

Compilation of design criteria from Maryena (9/12) and Dr. Law (9/26)

Summary Statement

“Functionality is the most important, I am not stuck on any specific designs” - Dr. Law

Communications-Scheduling

Dr. Law will be attending weekly meetings with entire team on Wednesdays at 3:30 In BEL room 328. During these meetings and honest report of where we are with the project and all advancements shall be given. Problems within the team are expected to be communicated immediately and resolved quickly. Unexpected challenges within the constraints of the design should also be communicated during weekly meetings. When we have these challenges Maryena, Andres, Feng Li, and Dr. Law are all excellent sources of information and advice.

Biological Sampling

The most important factor of the sampling is that the device is kept aseptic and does not get contaminated pre or post collection phase. The device must be completely sealable for this to be affective. The long-term goal is to have the device successfully sample in the stratosphere, which is 8km-15km in range. For now, collection from anywhere in this range is satisfactory. Having a device that can later be modified to differentiate between the elevations and sample at different elevations inside the stratosphere range is desirable. Sampling media we can be flexible with, however the team has found that agar does not fare well in the extreme environment of the stratosphere. Additionally, we must have multiple collection sites as well as a negative control sample. We must have a method of proving that the collected organisms were sampled from the stratosphere and not through contamination. Dry ice will be our method for transport of organisms once collected.

Environmental Factors/Launch Requirements

All aspects of the design must be able to with stand the -80 degrees Fahrenheit of the stratosphere. The design must be rugged enough to survive the decent from high altitudes. Landscape for launches should be publicly accessible, flat, and have the least number of trees possible. Launch must abide by the FAA and FCC requirements. We are expected to launch multiple times prior to the engineering expo. These launches do not need to be at full altitude. Challenges with launch involve, weather conditions of day, land accessibility, approved access to the sky, and recovery of device. All these factors should be considered and prepared for prior to launch. The system will be launched with high altitude balloons with helium.

Controls and Sensors

We are not limited to a controls system. Previous prototypes currently use an Arduino to control sensors. Required sensors include altitude/barometer, humidity, temperature, and GPS. Highly desirable sensors include gas sensors such as oxygen and carbon dioxide and radiation measures, these sensors may prove helpful in biological experiments. The electronics need to be able to communicate with us on the ground and be trackable during and after flight. The trackability of the device is crucial, Mareyna suggest even two GPS systems. There will be a ground system to receive and store data. We will have high risk elements that will incorporate modularity and redundancy.

General Design

Keep the device under 12 pounds to be within the weight limit of the balloons. The electrical components must be easily detachable for serialization of device and collection media. The team currently is autoclaving the device. We are not retrained to the size of the autoclave but rather the size of the auto clave bag. There is no set structural desire for device. Device must survive descent from atmosphere undamaged and uncontaminated. The device should be rugged enough for indefinite flights.

Budget

We do not currently have an exact number; our current high estimate for construction and approximately one launch is \$2,500. Each launch will cost 300 dollars in helium, if the team is to launch several times this easily will affect our budget. Additionally, each launch we will have to autoclave the device in a new autoclave bag, these bags range from \$58-\$268. To analyze the collected microorganism's, PCR and genetic sequencing has been the current standard. Each genetic sequence costs \$1500. If we are to run analysis on our collections this will significantly alter our budget.