# Student Payload First Flight (SPIFF) Payload Team Monthly Status Report

*Boston University / Georgia Institute of Technology*

**July 3, 2012**

## Current Team Roster

a. BU: Nate Darling, Chris Hoffman, Nima Badizadegan, Pantelis Thomadis
b. GaTech: Josh Mendez, John Trostel

## Boston University

After a series of significant setbacks in software development, the BU team has implemented a descope plan that will allow program goals and milestones to be met on time.

The most significant challenge was an unexpected loss of the NanoCDH circuit board. Initial concerns with this loss were based on the fact that the NanoCDH is a custom-built SPA-1 capable device, and did not seem to be readily available. It was suspected that the failure was in software, although it is possible that the failure was caused by an ESD or cleanliness issue. The failure was eventually resolved by sourcing a new NanoCDH board from the Configurable Space Microsystems Innovations and Applications Center (COSMIAC). Any risk of ESD or contamination effects has been mitigated by locating all further development efforts in a class 100,000 clean environment with good ESD protection.

Several development tools are available for SPA-1 software implementation, and are currently being employed by the BU Command and Data Handling team to develop the code necessary to be fully "plug-and-play" before integration at the end of July. The full SPA-1 system is comprised of the following components:

1. Satellite Data Model Application (SDM-App)
    a. High-level code structure that resides on the NanoCDH single board computer. This is the most generalized feature of the SPA-1 system and is applicable to a wide range of instruments. The SDM can be described as the "operating system" of a SPA-1 system, and does require some customization depending on the instruments it must interface with.
2. Applique Sensor Interface Module (ASIM)
    a. Software module that functions as a translation device between the instrument and the NanoCDH. The ASIM allows the xTEDS to be processed by the SDM-App.
3. Extensible Transducer Electronic Data Sheet (xTEDS)

a. Datasheet of commands and instrument-specific definitions that can be processed by the SDM-App in an initial handshaking / address resolution phase. Instrument-specific definitions include variables and expected messages to/from each device.

The descope plan involves reducing the software and hardware elements to the minimum that are required for a SPA-1 interface with both the magnetometer and the EFM. This will exclude part of the code written for the microcontroller on the HASP NanoCDH motherboard as well as the interface board's capability to act as a SPA-1 instrument.

Figure 1 shows two of the components that will not be descoped, the ClydeSpace EPS and battery assemblies. These units are currently undergoing load testing to verify their compliance with the HASP and BUSAT power budgets. The test will verify the total time that the batteries will supply power to payload subsystems in the worst case scenario where an external power supply is not available, and will be completed by July 5.

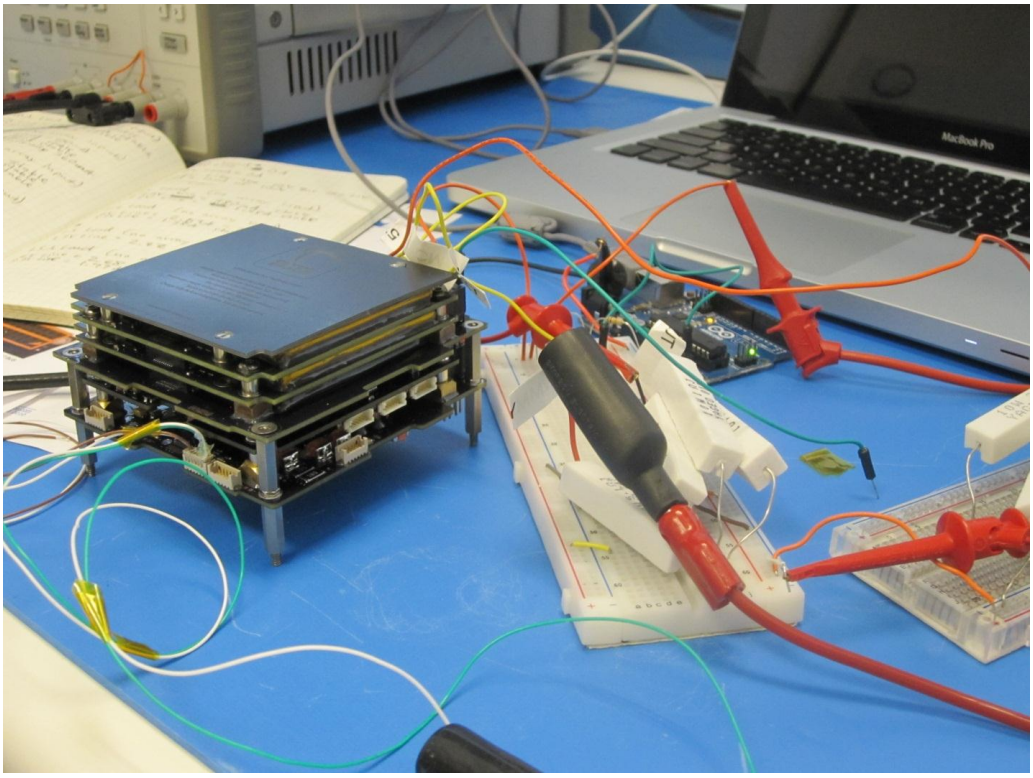

**Figure 1: Clyde Space EPS and Batteries (on the bottom of the stack) undergoing load testing in the BUSAT class 100,000 clean room.**

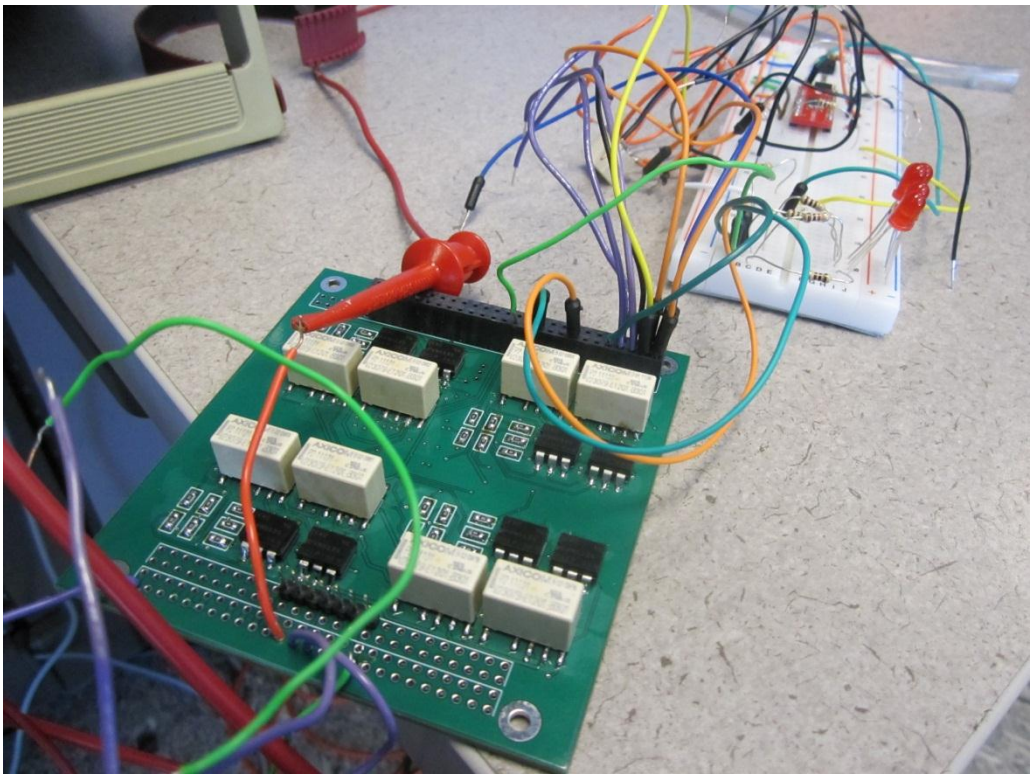

**Figure 3: The HASP interface board and breadboard testing assembly. The test shown verified that power could be switched on and off at the interface to the magnetometer payload.**

## Georgia Tech

Over the last month the Georgia Tech team has been finalizing the construction of the SPA-compatible miniature electric field mill. The analog board, containing the charge amplifier, a differential amplifier, a commutator and a 12-bit ADC, is currently being tested. To test the response of the EFM, the group has built a large parallel plate capacitor (See Figure (1)). The bottom plate is held at earth ground while the top plate is given a potential ranging from 0 to +/-10 kV. The distance between the plate is 30 centimeters. A small hole was made in the bottom plate to expose the aperture of the sensor to the electric field. The performance of the EFM is being compared to the simulations run in PSPICE.

The digital board also arrived this week and will be populated by the 2nd of July. A complete end-to-end instrument test has been scheduled for the 10th of July.

**Figure 2: Completed mechanical structure of the EFM supporting both the analog and sensor boards. Wires at bottom left are from stepper motor.**

The total cost of the EFM was 220 USD.

<u>July Goals:</u>

Implement SPA-1 on digital board

Integrate EFM with dummy CDH

Compare field mill operation to commercial EFM

Full HASP integration with Boston University's HUB on the 15th.

**Figure 4: Calibration device for the EFM.**

## New Mexico Tech

The New Mexico Tech team will be unable to continue development for HASP – This means that while the EFM (GaTech), the Magnetometer (BU) and the SPA-1 link (BU) will continue preparation for integration and launch, the SHM instrument will not. The following is a letter from Matt Landavazo outlining this:

*I regret to inform that New Mexico Tech will be withdrawing from the HASP project due to insufficient labor allocation and funding concerns. New Mexico Tech does not have the manpower to assign a dedicated team to HASP and have it in good flight ready and testable condition by the integration date. The work would have to be divided up between myself and Jordan Klepper. Unfortunately, both of us have other obligations this summer and do not have as much time to devote to the project as we would have hoped.*

*Additionally, with no direct funding for HASP we are relying on piggybacking funding from our own satellite project, NMTSAT. Its infrastructure will be highly compatible with both HASP and BUSAT. Because of the funding situation we have to make sure that the engineering work we do will have NMTSAT at heart. This makes pushing out a hasty prototype risky for us. If our HASP system is too hastily designed we may have overlooked something we need for NMTSAT in the design, in which case the design effort and manufacturing costs would have to be allocated again somewhere down the line again to remedy it.*

*I apologize for any inconvenience this may cause on your side of the effort and wish you the best of luck on the remainder of the project.*

*Matthew Landavazo*