

Monthly Status Report - February 2013
ASTRO Team - MIT - Payload 06
22 February 2013

Current Team Members and Activities of Members:

Ethan DiNinno (Aeronautical and Astronautical Engineering, 2016) - Designed electrical system, created circuit schematic

Cheryl Gaul (Aeronautical and Astronautical Engineering, 2016) - Involved with preliminary prototyping

Rodrigo Gomes (Computer Science, 2015) - Coding with MSP430, future website design

Jeremy Kaplan (Computer Science, 2015) - Coding with MSP430, future website design

Jessica Sandoval (Biological Engineering, 2015) - Team leader, developed SolidWorks schematics, involved with prototyping

Laura Standley (Mechanical Engineering, 2016) - Involved with preliminary prototyping

Linda Xu (Physics, 2016) - Preliminary research, including turbulence calculations for funnelling device to determine optimal altitude ranges for sampling

Christopher Carr - Research advisor for ASTRO team

****Steven Gordon** (2014) - Unfortunately, Steven had to return home to the UK and will be unable to participate in the ASTRO team for the coming year.

Issues Encountered:

The choice of collection fluid has been a problem. The vapor pressure of ethanol was higher than anticipated, so we are now looking for fluid alternatives to ethanol, namely a ration of water or ethanol mixed with Propylene Glycol. We have been studying Propylene Glycol (PG) and it has a low freezing point, -57°C , and a low surface tension. However, PG has a high viscosity at standard atmospheric conditions, and this viscosity increases as temperature decreases. Certain properties, such as the low freezing point, potential for preservation of *live* samples, and very low vapor pressure point render PG desirable. Thus, we are currently working on adding a solvent (ie water, ethanol) in order to reduce the viscosity without compromising the low freezing point and/or the low vapor pressure.

Another issue is finding a permanent location for meetings and lab space for prototyping. We are currently searching for a new permanent location in order to store materials and projects. This space will also give us the ability to productively and collaboratively work on prototypes and our final payload.

Milestones:

- We have successfully submitted the Payload Summary.
- The steps in our sampling procedure have been solidified and we have a fully defined design with which to begin prototyping.
- We now have a detailed and up-to-date power circuit diagram.
- We have received three essential parts: 1 nanoliter dispenser (NLD), 1 microinert valve (MIV), and 2 Ultraminiature High Voltage (UMHV) converters (5 V input, 0 to -5 kV output). We are able to perform tests, such as assembling a “mock dispensing” proof of concept, in order to validate the function of our various electrical subsystems. With these microfluidic controls, we will also be able to test the propylene glycol/fluid ratios and thus modify our design according to our results.
- Components for the proof-of-concept power supply and control subsystems are in the mail.
- We have received our first donations on behalf of Professor Maria Zuber and Dr. Gary Ruvkun for a total of \$2,500, which will help boost our prototyping abilities and also allow for easier fundraising down the road.