Launch Readiness Review (LRR) Document

W&J RockSat Team

Exploring Space and Earth’s Upper Atmosphere

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1.0 Mission Statement, Requirements, and Expected Results

Mission overview:
We plan to launch a set of experiments into Earth’s space environment. We will take measurements using several microcomputers.

Objectives:
1. We plan to measure the intensity of electron and ion currents in the ionosphere. From those we will calculate the ion and electron density as well as the electron temperature of the plasma. We will use a plasma probe attached to a multipurpose port.
2. We will measure sodium density in a narrow layer of the atmosphere using an optical port.
3. We will also measure energetic particles using a Geiger counter.
We plan to measure these intensities as a function of height of the Terrier-Orion rocket.

Expected results:
We should find a peak of electron density in the height range 110-120 km. Details will depend on the time of day and the condition of the ionosphere.
For the sodium layer measurement, we are going to measure the sodium layer thickness and average height. We need to have at least one full video from the cameras. We will measure the intensity of sunlight at the wavelength of 589 nm characteristic for sodium atoms.

2.0 Final Payload Design

In the 3D design below, the top plate contains the Langmuir Probe Experiment (LPC) and Geiger Counter Experiment (GCE) while the bottom holds the Sodium Layer Measurement (SLM). Wires are not shown.
The schematic below shows the LPC circuit including the activation subcircuit in the lower left.

The functional block diagram shows the flow of power and data for the 3 subsystems.
In the image below, the top plate is shown with the plasma probe circuit and its Arduino microcomputer.

The SLM’s two Raspberry Pis are shown on the left together with the activation circuit on the right.
3.0 Testing Results

A. Integrated Subsystem Testing Results

Tests were conducted on the LPC and SLM subsystems. Below are images from tests on the LPC subsystem showing the output on the probe was the range of voltages that were needed.

The activation circuit was based on snap action switches. It was tested to ensure that it would switch the system at the moment the rocket was launched. It provided the same output as the above picture once the switch was tripped.
Another test of the activation circuit is shown in the images below:

B. Full Mission Simulation Results

The full mission simulation has not been conducted.

4.0 Launch Readiness

A. User Guide Compliance
The table below documents the degree of compliance with User Guide Requirements.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Status/Reason (if needed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center of gravity in 1&quot; mid-can</td>
<td>Y</td>
</tr>
<tr>
<td>Contained in can</td>
<td>Y</td>
</tr>
<tr>
<td>Connected to can by 4 or 5 bulkheads on top and bottom only</td>
<td>Y</td>
</tr>
<tr>
<td>Mass at 20±0.2lbs</td>
<td>Below; need to add ballast</td>
</tr>
<tr>
<td>Shared canister clearance</td>
<td>Y</td>
</tr>
<tr>
<td>No voltage on the can</td>
<td>Y</td>
</tr>
<tr>
<td>No voltage on multipurpose port</td>
<td>Y</td>
</tr>
<tr>
<td>Activation wires at least 4 ft</td>
<td>To be checked</td>
</tr>
<tr>
<td>Activation wire at least 24 gauge</td>
<td>To be checked</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 checked</td>
</tr>
<tr>
<td>Battery Type</td>
<td>Alkaline</td>
</tr>
</tbody>
</table>

B. Integration Plan and Procedure

Integration includes connecting the multipurpose port.

C. Action Items

Items include:
- Connecting the multipurpose port with 24 gauge wire
- Testing the cameras with the new version of the software

5.0 Conclusions (0.5 to 1 page)

The activation circuit in the Langmuir circuit still needs to have wires connected from the LPC to the other student projects. This is because the only activation circuit will be on the Langmuir probe circuit. This should be completed prior to arrival. The physical Langmuir probe must still be connected to outside of the canister. Again this should be completed before arrival at Wallops.
The SLM is almost completed unless we are going to replace the regulator with printed circuit. the cameras but I will do that soon and it will not take much time.

6.0 Appendices
N/A