LU STEM Team
Integrated Subsystem Testing Review

Langston University
Bethany Barrientos, Micaiah Tripplett, Celicia Kinlow, Kameron Gibson

03/27/2018
Presentation Outline

• Section 1: Mission Overview
• Section 2: Subsystem Status
• Section 3: Integrated Subsystem Testing Status
• Section 4: Full System Integration Plan
• Section 5: Project Management Update
1.0 Mission Overview

Bethany Barrientos
Mission Overview

• Mission statement

Langston University STEM team technicians are building a real sounding rocket/biology experiment payload; they will integrate and launch it on a two-stage Terrier-Orion rocket into outer space, and will design and manufacture a clinostat and use it as a ground biology comparison experiment.
Payload Operations

Altitude

- $t \approx 1.3\text{ min}$
  - Altitude: 75 km
  - Arduino Activates Centrifuge

- Apogee
  - $t \approx 2.8\text{ min}$
  - Altitude: $\approx$ 115 km

- End of Orion Burn
  - $t \approx 0.6\text{ min}$
  - Altitude: 52 km

- $t = 0\text{ min}$
  - -G switch triggered
  - All systems on
  - Begin data collection

- $t \approx 5.5\text{ min}$
  - Chute Deploys

- $t \approx 7.3\text{ min}$
  - Centrifuge is deactivated

- $t \approx 15\text{ min}$
  - Splash Down

RockSat-C 2017

ISTR
Changes since STR

- We changed the motor we were going to be using for the centrifuge system
- But then we changed it back when we realized it would be a more controlled project using the original centrifuge system
2.0 Subsystem Status

Celicia Kinlow
Subsystem Overview

• List your subsystems here
  – Mechanical/Structure
  – Electrical/ CDH
  – Power (EPS)
  – Software
  – Science
  – ...

• Include information about your special port, if applicable!

• Use the following slide to show subsystem status and % complete of testing at the subsystem level (you can used multiple slides if needed for each subsystem)
Subsystem Overview

- **GC**: Geiger Counter
  - Gas filled radiation detectors that operate by using ionizing nature nature alpha, beta, and gamma radiation.
- **ADMC**: Arduino Microcomputer
  - The brain behind the SHIELD
- **CDH**: Command and Data Handling
  - Commands the subsystems
- **SHD**: SHIELD
  - Integrated components into the five circuits.
- **Elec**: Electronic
  - Memory Card
- **STR**: Structure
  - The Payload Structural Kit
- **Mech**: Mechanical
  - Rotor, Motor
Clinostat
The entire prototype for the clinostat is complete along with the coding and testing.
Subsystem Testing Status

ADMC: Arduino Microcomputer

The coding for the clinostat along with the heritage plate both run on Arduino microcomputers and are running as expected.
Subsystem Testing Status

Subsystem Components
• Motor
• Brackets
• Screws
• Cryogenics
• Second Plate

There are various subsystems still out on order that we have not had the chance to test as of now, but are expected to be fully functional by April 30, 2018.
Subsystem Testing Status

Lithium Battery

Has been tested and failed due to a lack of charge, it will be charged by April 30, 2018.
3.0 Integrated Subsystem Testing Status

Celicia Kinlow
Integrated Subsystem Testing Status

- Create a list with the order that subsystems will be/have been integrated and tested
- Include mechanical integration on the list
- Can be parallel activities

- List the status of each of these steps using copies of the following slide
- State the purpose of integration/test
- State the results of these tests
- If no results, describe how and when the test will be completed
Integrated Subsystem Testing Status

1.0 Subsystem A and Subsystem B

This will verify that the flux capacitor and the plutonium reactor work properly

Test was completed on April 13\textsuperscript{th} with great success

Additional tests will be conducted next week

Include pictures and/or screen shots of data or test

Include pictures and/or screen shots of data or test

USE this slide for each integrated subsystem
4.0 Plan for Full System Integration

Kameron Gibson
Canister Integration

Test Code

• Makron plate will have predrilled holes to mount hard wear.

• PLA mount will be created to hold components (ESC and Battery)

• Hot glue will be applied to bolt head to ensure no backing out.

• Followed by Integration into canister
Vibe Test

- Vibe test data will be used to ensure structural integrity.
- Spare components will be on hand in case of breaks.
- Spare specimens will be brought to replace the ones used for vibe.
Electrical Testing

- Post pressure, post gyro, humidity, post SD, Flight code
- Testing is currently in action.
- NO high voltage components
System Level Testing

Post pressure, post gyro, humidity, post SD, Flight code

• Consider an stepped approach to testing subsystems to get to the System Level
• Heritage system has been tested, Centrifuge is still in development
• Test date TBA
5.0 Project Management Update

Miciah Tripplett
Schedule Update

02/02/18 CDR Presentation
02/12/18 First Payment Due
02/12-16/18 Subsystem Testing Review Telecon
03/01/18 Prototyping Complete
03/05-09/18 Progress Update Telecon
03/15/18 Manufacturing Complete

04/09/18 RockSat Payload Canister sent to us
04/13/18 Integrated Subsystem Testing Review
04/30-5/04/18 Full Mission Simulation Test Telecon Report Presentation
06/14/18 Wallops FF Arrival
Summary

We are one step behind schedule. Right now, we need to print the remaining parts on the 3D printer. When the parts are finished, we can complete integration. This will put us back on schedule and allow for us to do some testing. We have planned to have everything printed and integrated by Wednesday. Our main concern right now is integration and cryogenics.
### User Guide Compliance (Example)

<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>1.2&quot; currently</td>
</tr>
<tr>
<td>Contained in can</td>
<td></td>
</tr>
<tr>
<td>Connected to can by 4/5 bulkheads on top and bottom only</td>
<td></td>
</tr>
<tr>
<td>Mass at $20 \pm 0.2$ lbs</td>
<td>19lb (Currently making 1lb ballast)</td>
</tr>
<tr>
<td>Shared canister clearance</td>
<td>Will not interfere, $\frac{1}{2}$” separation between payloads</td>
</tr>
<tr>
<td>No voltage on the can</td>
<td>Checked integrated bottom plate; need top plate still</td>
</tr>
<tr>
<td>Activation wires at least 4 ft</td>
<td></td>
</tr>
<tr>
<td>Activation wire at least 24 gauge</td>
<td>22 gauge</td>
</tr>
<tr>
<td>Early Activation: current &lt; 1 A</td>
<td>1.1 (working on reducing)</td>
</tr>
<tr>
<td>T-0 Activation: current &lt; .1 A</td>
<td>Not using</td>
</tr>
<tr>
<td>Battery Type</td>
<td>Lithium Polymer (will not charge at Wallops)</td>
</tr>
</tbody>
</table>
Shared Can Logistics

• We are sharing a can with RockON
Budget

- We have spent $1,075.24
- How much more we need to spend depends on what we are doing with the cryogenics
- Thanks to Dr. Byron Quinn and Mr. Marcio White

<table>
<thead>
<tr>
<th>Item</th>
<th>Supplier</th>
<th>Estimated, Specific Cost</th>
<th>Number Required</th>
<th>Total Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Controller</td>
<td>DigiKey</td>
<td>$150.00</td>
<td>2</td>
<td>$300.00</td>
<td>1 for testing</td>
</tr>
<tr>
<td>PM</td>
<td>LASP</td>
<td>$0.00</td>
<td>1</td>
<td>$0.00</td>
<td>LASP mentor deserves shirt</td>
</tr>
<tr>
<td>Microcontroller</td>
<td>DigiKey</td>
<td>$18.00</td>
<td>3</td>
<td>$54.00</td>
<td>3 board revs</td>
</tr>
<tr>
<td>Printed Circuit Boards</td>
<td>Advanced Circuits</td>
<td>$33.00</td>
<td>3</td>
<td>$99.00</td>
<td>3 board revs</td>
</tr>
<tr>
<td>Misc. Electronics (R,L,C)</td>
<td>DigiKey</td>
<td>$80.00</td>
<td>3</td>
<td>$240.00</td>
<td>3 board revs</td>
</tr>
<tr>
<td>Boom Material</td>
<td>onlinemetals.com</td>
<td>$40.00</td>
<td>2</td>
<td>$80.00</td>
<td>1 test article</td>
</tr>
<tr>
<td>Probe</td>
<td>LASP</td>
<td>$0.00</td>
<td>1</td>
<td>$0.00</td>
<td></td>
</tr>
<tr>
<td>Testing Materials</td>
<td>???</td>
<td>$200.00</td>
<td>1</td>
<td>$200.00</td>
<td>Estimated cost to test system</td>
</tr>
<tr>
<td>Cont. Rotation Servo</td>
<td>Parallax</td>
<td>$31.90</td>
<td>1</td>
<td>$31.90</td>
<td></td>
</tr>
<tr>
<td>AccuGrup</td>
<td>16 gear teeth</td>
<td>$13.95</td>
<td>2</td>
<td>$13.95</td>
<td></td>
</tr>
<tr>
<td>McMaster-Carr</td>
<td>M3 X 0.5 40mm</td>
<td>$8.50</td>
<td>1</td>
<td>$8.50</td>
<td></td>
</tr>
<tr>
<td>McMaster-Carr</td>
<td>Insert Locknut</td>
<td>$3.36</td>
<td>1</td>
<td>$3.36</td>
<td></td>
</tr>
<tr>
<td>McMaster-Carr</td>
<td>M3 X 0.5 10mm</td>
<td>$2.68</td>
<td>1</td>
<td>$2.68</td>
<td></td>
</tr>
<tr>
<td>Pololu</td>
<td>Gearmotor</td>
<td>$18.95</td>
<td>1</td>
<td>$18.95</td>
<td></td>
</tr>
<tr>
<td>Pololu</td>
<td>Magnetic Encoder</td>
<td>$8.95</td>
<td>1</td>
<td>$8.95</td>
<td></td>
</tr>
</tbody>
</table>

Total (no margin): $1,075.24
Total (w/ margin): $1,216.25
Conclusions

- Cryogenics is our biggest concern. We are waiting for instruction from our director, Dr. Quinn (Biologist).
Appendix

- Part of the coding for heritage payload testing completed.
- Motor for Centrifuge