Full Mission Simulation Report

West Virginia Rocketeers
WVU and WVWC
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Sardone, and Chris Sommers
Mission Overview

Mission Statement:
● The mission of the WV RockSat payload is to build, test, and fly a number of space science experiments.
ConOps

• All systems on and flight dynamics on at lift-off (T=0 minutes).

• Plasma data acquisition begins at >90 km (T=1:30) and ends at 90 km (T=4:00) during re-entry into the atmosphere.

• The amateur radio communication (ARC) experiment is activated near apogee at 115 km (T=2:30) and ends at 60 km during descent (T=5:00).
Full Mission Testing Overview

• Testing Overview
  – Software, electrical and mechanical testing has been done with most of the components.
  – Launch simulation testing was done outside of canister and data collected for 7 minutes.
  – Testing was done outside of canister as we are still waiting on plates to be cut.
  – GoPro Hero camera was not included in testing as we have decided to switch to a Raspberry Pi camera, which has been ordered and is en route.
2.0 System Performance

Amy Sardone
Mechanical/Structure

- So far, integration has gone as planned with a small change with the camera.
- We tested each system individually, we then put each system on the plates and tested them one at a time as we integrated them into the full payload.
- We have a list of parts available
- Payload is estimated to be 4.5lbs including Wesleyan College payload.
  - Will need ballast to reach our half canister weight requirement of 6.3 lbs.
Mechanical/Structure

- Final fit testing and overall system testing still in progress
  - Stress testing will be conducted as well
Electrical/CDH

- Electronics are functioning properly
  - We are close to integrating all together
  - ARC and SPACE have been integrated
  - Activation system prototype has been tested successfully. We are waiting for replacement parts.
- Electronics sampled data for FD, ARC and SPACE. We have tested LP separately.
- We have retrieved data and will be analyzing soon.
- Action items:
  - Test with the LP circuit, planning full int. with ARC-SPACE and FD-LP before LRR
  - Testing Raspberry Pi camera
Power (EPS)

- We have built 3 12-V alkaline battery packs, and plan to test soon.
- We have not had any malfunctions or power draws. Regulators performed as expected.
- Action items:
  - We will measure total power consumption after integration and verify power budget.
Software

• The software is running properly. No stops or crashes.
• Data records are clean.
• Sampling rates are as expected.
  • Writing speed is 115,200 baud
  • Tested data acquisition rate is low (100 Hz)
• Action item:
  • Want to increase data acquisition to higher rates
Software - Data

Hex code

ASCII rendering
Flight Dynamics

- Flight dynamics board is running successfully.
- It has been run on a MOD5213 connected to the IMU, magnetometer, gyroscope and other flight dynamics sensors.
Plasma Dynamics

- PCB version 4 has been soldered
The ARC subsystem is fully functional and integrated with the SPACE subsystem.
A 5-V and 12-V regulator and has been constructed and tested for the power management of the ARC/SPACE exp.

The regulator board will have a solid state relay integrated into the power management board so the ARC/SPACE exp. can be activated via RockSat’s NetBurner.

SPACE subsystem is fully functional and integrated with the ARC subsystem although slight modifications to the code are expected to be made.
Camera System (CAM)

• We have been looking for components that would help optimize mass, volume, and power for the experiment and make it fit with the optical port requirements.
• The aerospace engineering team has recommended the Raspberry Pi Omnivision camera so we are about to test it instead of the GoPro.
4.0 Project Management Update

Amy Sardone
## Action Item Summary

<table>
<thead>
<tr>
<th>Date</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 23, 2014</td>
<td>Test Raspberry Pi camera</td>
</tr>
<tr>
<td>May 23, 2014</td>
<td>Increase data acquisition</td>
</tr>
<tr>
<td>TBD</td>
<td>LP circuit testing</td>
</tr>
<tr>
<td>May 29, 2014</td>
<td>Fit testing</td>
</tr>
<tr>
<td>May 30, 2014</td>
<td>Full integration with ARC-SPACE and FD-LP</td>
</tr>
<tr>
<td>May 30, 2014</td>
<td>Measurement of total power consumption</td>
</tr>
<tr>
<td>Jun 6, 2014</td>
<td>Launch Readiness Review Review</td>
</tr>
</tbody>
</table>
Biggest Worries

- **Mechanical:** We plan to build the carbon fiber bracket for the camera.

- **Programming:** The aerospace engineering team has developed a program for the RP camera control. We need to validate/verify this program.
## User Guide Compliance

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Status/Reason (if needed)</th>
</tr>
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<tbody>
<tr>
<td>Center of gravity in 1&quot; mid-can?</td>
<td>COG is within .3&quot; of center</td>
</tr>
<tr>
<td>Contained in can</td>
<td>Yes</td>
</tr>
<tr>
<td>Connected to can by 4/5 bulkheads on top and bottom only</td>
<td>Yes</td>
</tr>
<tr>
<td>No voltage on the can</td>
<td>Have not checked</td>
</tr>
<tr>
<td>Activation wires at least 4 ft</td>
<td>Yes</td>
</tr>
<tr>
<td>Activation wire at least 24 gauge</td>
<td>30 gauge</td>
</tr>
<tr>
<td>Early Activation: current &lt; 1 A</td>
<td>N/A</td>
</tr>
<tr>
<td>T-0 Activation: current &lt; .1 A</td>
<td>To be tested</td>
</tr>
<tr>
<td>Battery Type</td>
<td>Alkaline</td>
</tr>
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</table>
Appendix: Data file from Flight Dynamics tests
Appendix: Data file viewed by hex editor
Conclusions

Our planned completion of the action items will enable us to continue on schedule, and be ready for the Launch Readiness Review.

Questions?