

## **ARIES-GPS Payload**

### **Inter-American University of Puerto Rico Bayamon Campus**

#### **June 2012 monthly report**

##### I. Activities of the team members

We will describe the activities that the members of the ARIES-GPS Payload are working at this point of the project.

- **Electrical system**

- It is important that all the components and boards are tested, so we can confirm that any failure or any power value different than the estimated will not occur. We use the prototype power board to hook up all the boards and take the measurements. At first, one of the IC was having problems with its internal temperature. The problem was because we didn't throw a thick enough line of ground, and after the problem was solved all the power tests were made. As we expected all the power consumptions of the devices were much closed to the estimated one, even with the 91% efficiency of the DC/DC converters (9% power loss). The maximum current consumption at 30VDC was 0.42A, which means a 16% less than the maximum current consumption required by HASP. Also the PCB design was altered because some minor components were changed due to optimization requirements. Because we needed an external temperature sensor, we looked for one that obeys the temperature range conditions, which are -80°C to 100°C. We select the HONEYWELL HEL-705 series because it accomplished that range. We needed to design a circuit to have a better resolution in the data obtained by the temperature sensor. That circuit was made and tested to ensure that it works. After all the tests the circuit was implemented in the PCB design of the power board.

- **Mechanical system**

- During the month of June 2012, the design of the outer case had to be partially re-designed. Some simulations were ran as required to ensure the structure could withstand 10g's vertically, 5g's horizontally and the equivalent of 5g's in shear (torque). Since exact weight of the total payload was not determined yet (not all the parts have been received) we ran the simulations under critical mass conditions (3kg). All of the results were positive and way under the yield strength of the material. The total outer structure including the base has a mass of 1.4kg. This leaves a good margin for insulation and inside payload.

- Since the GPS antenna was changed, a new bracket was designed for it. We are currently waiting on the final antenna specifications to send the new design of the bracket to be built. The bracket was also tested for vertical, horizontal force and torque, all with successful results under yield strength.
- The outer case of the payload was completely built, and assembled, with its brackets, walls and all hardware. It was also attached to the PVC base provided. Currently, the base for the circuit board stack and the railing system for the stack itself is being built.

- **Software System**

- A During the present month the software team continue to interface with the SBC running our applications.. The compact embedded system utilized for this project is the TS-7260. The serial communications ports in the system where tested and observed that we can communicate through them via the use of RS-232 communication ports. These ports run at the standard baud rate of 9600, as a Linux is lacking some capabilities the baud rate for the serial port on the HASP would be changed in software. A side from this minor issue, the system has been set to load all USB ports, FTDI and USB serial modules during the startup, via a script. An auto login to root user was also configured so we may just turn on the system and commence our testing without delay. Also some software was developed for using the watch-dog timer each 8 seconds before a full reset. In addition some code is addressing to lowering as much as possible the power consumption turning off the Ethernet port and the serial port not used.
- We've been able to retrieve data from each sensor the IMU posses. Using the Linux terminal we have acquire, through some strong research, the commands and data we need from the IMU. We are currently working with an implementation to extract the data using a C file in order to implement it in the project file. We have modified some code to be able to retrieve the necessary data and have total control of the hardware as desired.

- **System Engineering**

- During the month we worked mainly in the documentation for the final PSIP. After some issues were addressed we manage to fix those. For this team is indispensable that our documents meet the HASP requirements.
- Also after some experiment an IMU was added to the payload in order to complement the data from the radio-occultation experiment, the new instrument does not represented major issues in the system power consumption.

## II. Issues Encountered During Payload Design

- The TS-7260 had installed in its flash memory a minimalistic Linux which eliminate most of the common Linux features, however is a fundamental piece in the low power consumption of the processor.
- One of the RF board on the ASTRA GPS receiver was not PC/104 form factor; so mechanical improvements were made in the stacking board process.

## III. Milestones Achieved

At the time of the projects this are the milestone that we have achieved.

- **Objectives**

- Power board for the payload was completed.
- The ARIES GPS payload preliminary assembly was started.
- Payload external structure was finished and it is under HASP regulations.
- Software improvements in the auto-running programs for the Linux environment.

## IV. Current Team Members and Leaders

