

Week XI Report

Advisor(s): Gary Tuttle

Client: NASA Marshall Space Flight Center

Members (Roles): **Isaac Johns**-Team Communicator, **Ryan Bissett**-Team Communicator, **Tom Henry**-Webmaster, **Luke Dahlman**-Team Leader, **Anh Ho**-Key Concept Holder, **Dustin Pierce**-Key Concept Holder, **Antjuan Buffett**

Project Title: Remote Deployment Circuit and Mechanism for Lightweight CubeSat Solar Panels

Weekly Summary

In the previous week we drew the dimensions of our new design within 1 U (10 x 10 x 10 cm) to get a visual representation of the space constraints we're working with. Having drawn out the system we can see that in fact our new design is possible within the 1 U constraint we're working with. Knowing that everything fits into the dimension constraint we then started planning to move forward in finalizing parts so that we may implement. Everyone was also given individual tasks to work on throughout the week that are listed in a later section of this report. We're also looking into fine tuning different components in the system, e.g. polymers for rollers or how to attached the solar array to the rollers.

Meeting Notes

From our weekly meetings:

- With no response from John yet we have continued moving forward with our new design.
- It was discussed what still needs to be worked on, what we have completed as of right now, and where we need to go with our design with respect to time and space constraint.
- The dimensions of the most current components at the time were drawn out into a 1 U visual representation. Having drawn out the exact dimensions to scale within the 1 U space constraint gives us the confidence to say that everything will fit (on whiteboard).
- We were able to identify problems with space efficiency and component placement. There are a few components like the latching system that can be downsized and we plan to downsize.
- We are planning to rearrange components and redraw the system for maximum space efficiency within the 1 U. The 1 U space constraint is a very important factor in this design and wherever we can save space will greatly help.
- It was decided that we have two tape rolls versus one center tape roll to ensure rigidity up deployment and while retracting. In our design we have decided to drive the tape rolls out which are attached to the solar array that is rolled onto a roller. Driving the

two tape rolls will be rolled out bringing the solar array along with them. We will need to deploy about 12 ft. to achieve the desired 4 ft².

- We have begun to finalize our components for the new design with the motor, latching system, rollers, and springs being our new focuses. Individual members were given areas to research and finalize by Wednesday so that the group may move forward toward implementation.
- Gary Tuttle has let us know that he has not yet received the substrate/solar array from John Carr, but will update us if that changes over Thanksgiving break.
- Parts for the mock design have been purchased. The parts include an acrylic box, pvc piping for rollers, bonding agent, and a steel rod. With these parts we can put in their respective positions within our 1 U cube before the hardware arrives.
- The main focus of the past week's meetings was to finalize our design layout and move forward to finalizing our parts.

11/12/2014 Group Meeting to Decide Course of Action and Draw out Dimensions of New Design

Duration: 2.5 hr
Members Present: Isaac Johns, Tom Henry, Luke Dahlman, Antjuan Buffet, Ryan Bissett

Purpose and Goals: We decided to move forward with our new design of having the solar panel wrapped around a roller with spring tension to keep the system taut. We needed to figure out how exactly we were going to do this and what dimensions we were working with. The dimensions of all of the components within the 1 U box were drawn on a whiteboard in Coover from a side & bottom view. Pictures of the preliminary placements and dimensions are attached below.

11/15/2014 Group Meeting to Decide Course of Action

Duration: 1 hr
Members Present: Isaac Johns, Tom Henry, Luke Dahlman, Ryan Bissett

Purpose and Goals: We met on Saturday to discuss the dimensions of our design that we had drawn out from our meeting on Wednesday (11/12). We needed to discuss possibly minimizing some of the dimensions of some of the components for space efficiency. A different motor configuration was brought up in the Wednesday meeting that needed to be discussed and was ultimately decided we will continue with our original motor setup.

11/17/2014 Weekly Group Meeting to Update & Decide Course of Action

Duration: 1 hr
Dustin Pierce

Members Present: Isaac Johns, Tom Henry, Luke Dahlman, Ryan Bissett,

Purpose and Goals: This weekly meeting was to get the team updated as well as our advisor, Gary Tuttle. We talked about our plan of action for this coming week as well as the rest of the semester. We also talked about finalizing parts so that we may order parts by 12/8, the Monday of Dead Week. Tasks for our Wednesday meeting were divided up between individual group members. In the Wednesday meeting we expect to have all parts finalized and reasons for choice in parts.

Achievements

This week we were able to hash out the dimensions of our components within the space requirement of 1 U. At the bottom of this document are pictures showing the current placement and measurements of the different components. We have also begun finalizing components we would like to use in our design. We now have a clear view of where we're headed in our new design.

Pending Issues

- Still needing to get John Carr's approval of our design. It is expected he will allow us to experiment with it, but we want to know if he sees any problems with it that will stop our progress that we haven't thought about. We also need to know if our current design violates any design parameters we are unaware of.

Plans for Next Week

What we will work on over the next couple days

- Ahn- Finish 3D modeling of each part
- Antjuan- Have a brushless motor/motor controller picked out
- Dustin- Have a plan for rollers (bearings & lubrication) for the solar panels
- Luke- Finish Logic & finish test plan. Document why the 281 will work to test with
- Tom- Pick out locking mechanism
- Ryan- Coil springs, what material will they be & how will the solar panel substrate be attached to the roller
- Isaac-Tape measure driver, what material will the wheels be made of.

Everyone will write up a document describing why they choose each of these pieces (and the parameters of each) and why they chose these particular pieces over others. Also if we are using a cheaper option for the design, explain what should actually be used.

On Wednesday we shall:

- Develop our final Parts List
- Talk about the final Design Document
- Talk about what each individual shall be doing over Thanksgiving break
- Finalize plan for the rest of the semester

We will meet on Wednesday at 3p.m. in Coover (first floor classroom). We will have all of our documentation completed before our Wednesday meeting.

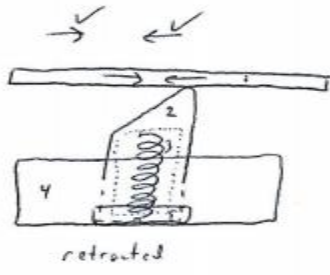
Individual Contributions This Week

- Luke: Conducted meetings, provided FPGA information and documentation, continued to alter logic to specifications, & designed test parameters for PLC
- Isaac: Furthering new design & hashing out dimensions within 1 U, attended all team meetings over the past week, researched rollers & relays, went to Lowe's and bought piping/parts for mock design, & wrote the weekly report.
- Ryan: Weekly meeting Wednesday, weekly meeting Monday, & individual research into springs and 3D modelling.
- Tom: Shopping for materials at Lowe's for proof of concept, planning layout for the cube, discussing motors and mechanical operations, researching PLCs, & starting cube and component construction.
- Dustin: Weekly meetings and design/construction of how we will be using the space inside the box.
- Anh: Outside of meeting as a group, I also worked on the 3D design drawing using inventor. I completed the panels roller, the spiral spring/spool, cube-sat, and the measuring tape rollers.
- Antjuan: Motor Selection

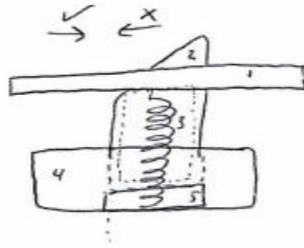
Total Contributions for this Project

3 – 1 hour meetings

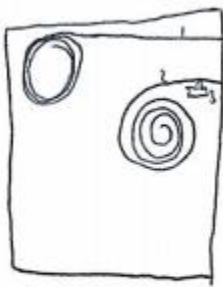
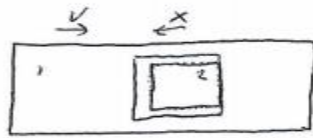
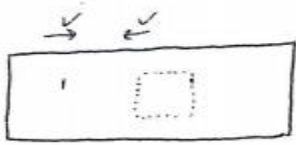
- Luke: 6 hrs
- Isaac: 10 hrs
- Ryan: 5 hrs
- Tom: 10.12 hrs
- Dustin: 2.5 hrs
- Anh: 4 hrs
- Antjuan: 0.5 hrs



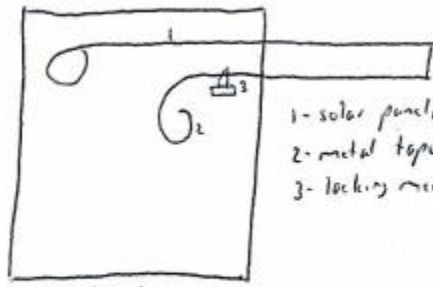
retracted



- 1- metal tape
- 2- stopping mechanism
- 3- spring
- 4- base
- 5- magnetic latching relay



retracted

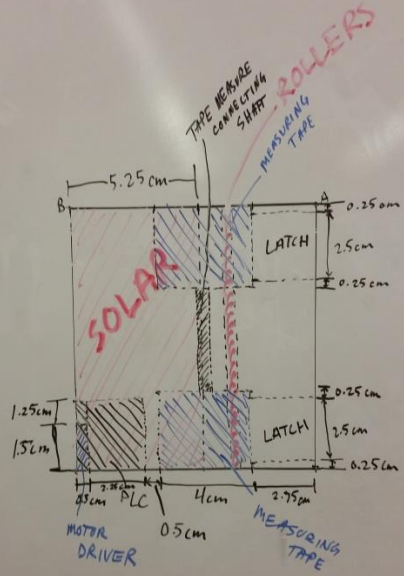


Deployed

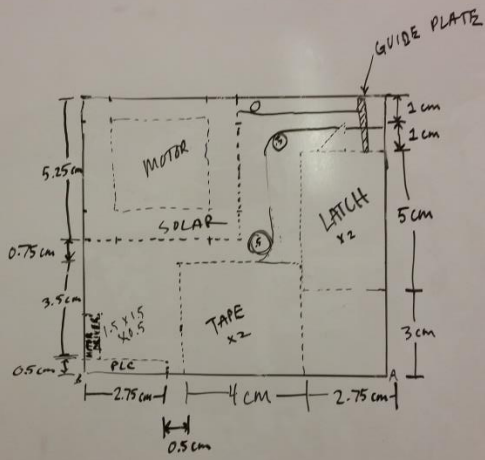
- 1- solar panel/substrate
- 2- metal tape
- 3- locking mechanism

A12

BOTTOM VIEW



SIDE VIEW



BOTTOM VIEW