Lessons Learned from SNOWCAT Model 1

The purpose of this document is to highlight any observations that we made during our first prototype of the SNOWCAT system.

Structures

- We need to pay more attention to tolerances so that the structure fits together well and can accomplish its dust collecting abilities for different events
- We need to think about the benefits of 3D printing and decide if we want to make this machinable so that it can be mass produced in the future
- We need to fully work out the SolidWorks once we have the final model so that we can visually confirm its viability
- We need to work more closely with electrical to see what they require from us and truly create a working model so that the team can fulfill the mission requirements
- We need to have a firm idea on which collection system we are going forward with so that the Structures team can put all of their energy and focus into that model
- Use SI units

Electrical

- We need to incorporate the electro-mechanical system
- Implement the designed battery system
- Spend less time on a development board, more time on software
- Begin writing software and developing board as soon as possible
- Come up with a better way for multiple people to work on code/board design (git hub)

Systems

- Need clear timeline and clearer budget break-down
- Working on improved requirements

From Alia

Flute Chambers:

- Concerned about intake and collection capsules (gap between flutes and collection chamber) → add gasket?
- Concerned about removability of box (wearing gloves, sometimes there is precipitation)
    - Should make it easier to change out samples in the field

    - Box did not slide easily out of chamber, could potentially lead to loss of sample if it requires a lot of force to remove.
    - Also concerned about sample contamination (because of gaps between flutes and collection chambers).

Power:

- Need to make sure the system has enough power to last for a whole mission
    - System should be shipped with the batteries removed
    - Need batteries that last longer, or a way to make the system use less power.
    - Or increase battery amount.
- Documentation of how to interpret the data to make it more easily interpretable when it is downloaded in the field (perhaps this is the software mentioned above?)

Structure:

- Boxes: The epoxy holding the electronics box to the dust chamber was beginning to fail after the 4 day test, but the duct tape was still holding it together (though it was wet from rain). However, it was way easier to transport the boxes separately on the way back so a design where they can fit together for field deployment, but transported separately would be great. For example a groove in the top box that the bottom electronics box can slide into, and then be reinforced with duct tape, or something like that.
- Wind Sail: The wind sail seemed to work really well. However, there was no snow during the test, so I am thinking it might be nice to take the design with em to Svalbard, where there should be lots of snow, blowing in all directions, so we can see if it gets stuck in the back triangle of the wind vane. Or does the team need the existing model to continue to work on?
- Wind Sail: I also put duct tape over screws fixing the windsail to the box, but maybe we can think of another way to reinforce them without duct tape.
- Base: The base worked well too - but it was dug/buried in the soil/ground for extra stability. I'm not positive this will work in the snow too, but think it could be a good option. However, on a glacier, we would need another system as there is no way to dig it into the ice and have the refreeze over it, though it would make it stable! :)
- Nozzle/In-take: I am also concerned about the nozzle/flutes getting clogged with snow. Perhaps another reason to plan to test it in Svalbard, prior to finalizing the design of the intake system. In CO, because there is much more sun, this may only be an issue during a snow storm, and then it could likely become unclogged when the sun comes out and melts the snow, however in snowy/dark places, like

the Arctic in winter, if it gets clogged, it could stay that way the rest of the season…

- Sturdiness: For this prototype I used a lot of duct tape, I did this in the past with the BSNE collectors as well, however, coming up with a way to avoid the duct tape 'securement' could be useful for producing less waste :)

Questions

- HOW SHOULD DUST BE REMOVED → brushed out of stall?? Airflush??
    - How should capsules be removed??

Alia's reply: It can either be brushed out with a clean tool/chem wipe, or washed out with deionized water into a clean bottle. Likely first it would be stored dry, so that it can then be separated for wet and dry analyses. The main thing is that it will be possible to remove each sample individually, without contamination from the other samples.