somers – Programing and Software Advisor
Branden Buhler – Communications and Program Team Lead
Brandon Beaver – Project Manager

o **Weekly Summary:**

- **During the week, our group focused on getting things organized for the project. The team contract was completed, which lays out the rules for how working together is outlined in a professional setting. Each person received specific areas of focus to highlight their talents and bring the most value to the project. A meeting with Matthew Nelson, our client/advisor, was also held toward the end of the week. In the meeting, discussion of individual expectations from the client's perspective and overall team expectations for the desired deliverables. This week was about setting a team dynamic and overall standards for what is expected of the individual members of the project and laying the groundwork for future tasks for the project.**

o **Past week accomplishments**

- Preliminary Research
  - Investigated S.D.R. (Software-Defined Radio) functionality and applications at a surface-level understanding via web searches and wiki pages to deepen understanding of how it can be applied in our project conceptually.
    - Software defined radio uses software for modulating and demodulating radio signals
    - Does significant amounts of signal processing in general purpose computers, digital electronics, cell phone services, etc.
    - Uses hardware to convert digital signals into and convert from analog RF signals and can have these signal frequencies defined using the software at moments notice.

- Read over Matthew Nelson's graduate thesis in PDF form on his [GitHub](#) website. Understand the basics of SDR needing software and hardware aspects (more review needed).
- Set up an introductory class on Linux with HABET's Project manager for Wednesday, Feb. 5th to review basic Linux functionality to apply to the integration of Heimdall into the HABET spacecraft. This class will cover basic commands and navigation through the operating system on the Raspberry Pi 4 that is serving as the brain of the spacecraft.
- Toured the lab space in which collaboration with HABET will take place and added necessary lab training for each project member, which each member has completed within the week.

o **Pending issues**
- A deeper understanding of how the type of radio communication procedure to be used in our project requires H.A.M. (Hyman-Almy-Murray) radio. Temporary utilization of the client's amateur radio license, but there is work toward getting a class set up for any who wishes to become certified at a small fee. Brandon will be attending this course to become certified.

- **Individual contributions**

NAME	Individual Contributions *(Quick list of contributions. This should be short.)*	Hours this week	HOURS cumulative

Alec Sutton	1) Completed the M2I safety training modules
	2) Read Matt Nelson's Thesis on Software Defined Radio
	   a. This helped me better understand the fundamentals of radiometers as I have not studied communications
	   b. The benefit of an SDR is that different jobs such as filtering signals can be done in software instead of physically changing components.
		3.5	3.5

Cullen White	1) Completed M2I/EH&S lab and safety training modules
	2) Took a quick look at Professor Nelson's thesis about Software-Defined Radio (SDR) and did some basic research on how SDR works
	   a. SDR is a technology that uses software to process and manipulate radio signals instead of relying on traditional hardware components.
	   b. SDR works by converting radio signals into digital data, allowing for flexible and reconfigurable communication systems through software-based control.
		3.0	3.0

George Cleaver	1) Researched SDR functionality and application, relative to the project. 2) Completed M2I/EH&S lab and safety training modules 3) Toured M2I lab facilities and made introductions with the other engineers in the H.A.B.E.T program.	5.5	5.5
Lex Somers	3) Completed M2I/EH&S lab and safety training modules 4) Introductions w/H.A.B.E.T. and Heimdall's role 5) Started looking into basics of SDR, such as definitions of basic terminology and SDR's common usages and applications in the modern day.	4.5	4.5
Branden Buhler	1) Read Matt Nelson's graduate thesis and the fundamentals of SDR applications. 2) Completed M2I/EH&S safety training. 3) Looked through the M2I lab and was brought attention to the team locker and the interesting team materials that it contains.	5.5	5.5
Brandon Beaver	1) Finished and submitted all M2I/ EH&S lab safety training modules needed for work in Howe 0620 2) Reviewed Professor Nelson's SDR	6	6

	graduate thesis briefly, as well as some surface-level research on how SDR works via web searches and wiki pages on the subject. 3) Began organizing a mock balloon launch for Heimdall to attend with the H.A.B.E.T. leadership. This will depend on H.A.B.E.T.'s launch schedule.		

- o **Comments and extended discussion**
  - Scheduling between the two teams has proven difficult, both internally and with H.A.B.E.T. Ideally next week schedules will align better and allow for a concrete meeting time for both Heimdall and H.A.B.E.T. so planning for future tasks is more comprehensive for the rest of the term at least.
  - Finding a starting point has proven difficult as well. While research appears to be the agreed upon reference frame for this week. Next week understanding the basics of the programming languages and environments needed for H.A.B.E.T. integration is the best second step.

  - **Plans for the upcoming week**
  - Alec Sutton:
    - Begin Research on Low Noise amplifiers and how they respond to different frequencies
    - Attend HABET balloon launch to get to know some of the other HABET members
    - Visit the M2I lab and see some of HABET's existing work and learn my way around the lab
    - Understand what amount of lifetime we need out of our device to start figuring out what size battery will be needed to power components.
  - Cullen White:
    - Explore further into Software-Defined Radios (SDRs), with a focus on understanding the hardware transmission aspect.
    - Increase hands-on exposure by dedicating additional time in the M2I lab, examining and studying previous H.A.B.E.T productions.
    - Evaluate the Linux operating system, exploring its applications and usage within the broader H.A.B.E.T. system.
  - George Cleaver:
    - Attend a H.A.B.E.T balloon launch next Friday to continue to get more exposure to the H.A.B.E.T program.
    - Continue to research and learn about SDRs, specifically the hardware transmission aspect.
    - Try to spend more time in M2I lab to get hands-on time with previous H.A.B.E.T productions to study.
  - Lex Somers:
    - Review Linux OS and explore its application and usage within the overall H.A.B.E.T. system.

- Attend H.A.B.E.T. balloon launch to witness the process and system checks.
- Research SDR, GNU radio, and DVBS along with other software tools to be used for the development of the SDR video transmission system.
- Explore and experiment with Pluto SDR and raspberry Pi's capabilities and functions.
- Read Matt Nelson's thesis on SDR
- Branden Buhler:
  - Learn how to use Linux operating system to move forward with the SDR software side.
  - Research low noise amplifiers and how they are to be used for a quality video.
- Brandon Beaver:
  - Further scheduling with the H.A.B.E.T. leadership and Engineering team to understand what requirements integration of the Heimdall system, power demands and wireless connectivity with H.A.B.E.T.'s Raspberry Pi requires.
  - Research SDR further, using more scholarly sources from the library, as one example of a resource. Acquiring DVBS documents provided by the client/advisor will be necessary as well.
  - Planning for the launch in April will require some logistical planning/scheduling. A list will be gathered this week of Heimdall members who wish to attend the Eclipse launch.
  - Begin familiarization of the Pluto SDR board through Analog Devices' website, and developing an understanding of gnuradio, Python, and Linux and their applications to Heimdall.

- **<u>Summary of weekly advisor meeting</u>**
  The advisor meeting was educational as far as next steps for the project team. The overall requirements for meeting the deliverables were more firmly established as the client's needs were formally explained. The project must be able to transmit any type of video and data for any given amount of time. While this sounds simple, development requires several different coding languages, operating system knowledge such as Windows and Linux, and a set goal of a video transmission of 720p or better visual quality. The meeting also provided the team with added resources to get started, such as the Pluto board and some beginner SDR programs through Analog Devices and documents to review from old research performed by Professor Nelson in the past related to SDR and DVBS (Digital Video Broadcasting Systems). Next week, Professor Nelson is indisposed next week due to family obligations and will not be able to meet with the team, so it is suggested in the meantime that some of the team spend time with the H.A.B.E.T. group understanding their systems and going through tutorials on the Pluto boards, summarizing progress and reporting this to the advisor/client.