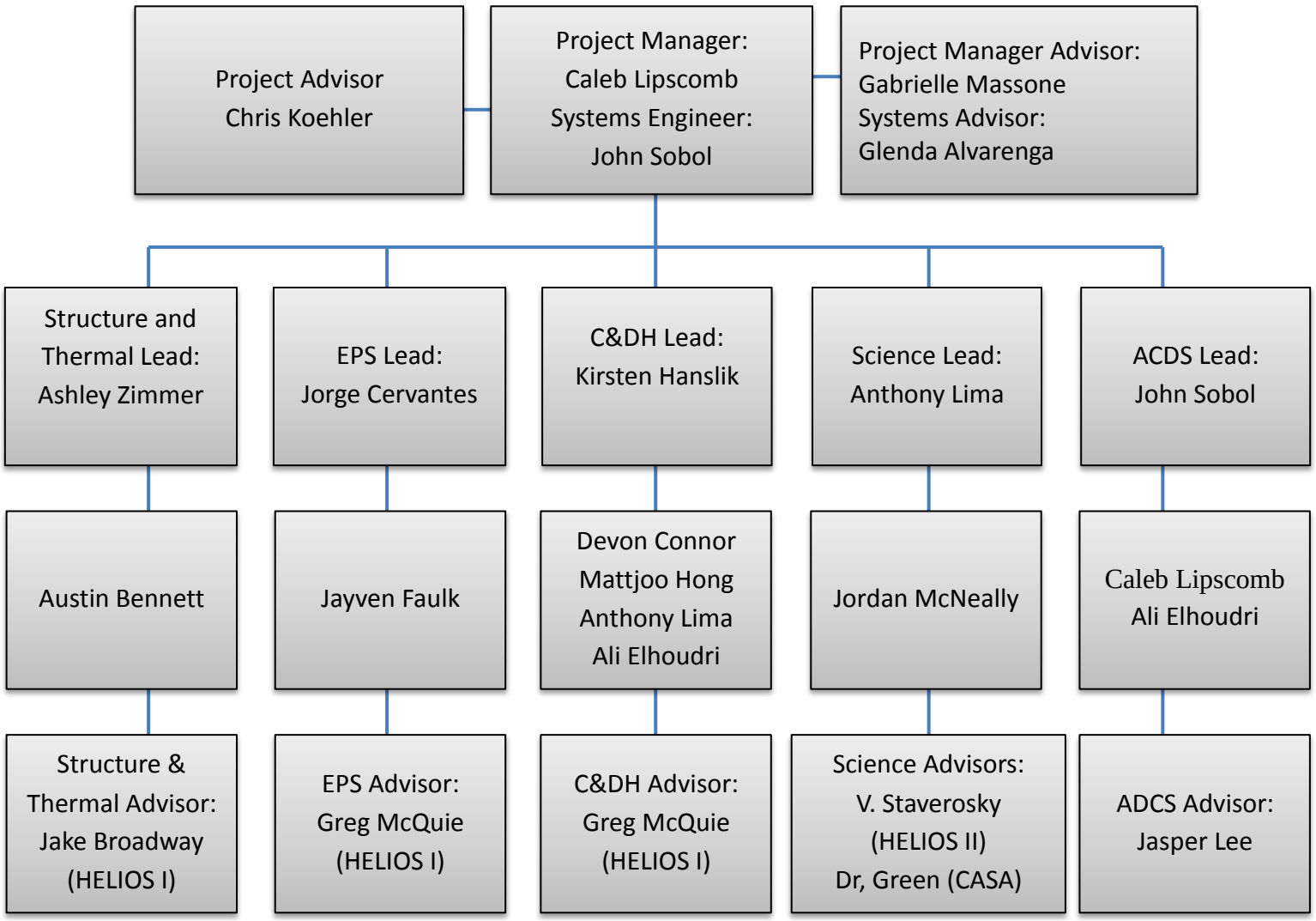
University of Colorado Boulder Monthly Status Report: May 31, 2013

Overview since 4/26/2013

In the last month, HELIOS II has re-organized with a new summer meetings and team organization. Prototypes for the Attitude Determination and Control System (ADCS), Solar Wavelength Imaging System (SWIS) and the Electronic Power System (EPS) have been completed. The Pandaboard used by Command and Data Handling (C&DH) is currently having Ubuntu and the Camera Drivers installed. The Structure of HELIOS II is undergoing its final design revs and will be machined in the next few weeks.

Current Team Members and Leaders

Two new people have joined the HELIOS II team and one person has left the team. Austin Bennett is a new member of the Structures team and Mattjoo Hong is a new member of the C&DH team. Additionally, Caleb Lipscomb has joined the ADCS team and Anthony Lima is helping the C&DH team.



1 Activities of Team members

Since the last report, ADCS, EPS, and SWIS have built a functioning prototype of their systems. ADCS constructed a prototype array to track the sun on a single axis. The array consists of two arms 10 cm long at a 90 degree angle with one photodiode on each arm. The photodiodes on each arm are the same distance from the center, 6cm. There are laminated paper filters over each diode to reduce the intensity of the light outside such that the sun does not oversaturate the diodes. Each diode has an op amp to increase the current being produced by each diode so the Arduino microcontroller can read the signals. The array is centered on the sun when each diode outputs the same current. If the output of the diodes is different, the Arduino controls a motor to turn the array until the readings from the diodes are equal. EPS has constructed a prototype power board to convert 30 VDC into 4 lower voltage power lines; one 5V line for the panda board and three 7V power lines to power the Arduino microcontrollers. Each power lines have a buck converter and a linear regulator to step down the voltage. SWIS has successfully built the wide field of view ADCS camera and the high magnification Science camera. Additionally, the SWIS team was able to identify several sunspots in test images taken from the ground with the science camera. C&DH is currently installing an Ubuntu environment on the pandaboard and will then install the drivers used to control the cameras. The Structure team has completed a CAD Design of the HELIOS II's stricter and will be finalizing the design next week. The team will begin machining the structure as soon as the CAD designs are finalized.

2 Issues encountered

Several Issues were encountered during prototype construction. The major issues included:

a. A re-design of the Science camera system: two lenses changed the size of the image such that it was too small to resolve sun spots. The barrel of the Science camera was extended and a single lens magnification system was implemented
b. After constructing the ADCS photodiode array, there was too much electrical noise in the system for the diodes to track the sun accurately. The wires in the array were shortened and all signal wires were wound with the power and ground wires. This reduced the noise significantly and solved the issue.
c. In C&DH a Debian operating system was originally used in the Panda Board, however after further research it was determined that the pandaboard operates best under an Ubuntu environment. Ubuntu is now being installed on the Pandaboard.

3 Milestones Reached

The biggest milestone reached was the completion of prototypes for the ADCS, SWIS, and EPS systems. The prototype ADCS array can track the sun to within a degree of accuracy on a single axis, even when the axis is slowly rotating (rotation data used to model the HASP platform rotation was taken from the University of Colorado SPARTAN V 2010 HASP mission). Further testing and calibration is predicted to bring error of the ADCS array to under plus or minus 0.5 degrees. The Prototype SWIS science camera was able to identify several sunspots on test images on the ground. The EPS board is able to power both the SWIS prototype and the ADCS prototype.

4 Next Objectives

The next objective for HELISO II is to begin constructing and designing a flight ready payload. The payload will consist of an aluminum structure and camera mount with plastic 3D printed photodiode arrays. Additionally, C&DH shall be able to control the SWIS cameras to automatically take pictures and

store the images captured onto a solid state drive. Finally, by the end of June, HELIOS II is expected to have completed it’s first day in the life test.