University of Colorado at Boulder May Status Report

In the month of May, members of HELIOS III continued to work within their sub-systems and began to integrate with other sub-systems. All parts save for some expensive optics equipment have been ordered and are being integrated and tested into various systems. The team has changed since the end of the semester as it has both lost and gained members and increased weekly work hours.

Team Demographics:

Cooper Benson: Caucasian male, sophomore, Aerospace Engineering

Paige Arthur: Caucasian female, sophomore, Aerospace Engineering

Kristen Hanslik: Caucasian female, sophomore, Aerospace Engineering

Chris Bradford: Caucasian male, sophomore, Aerospace Engineering

Dylan Richards: Caucasian male, sophomore, Aerospace Engineering

Tyler Lugger: Caucasian male, sophomore, Aerospace Engineering

Ryan Cutter: Caucasian male, sophomore, Aerospace Engineering

Alec Fiala: Caucasian male, sophomore, Aerospace Engineering

Ryan Tabler: Asian / Caucasian male, sophomore, Electrical and Computer Engineering

Jorge Cervantes: Hispanic male, junior, Aerospace Engineering

Brandon Boiko: Asian / Caucasian male, junior, Mechanical Engineering

Justin Alvey: Caucasian male, freshman, Aerospace Engineering and Applied Math

Team Organizational Chart:
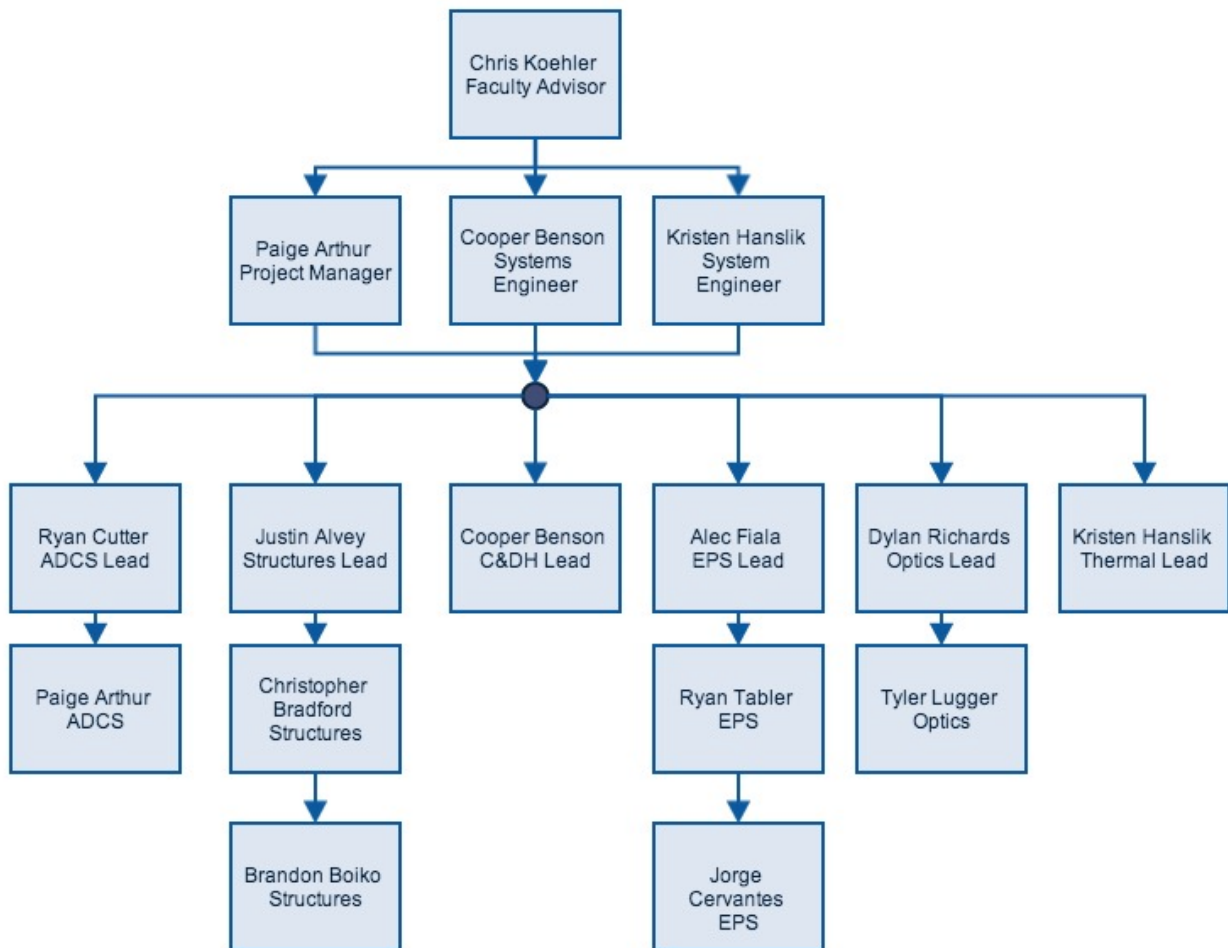
Accomplishments of May:

ADCS: The Attitude Determination and Control System have figured out a way to amplify the photodiode signals without use of op-amps by reverse biasing the photodiodes. They hooked up the photodiodes, Raspberry Pi, analog to digital convertor, and a motor to a power source and, by attaching a makeshift photodiode housing to the motor, were able to get the motor to track a light source. Working with C&DH, they created code to use the information from the ADCS camera to calibrate the photodiodes by using a linear model. They also tested the motors on HELIOS II to test their strength. They are currently working on transferring their system from the breadboard to circuit boards.

C&DH: Command and Data Handling has worked primarily on setting up commands between ground and the platform. They have finished the code and are currently working on debugging it. They have also created a file structure and set up the Raspberry Pies and the Gertduinos on which the other sub teams will be testing. Most recently, they have finished the code to take the

information from the image analysis software and apply it to a model relating the difference in the photodiode readings to the degrees off the sun is in the ADCS (Attitude Determination and Control System) camera.

EPS: The Electrical and Power System has worked almost exclusively on training with Altium and creating a PCB board for the payload. They finished this and received the board recently. Since then they have started soldering new parts onto the board and have already started re-designing the board for the next iteration. They have also worked on writing the code for and testing sensors.

Optics: Optics has researched different options for the cameras, lenses, power filters, and telescopes. They recently received their telescope and have been running tests on it. They have found a new science camera with a slightly larger field of view that will allow for a larger margin of error in the accuracy of the tracking system and have been talking to industry members willing to give the team significant student discounts on hardware. They have extensively researched the imaging filters to try to find one that is inexpensive, is small, and doesn't take too much power. They have chosen a non-powered filter with a narrow bandwidth for a relatively low cost, one that will be more accurate than the filter used by HELIOS II but not as accurate as the power filter chosen originally.

Structures: Structures completed their acrylic model but were unable to perform any serious tests on it. Upon being supplied with more accurate dimensions from the other sub teams, Structures has re-done most of the Solid Works files. They have researched different mechanisms to attach the camera housing to the base housing and have rejected the original idea of a slew ring bearing because of cost and potential for outgassing in favor of a double ball bearing. They have also decided to implement a worm gear on the phi axis. They have been working closely with Optics to determine the final dimensions of the camera housing and will begin machining the aluminum as soon as they receive them. They have also been working with a new mentor, Lee Sutherland from the National Center for Atmospheric Research.

Thermal: Kristen has transferred from C&DH to Thermal in Chris Row's absence. She is communicating with Lockheed Martin's Emily Brisnehan for mentoring and is researching ways to calculate thermal input and output. She plans for the payload to by painted white on the outside and black on the inside to minimize the internal heat.

Management: The position of project manager has been transferred from Chris Rouw to Paige Arthur upon his leave for the summer. New daily and weekly team meetings have been arranged. The team is now utilizing a website called Thinker to better keep track of goals, accomplishments, deadlines, team member vacations, and upcoming meetings and events. The Systems Engineers have created extensive testing documentation to ensure smooth integration between sub teams. Management has also worked to allocate the funds provided by the Undergraduate Research Opportunities Program, the Engineering Excellence Fund, the Colorado Space Grant Consortium, and the Center for Atmospheric and Space Astronomy. They have also updated the HASP and HELIOS III webpages on the Colorado Space Grant website.

Plan for June:

The sub teams will continue on work on their individual goals and will increasingly work with other sub teams. Already the sub teams have been working more and more closely with each other and this will only increase as they teams start to integrate their hardware with the hardware of the other sub teams. HELIOS III still plans to be done two weeks before integration so that they can extensively test their payload.