1.0 Mission Overview

Josh Brown
Phathom Donald
Mission Overview

- To collect atmospheric samples near the apogee of the flight to test for the presence of organisms.
  - Two compartments within our canister will collect the same samples.
  - One will be tested for environmental samples, the other for biological samples.
**Concept of Operations**

- **t ≈ 0 min**
  - G switch triggered
  - All systems on
  - Begin data collection

- **t ≈ 125 sec**
  - Altitude: ~108 km
  - Solenoid Valves Open

- **t ≈ 155 sec**
  - Altitude: ~114 km
  - Solenoid Valves Close

- **Apogee**
  - t ≈ 174 sec
  - Altitude: ~120 km

- **t ≈ 220 sec**
  - Altitude: ~110 km
  - Solenoid Valves Open

- **t ≈ 250 sec**
  - Altitude: ~91 km
  - Solenoid Valves Close

- **t ≈ 330 sec**
  - Chute Deploys

- **t ≈ 800 sec**
  - Splash Down
## Full Mission Testing Overview

<table>
<thead>
<tr>
<th>Mechanical Subsystem</th>
<th>Electrical Subsystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Completed By: Daril, Josh, Jade</td>
<td>● Completed By: Phathom, Hilton</td>
</tr>
<tr>
<td>● Testing since last review</td>
<td>● Tests since last review:</td>
</tr>
<tr>
<td>○ Interim System weighed</td>
<td>○ Solenoid Valve Activation</td>
</tr>
<tr>
<td>○ Fittings and Connections checked</td>
<td>○ Accelerometer Data Retrieval</td>
</tr>
<tr>
<td>○ Strength of Filter Seal tested</td>
<td>○ SD Card Data Transfer</td>
</tr>
<tr>
<td>● Test to be completed</td>
<td>○ Voltage Regulator Implementation</td>
</tr>
<tr>
<td>○ Structural stability of System</td>
<td>○ System Integration</td>
</tr>
<tr>
<td>○ Vibration Test (Shopping Cart)</td>
<td>● Each test was conducted approximately 5-10 times for about 10 minutes.</td>
</tr>
<tr>
<td></td>
<td>● All tests generated desirable results except those for the accelerometer and the SD card.</td>
</tr>
<tr>
<td></td>
<td>● The values retrieved from the accelerometer need to be converted to G’s.</td>
</tr>
<tr>
<td></td>
<td>● None of the SD cards were compatible with the DataLogger shield.</td>
</tr>
</tbody>
</table>
Unassembled Flange with Screen

Assembled Flange

Mechanical Subsystem Tests
Mechanical Subsystem Tests
The electronic system integration test was conducted on a breadboard. It was a success, allowing us to move the electronics to a PCB.

After building the circuit on the PCB, the system was tested again. It was a success, and is now ready to be secured to its designated layer.

**Electrical Subsystem Tests**
2.0 System Performance

Jade Parker
Phathom Donald
Structure Status

- Hex standoffs for spacing between levels are en route for delivery.
- Machining of the parts are underway. Status of the parts will be checked on Tuesday.
- Composing the structure should begin next week as soon as the parts are finished being machined.
- Structure completion date is set for June 1st to assemble the final payload.
- The team needs to get spare parts; nuts, bolts, screens and other securements.
# Payload Weight

## Electronic Components:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Weight (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protoboard</td>
<td>1</td>
<td>0.029</td>
</tr>
<tr>
<td>Arduino Uno Board</td>
<td>1</td>
<td>0.096</td>
</tr>
<tr>
<td>9V Battery</td>
<td>7</td>
<td>0.727</td>
</tr>
<tr>
<td>Solenoid Valve</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Securements</td>
<td>N/A</td>
<td>0.044</td>
</tr>
</tbody>
</table>

**Total**

## Structural Components:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Weight (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plates</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Pipes/Tubing</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Hex Spacers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total**

**Available scales were inadequate to weigh certain components.**
Payload Weight

- There are still parts that need to be weighed in order to acquire a total weight of payload.
- It is a priority to measure these parts today upon obtaining an appropriate scale.
- We anticipate using a ballast for extra weight and balancing the center of gravity.
Mechanical Action Items

- Holes in the layers to be drilled.
  - These holes will be threaded to hold the Hex standoffs.
- Drilling of holes in the steel flanges have been initiated. The process is time consuming and is projected to be completed by June 1st.
  - The holes in the flanges will be threaded to ensure an airtight seal.
Mechanical: Layer 1, 5

- 5 holes will be drilled into the 1st and 5th layer to ensure proper integration with the Wallops payload.
● The Solenoid valve will be connected with ¼” male adaptors.
● The tee will separate the flow into two tubes. One capturing the organic and the other capturing the inorganic particles.
The Solenoid valve will be secured by utilizing two threaded ports at the base of the device.

Screws and bolts have already been purchased.
4 holes will be drilled into the 2nd and 4th layer to install the hex standoffs that will connect all the layers.
The third and middle layer will have the same four holes as the 2nd/4th layer, however will also have two holes to support the end piece of the flange. This will ensure that it is securely held in place.
● The valve will also be secured with the base ports on Layer 5.
● The idea was proposed to create a vacuum of pressure within the capture section.
● Once the valves opened, the vacuum would suck in particles once opened by the valves.
  ○ A pressure gauge will monitor the change prior to launch.
Electrical/CDH

- Electronics work as intended.
- Activation system tested, works as intended.
- 4ft, 24 AWG activation wires in possession.
- Tested two SD cards, neither worked.

**Action Items:**
- Obtain functional SD card for data acquisition.
Electrical/CDH

- Electronics work as intended.
- Activation system tested, works as intended.
- 4ft, 24 AWG activation wires in possession.
- Tested two SD cards, neither worked.

**Action Items:**
- Obtain functional SD card for data acquisition.
Power (EPS)

- Batteries operated as intended.
- Implemented 7812 voltage regulator for 18V battery pair to power 12V-rated solenoid valves.
- Voltage regulator operated as intended.

Action Items:
- Continue testing for voltage draws and undesired current flow.
Software

- Software runs correctly.
  - Valves open/close when specified.
  - Analog values from accelerometer are obtained when specified.
  - Code for SD card runs correctly.

```c
void loop() {
  unsigned long currentTime = millis();  // The time that has passed since activation
  if ((currentTime - activationTime >= enterTrop) && (currentTime - activationTime < leaveStrat)) {
    digitalWrite(Valves, HIGH);  // 'HIGH' means Valves are turned 'ON' in this time range
    // print the sensor values:
    Serial.print("x-axis value: ");
    Serial.print(analogRead(xpin));
    Serial.print("\n");
    Serial.print("y-axis value: ");
    Serial.print(analogRead(ypin));
    Serial.print("\n");
    Serial.print("z-axis value: ");
    Serial.print(analogRead(zpin));
    Serial.println();
  }
```

Action Items:
- Convert analog values from accelerometer to G’s.
- Set more accurate activation and open/close times.
- Make accelerometer data spreadsheet-friendly.
3.0 Project Management Update

Josh Brown
### Action Item Summary

#### Mechanical Subsystem

<table>
<thead>
<tr>
<th>Action Item</th>
<th>Design Date</th>
<th>Test Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of holes in layers</td>
<td>6-1-14</td>
<td>6-2-14</td>
<td>6-3-14</td>
</tr>
<tr>
<td>Completion of holes in flanges</td>
<td>6-1-14</td>
<td>6-2-14</td>
<td>6-3-14</td>
</tr>
<tr>
<td>Secure components to layers</td>
<td>6-1-14</td>
<td>6-2-14</td>
<td>6-3-14</td>
</tr>
</tbody>
</table>

#### Electrical Subsystem

<table>
<thead>
<tr>
<th>Action Item</th>
<th>Design Date</th>
<th>Test Date</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert accelerometer values to G’s</td>
<td>5-22-14</td>
<td>5-22-14</td>
<td>5-22-14</td>
</tr>
<tr>
<td>Set accurate activation times</td>
<td>N/A</td>
<td>5-22-14</td>
<td>5-22-14</td>
</tr>
<tr>
<td>Obtain functional SD card</td>
<td>N/A</td>
<td>5-27-14</td>
<td>5-27-14</td>
</tr>
<tr>
<td>Secure components to layers</td>
<td>6-1-14</td>
<td>6-2-14</td>
<td>6-3-14</td>
</tr>
<tr>
<td>Requirement</td>
<td>Status/Reason (if needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>---------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center of gravity in 1” mid-can</td>
<td>Have Not Checked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contained in can</td>
<td>Have Not Checked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected to can by 4/5 bulkheads on top and bottom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No voltage on the can</td>
<td>Can Not in Possession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation wires at least 4ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation wire at least 24 gauge</td>
<td>24 Gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Activation: current &lt; 1A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-0 Activation current &lt; 0.1A</td>
<td>Not Using</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery Type</td>
<td>Nickel-Hydride</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Biggest Worries

● Successful configuration of SD card for inflight data collection.
● Ensuring that electronics remain dry and operational.
● Successful collection of atmospheric samples.
● Ensuring that the payload is secure and remains intact.
Conclusion

● Machining is our main concern at the moment.
  ○ The flanges are the most complicated to machine
  ○ Next week will show if more time will be required
● The goal is to complete the payload by June 1st
  ○ The structure should be fully integrated and operational