

## **University of Colorado at Boulder March Status Report**

In the month of March, HELIOS III has completed their Preliminary Design Review (PDR), and their Conceptual Design Review (CDR). The team is now beginning the construction phase whereby each subsystem will begin ordering hardware and testing their current configuration to prove its viability.

### **Team Demographics:**

Cooper Benson: Caucasian male, freshman aerospace engineering

Paige Arthur: Caucasian female, freshman aerospace engineering

Kristen Hanslik: Caucasian female, freshman aerospace engineering

Chris Rouw: Caucasian male, freshman aerospace engineering

Justin Alvey: Caucasian male, freshman aerospace engineering and applied math

Chris Bradford: Caucasian male, freshman aerospace engineering

Dylan Richards: Caucasian male, freshman aerospace engineering

Tyler Lugger: Caucasian male, freshman aerospace engineering

Ryan Cutter: Caucasian male, freshman aerospace engineering

Matia Astarita: Italian international student, freshman aerospace engineering

Griffin Esposito: Caucasian male, freshman aerospace engineering

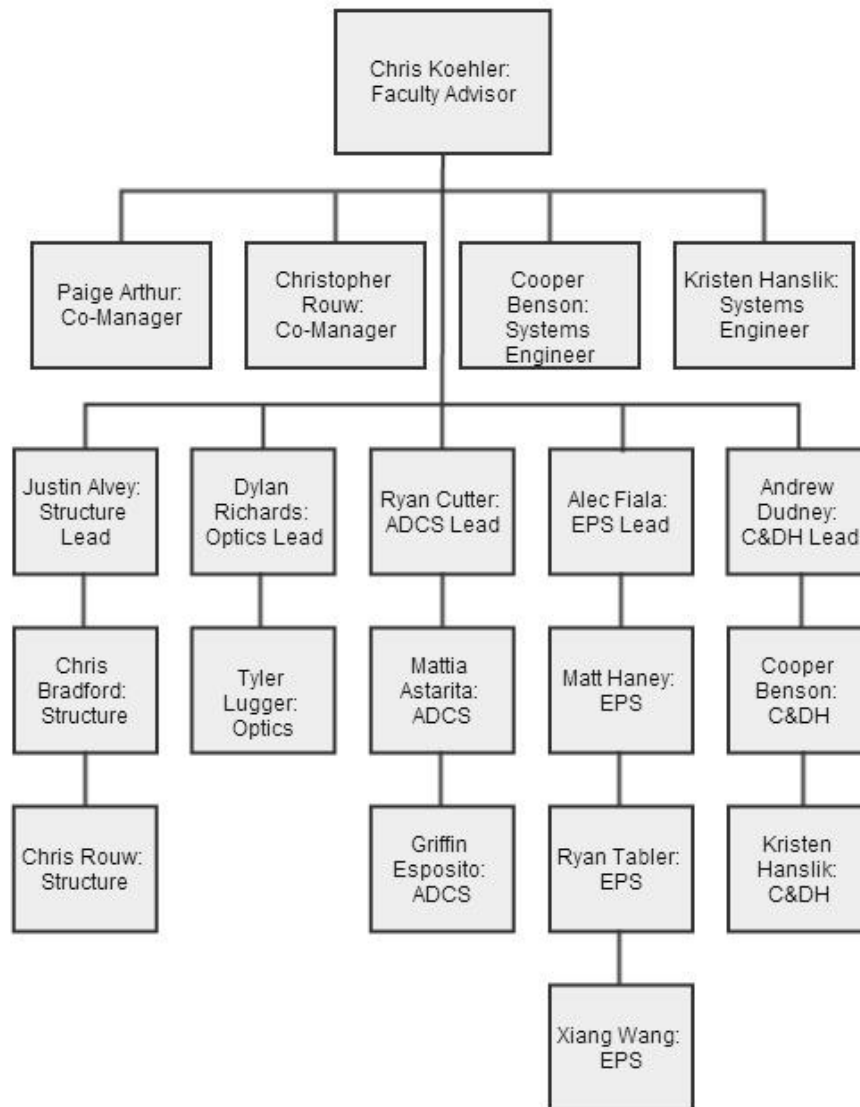
Alec Fiala: Caucasian male, freshman aerospace engineering

Ryan Tabler: Japanese male, freshman electrical and computer engineering

Xiang Wang: Chinese international student, sophomore electrical and computer engineering

Matt Haney: Caucasian male, freshman electrical and computer engineering

Andrew Dudney: Caucasian male, freshman electrical and computer engineering



### **Accomplishments of March:**

On March 3<sup>rd</sup>, 2014, the HELIOS III team presented their PDR to the Colorado Space Grant Consortium and the HELIOS II team. Both parties reviewed the project and gave feedback to the subsystems. Between March 3<sup>rd</sup> and March 19<sup>th</sup>, each subsystem continued to refine their design and incorporate suggestions received at the PDR and CoDR

**C&DH:** C&DH was able to obtain a Raspberry Pi (their primary CPU for the mission) and began testing the viability of real time image processing software. They were able to accurately track the Sun in .1 seconds using images taken by the HELIOS II ADCS camera aboard the 2013 HASP flight. They encountered an issue with overdraw of current by the cameras when hooked up to the Raspberry Pi. Through testing, they determined an independently powered USB hub

would resolve this issue. The team has also found open source C drivers for the cameras they intended to use and have tested them and found them to be compatible with last years cameras. They have yet to test the drivers with this years cameras.

**ADCS:** The ADCS team considered multiple tracking options between PDR and CDR. The most popular solution was to use one set of baffled photodiode arrays and the ADCS camera to calibrate the diodes for any offsets encountered by bias in the photodiodes or reflections. The team worked closely with Caleb Lipscomb from HELIOS II to determine the most viable option to track the Sun. The team also chose new motors that have a higher holding torque required to maintain the stability of the SWIS housing.

**EPS:** Similar to ADCS, EPS worked closely with Jorge Cervantes from HELIOS II to determine what components to use for the EPS board. They have eliminated linear regulators from the design and opted to use more efficient buck converters to decrease the power loss of the system. They also ordered and began designing the buck convertor circuits. EPS has been working with ADCS to create the op amp circuit necessary for the photodiodes. EPS is currently looking into the benefits of a P-channel MOSFET switch versus an N-channel MOSFET switch. Once they determine which one they will use, the team will begin designing the first iteration of the EPS PCB.

**Optics:** The Optics team has worked with both Anthony Lima from HELIOS II and Fabio Mezzalana from the University of Colorado at Boulder's Department of Astrophysics and Planetary Sciences. The team has determined the resolution needed by the science camera and the focal length required to meet the requirements of that resolution. They have chosen a cassegrain telescope system that will increase the focal length of the system from the HELIOS II design, while only adding a small increase to the total length of the system. The telescope system will also use a narrow bandpass filter and a powered H-alpha filter in order to see true H-alpha wavelength.

**Structures:** The team has completed the necessary shop training classes in order to machine the aluminum structure in house. Currently the team is in the process of receiving training for 3D printing and Laser cutting as well. The structure has been modeled in Solid Works. The center of mass has been calculated and a support system has been created in order to maintain the stability of the system. The team has created a foam core structure to demonstrate the structure can actually be built by hand (hopefully no hammers this year at integration). The team will also be creating a fully functioning acrylic model of the structure by mid-April. This structure will be used to test the viability of the structure as a whole as well as act as a base for ADCS to test with.

**Thermal:** This subsystem is a bridge between structures and EPS to ensure the system remains within the thermal restrictions. The team has completed multiple hand calculations however the validity of the results are inconsistent. The team has worked with other members of the Colorado Space Grant Consortium in order to learn AutoCAD and Thermal Desktop to create a thermal model of the system during the flight. Currently the team is attempting to contact former Space Grant students at Ball Aerospace for guidance of the thermal analysis of the system.

**Plan for April:**

Each team has created five Milestones they plan to reach prior to the end of semester (set as May 4<sup>th</sup>). Each team is expected to complete their individual system by this time and begin integration with other subsystems beginning in May. The HELIOS III management team has decided to hold an informal review the last week of April. The team will also be working towards completing the preliminary PSIP required by HASP and they will be presenting at the Colorado Space Grant Consortium Symposium in late April.