

University of Calgary

HASP Group

Monthly Status Report

May, 2015

Team Leader: Alex Sheldon & Candice Quinn

Team Members:

Alex Sheldon

Andrew Eriksen

Armando Davalos

Austin Reister

Candice Quinn

Casey Daniel

CJ Osakwe

Dain Galts

Elizabeth Roy

Eric Grono

Juan Delfin

Justin Mansell

Marc Russel

Michelle Bootsma

Paul McMahon

Robin Williams

Supervisor: Dr. Chris Cully

Advisors: Dr. David Knudsen, Dr. Laura Mazzino

Summary of Activities

1. Thermal testing has started & design is being finalized
 - (a) We are currently in the process of deciding on the type of paint being used on the outside of the design to handle the temperature variations within the payload. The behaviour of the paint will determine whether or not we require heat tape. Foam insulation has been acquired.
2. Assembling of all electronics boards has begun (VLF main board, VLF, pre-amplifier, and Geiger boards)
 - (a) We were able to get in most electronic components, and full assembly has started, and should be completed by the end of this week.
3. Software design has begun
 - (a) The skeleton design for the software has been decided on, and minor details are dependent upon the speed at which the SD card can write.
4. Mechanical chassis design has been finalized
 - (a) We have made a slight modification to allow for cables to be properly strung throughout the system. The machine shop building the chassis should have it back to us by Monday June 1st.
5. Camera functional testing was completed
 - (a) Thermal testing indicates we should not have a problem at the projected extreme temperatures. However, given our facilities, we are not able to do thermal testing in a vacuum condition at this time. This will be done at a later date.

Changes in Design

1. Small hole at the bottom of chassis for cable routing
 - (a) We decided that the simplest design was to have a small hole in the bottom of the chassis system and string through all of our cables, and have them bundled with a cable tie. This would then connect to the serial connection.
2. Determined a rigid VLF antenna would be better than the dynamic antenna
 - (a) We determined that a rigid design for an antenna is more stable than a dynamic system (see *Issues Encountered*). A longer antenna would give us better data, however we are concerned about any possible problems during flight and decided that a 75cm long antenna would suit our needs.

3. Changed mounting of chassis to plate

- (a) For stability, we have placed L brackets on the bottom of our chassis in order to attach it more securely to the plate. These can be screwed on from the outside of the chassis, as well as removed from the outside of the chassis.

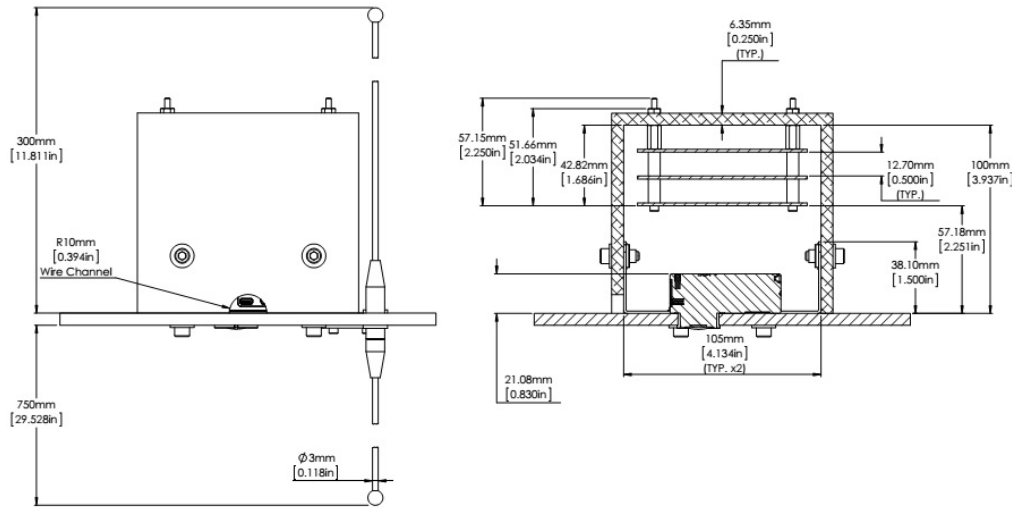


Figure 1: Cross Sectional View of Chassis

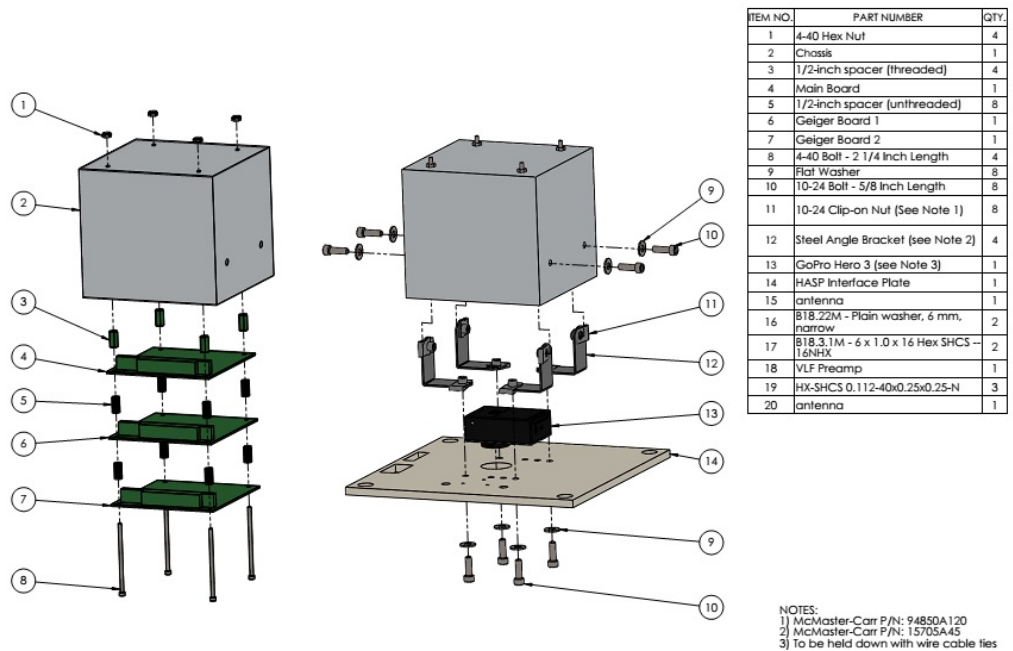


Figure 2: Current Chassis Design

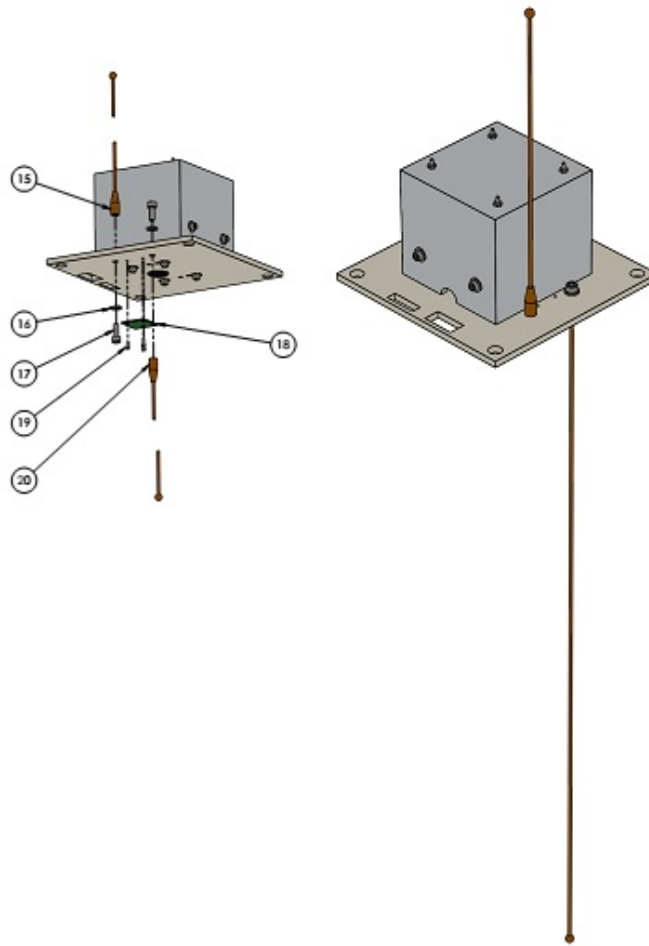


Figure 3: Placing of Rigid Antenna

Issues Encountered

1. Data Sync-up

- (a) We need to be able to sync the video from the camera with the data received from the VLF receiver. We are currently designing an LED system, in which we would place a single LED just on the edge of the camera's field of vision. This would not visually obscure the recording, and we would be able to detect the resulting flash on the VLF receiver, and properly subtract it from the data. The LED pulse would be driven off the Pulse per Second (PPS) signal from the GPS.

2. Antenna Stability

- (a) After further stress analysis we determined that the dynamic antenna would not survive the stress from the wind and we decided to switch to a rigid system, similar to one found on vehicles. This system is a lot more stable and reliable than the previous dynamic system we proposed.

Milestones Acheived

1. PCB designs finalized and ordered
2. Electronics have been received and are being assembled
 - (a) All members involved received training in soldering, and are currently working on assembling main boards and preamps in house. Any problems that appear during testing will also be fixed in house to prevent any shipment delays that may occur.
3. Chassis design finalized and ordered
 - (a) Once received, complete assembly of the full testing unit can be done, including thermal and impact testing.

Outlook

1. Final system to be integrated next week. This will allow us for final thermal, shock and vacuum test.
 - (a) Once the chassis arrives, the first test will be impact testing. We will have false electronic boards and equipment inside to simulate the payload. This will allow us to have confidence in our design, and fix any unexpected flaws. By setting up a bungee system in which the payload is attached to bungee cords and released to reach required forces, we will ensure our payload is structurally sound. The final stage of impact testing will involve removing any false electronics and placing all of our equipment inside.
 - (b) We are also planning on launching a small balloon to simulate HASP to the best of our abilities. This involves training a handful of members to use HAM radios, as required by law. We will also receive informal training by Dr. Laura Mazzino in the various equipment involved in launches. She will also attend the launches to advise and guide us. We have scouted out lands and will inquire as to whether or not we can launch - we are aware of legalities towards airspace involving restrictions around airports.

Meeting Minutes

May 4th, 2015

GoPro:

1. Various testing will be completed this week (please see below). The testing will include familiarizing ourselves with the camera.
2. A new mount needs to be built as the camera did not come with the thread we expected.
3. We are debating how the temperature of the FPGA will affect other components like the Geiger tubes.
4. May use a fisheye lens
5. For anyone interested, scripting for the GoPro can be found at <http://www.camdo.com>

Okay, these are the tasks that will be completed this week:

VLF-Preamp:

1. Determine Gain
2. Order Boards
3. Double-check design
4. Assemble boards
5. Order components
6. VLF vs Geiger interference testing

VLF-Main:

1. Deal with FPGA Heating issues
 - (a) Keep in mind the Geiger tubes been to be above -10C

Geiger:

1. VLF vs Geiger interference testing
2. Design Review
3. Order components and boards
4. Assemble components and boards
5. Temperature testing for -10C

Software:

1. Teach Xilinx
2. VHDL general work

Mechanical:

1. Re-evaluate circuit mounting and chassis

GoPro:

1. Temperature testing
2. Battery testing
3. Strobe light testing
4. Power on/Power off possible issues
5. Familiarize with settings

These are the tasks that will be completed after this week:

VLF-Preamp:

1. Design review

VLF-Main:

1. Testing once board is received from Cody
2. GPS Testing

May 11th, 2015

Good news everyone!

If you haven't heard, we finally have enough members to become an official club. Administration stuff will be done within the next couple of weeks - updates to come as needed. The executives are:

President - Candice Quinn

VP Finance - Elizabeth Roy

VP Projects - Alex Sheldon

VP Public Relations - Robin Williams

Remember that Monday is a holiday, so there may not be a meeting next week. The consensus at the meeting was to see how we progress this week, and perhaps call a meeting later next week if necessary.

Meeting Minutes:

3D Model

1. We finally picked up the model, and handed it over to Robin to put together
Shielding

1. A size of 1/4 inch aluminum will suffice in canceling out the background noise of space

Helium

1. Robin has been outreaching to another group and assisting them in balloon launches. He has been able to negotiate some free helium for us so we can do a small scale launch at some point this summer. Their group is called HABEX and they are a girls outreach through the Schulich Woman's Advancement Office.

FPGA

1. There will be thermal and vacuum testing done Wednesday to deal with any thermal issues, and any surprises that may pop out of the board.

May 25th, 2015

The documentation is up on Google Drive under the folder Documentation. Please edit how you see fit, and add your work. I placed in everything I could think of, so if you feel as though it is unnecessary, comment as to why and we'll go from there. Comments and constructive criticisms are welcome.

1. After a discussion over the chassis system, we decided that its best to keep everything as is, but add a small hole to fit all the cables required for the boards inside.
2. A suggestion for the logo was submitted, resulting in two ideas for a logo. If anyone wants to submit their own idea, please do so before Monday, June 1st. Ill be posting a voting poll for everyone to express their thoughts and opinions on any submitted logo. Ill keep it open for a few days, and close it when a design has been finalized.
3. The teleconference will be held next Friday, at 9am. It will be held in 538A and all are welcome to join in. Please show up a few minutes early. The monthly status report is also due this Friday.
4. The boards required for flight are being assembled today, with a skeleton structure of the programming scheduled for tomorrow. If anyone wants to help out with the programming aspects of things, let me know. The language being used is C, but if you know C++ you can catch on pretty quickly.

5. The due date for HASP is June 26th, which is coming up fast everything needs to be completed and working by then. This means testing as well. We will be doing baby balloon launches early/mid June to test everything, once we have received the chassis from the metal shop. This requires as least one person to have a HAM radio license. However, more people can apply. Its relatively cheap (around 5 dollars) and relatively easy to obtain. I will be receiving the documents required soon, and they will be passed on to everyone. Laura has also offered to train everyone on how to do launches. More information will be available at next weeks meeting.
6. The payload must undergo impact testing to make sure it can sustain the forces required by HASP. We have decided on a bungee cord system, and will be completed outside. This will be done as soon as we receive the chassis from the shop, but before the balloon launches.
7. We also had a brief discussion about the GoPro and syncing all data streams together. By using a light source, like an LED we will be able to sync all of our data up to determine the time delay between lightning and counts.

The next couple of weeks are going to be quite busy. If you are able to come in and volunteer your time, please do. The deadline is coming up quite quickly!