Monthly Status Report - April 2013
ASTRO Team - MIT - Payload 06
23 April 2013

Important Note:

Due to the great number of variables created by the microfluidics system, we have decided to instead develop our second design, a purely electrostatic method for collection. Since our prototypes of the microfluidics system were not successful, we are instead turning to a more simplistic electrostatics design. In this alternative system, the collection tubes are two concentric cylinders that contain an electrode in the innermost cylinder. Both (inner and outer) collection tubes have rectangular cutouts in the sides, allowing for airflow upon alignment. In the off configuration, these cutouts are offset by 90 degrees. The tight alignment is lubricated with a grease (although we are considering replacing the grease with a teflon ring). The grease will not only allow for easier sliding, but also prevent contaminants from entering. After the collection sample time period is completed, the chambers are then rotated into the "off" configuration. Each electrostatic collection chamber has an electrode in the center. A UMHV chip is used to apply high voltage to the electrode. Upon collection, our sample collection chamber is activated by a twist of the outer, cylindrical chamber. The 90 degree turn is caused by stepper motor. There are a total of 4 collection chambers, 2 mounted in the horizontal and 2 in the vertical positions. This design is far more simplistic than the mircrofluidics system, which we are still researching for applications in future designs. However, with this electrostatic trapping system, we can still yield a sample, just without the luxury of concentrating the sample in a fluid drop.

Prototyping Team

Cheryl Gaul (Aeronautical and Astronautical Engineering, 2016)
Jessica Sandoval (Biological Engineering, 2015) - Team leader
Laura Standley (Mechanical Engineering, 2016)
Linda Xu (Physics, 2015)

Updates: See above "Important note" for modifications to the original design. We are now using PTFE as the material for our cylindrical collection tubes due to its low coefficient of friction, good electrical insulation, high UV resistance, and good performance in low temperatures.

Issues Encountered: For prototyping, using PVC instead of PTFE. PVC piping has slightly different diameter. Had to compensate for slight difference. Staying within weight limit, begin shelling out unnecessary weight. Trying to improve airflow in new design.

Milestones: Achieved: Finished new design for payload, continued working on prototype, began testing concentric collection chamber system.

Electrical Design

Ethan DiNinno (Aeronautical and Astronautical Engineering, 2016)
Updates: Electronics modified to fit new design (see above); system is still MSP430 based
Issues Encountered: Some design flaws in layout of PCB, details pending testing
Milestones: PCB and components for central electronics obtained; will be assembled and tested soon

Programming/Website Development

Rodrigo Gomes (Computer Science, 2015)
Jeremy Kaplan (Computer Science, 2015)
Updates: Experimented with MSP430, and learned how to code for it, and upload the software on the board. Wrote a skeleton of code with the methods necessary for the sampling procedure and other controls. Need to redesign this skeleton, because of new payload design. Will also need to use a different board because the first one turned out to not be compatible with certain electronic components. Website delayed but under construction.
Issues Encountered: First board tried was not compatible with certain electronics components; change in design implies redoing some of the code.
Milestones: Achieved: Obtaining and learning how to use the MSP430. Writing a code skeleton. Website near completion.To achieve: Redesign skeleton to meet needs of new design; code communication module; testing.

Christopher Carr - Research advisor for ASTRO team