Inter-American University of Puerto Rico
HASP 2012
June Monthly Status Report

As the first of the summer term, this month has been witness to a great number of changes in our team. Our primary objective has been to have the entire project fully prepared both as a HASP 2012 backup payload and as a possible flight ready payload. Therefore, particular care has been given to required documentation for flight integration and readiness.

Furthermore, with the graduation of all our senior members, our positions have been filled with students from various universities working as interns, part-timers, and voluntaries. These students have been in charge of reviewing and optimizing the project's different systems organized into mechanical, electrical, and software classifications. Overall changes include a complete structure redesign process; we are currently waiting for the parts to be machined and assembled. The solar panels that were previously being developed have been abandoned in place of a heating system, and all software code in the process of being optimized for processing power. If all the structure is machined on time, a re-calibration of the control system would be all that is needed to complete this project in time for launch.

1. Activities of Team Members

The Electrical team (ELEN) has finished improving the GPS's power management system (turn on and turn off), a prototype of this board board is shown in **Figure 1**. The prototype includes the heater circuit, which is able to be configured to generate 3W, 6W or 9W of thermal power (depending on the final thermal analysis results). This board was tested with the other two populated boards (ADS & ACS / Flight Computer PCB's) and was verified to ensure a proper design following the PC104 standards. **Figure 2** shows the Schematic and PCB layout of this board to be populated and tested in the first week of July.

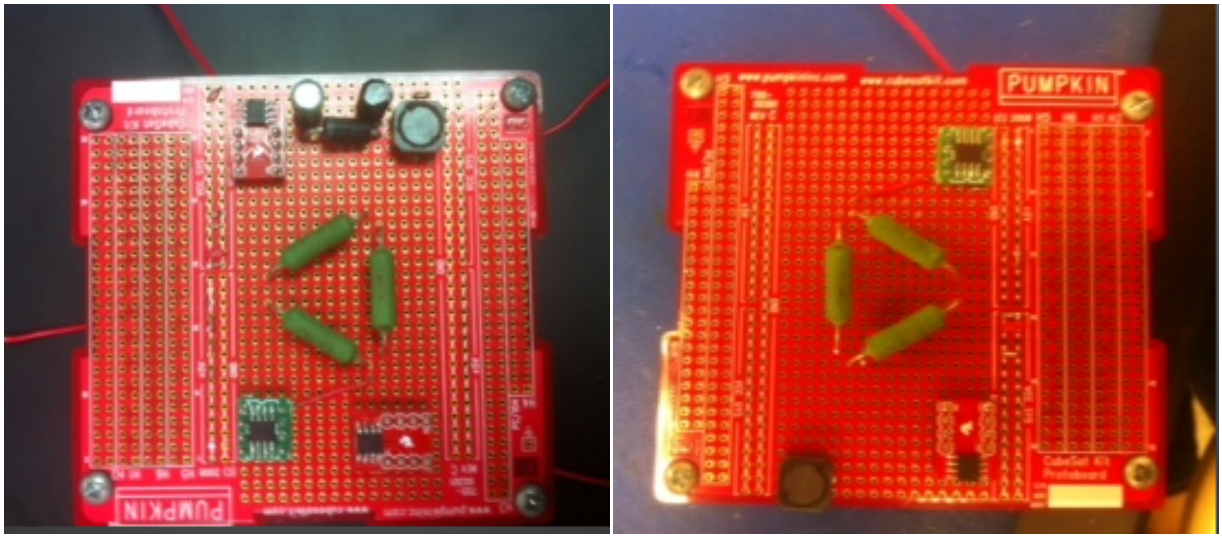

Figure 1. Prototype for GPS' Power Switch and Heater

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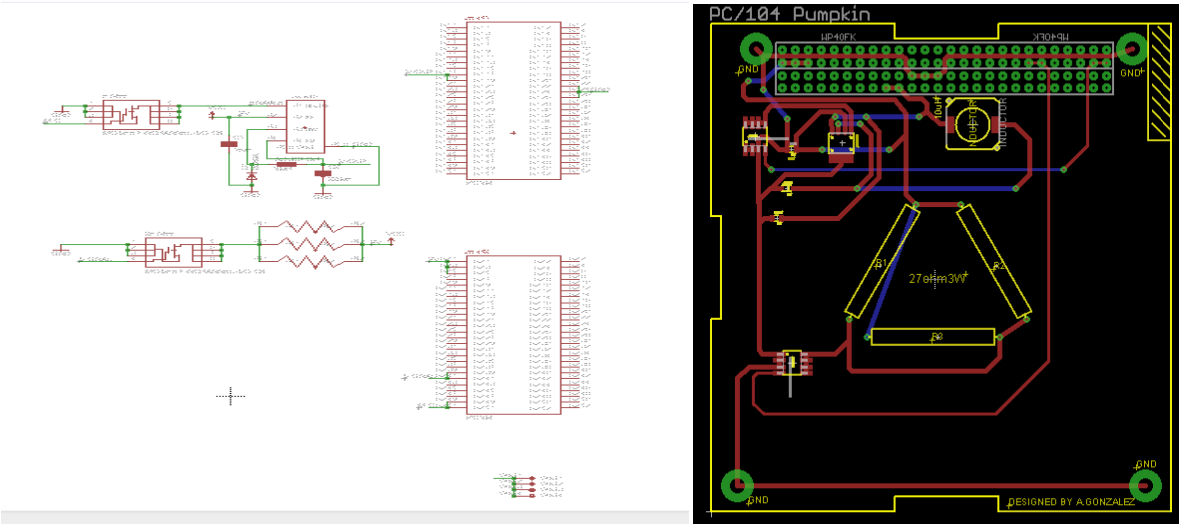

Figure 2. Schematic and PCB Layout (Power Switch for GPS and Heater)

The Mechanical team has been working on redesigning the pre-existing structure because the machining and assembly quality presented several problems in terms of functionality. It performed as necessary for a prototype but interfered with the maximum displacement allowed by the control system (structure could not turn more than 45°). The new structure (shown in **Figure 3**) accounts for all these issues as well as streamlines the overall appearance, resistance, and reusability of the frame. Another major feature is the 1U's closed geometry designed for thermal insulation rather than solar panel compatibility.

In addition to the aforementioned changes, extensive structural and thermal analyses have been performed including computerized structural simulations, and insulation testing (mylar, combined with Fomular 250) in sea level and subzero temperatures. Reflectivity (for the mylar) analyses are currently performed to determine the transient heat change inside the 1U structure throughout the flight's duration.

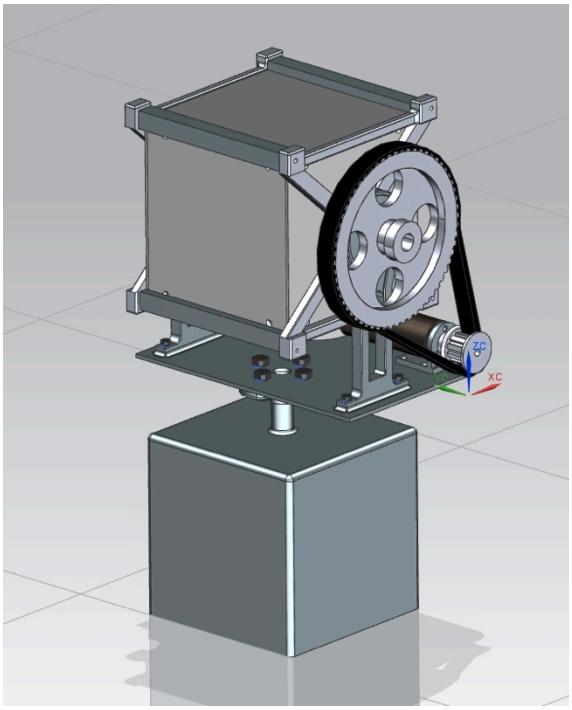

Figure 3: Entire payload assembly without mounting plate.

The software team has been working on low power optimizations at high level applied to the ADS and ACS codes to reduce power consumption. Among the optimizations applied are loop unrolling, function in-lining, etc. Moreover dynamic memory allocation was implemented to more efficiently use the data in the memory and increase performance.

2. Current Team Members

At the beginning of June 7 new people joined our team including last year engineering students from UPR Mayaguez, Polytechnic University of Puerto Rico, and Embry-Riddle Aeronautical University. The flowchart below shows the latest team structure:

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