Project Janus
Subsystem Testing Review (STR)

Capitol Technology University
Team Janus
2/12/2018
Presentation Outline

- Section 1: Mission Overview
- Section 2: Final Design Description
- Section 3: Hardware Procurement Status
- Section 4: Subsystem Testing Results
- Section 5: Plan for ISTR
- Section 6: User Guide Compliance
- Section 7: Project Management Update
1.0 Mission Overview
Mission Overview

- The mission of Project Janus' flight is to demonstrate the use of a laser distancing system to measure speed of CubeSats within constellation during flight.
- The beneficiaries of Project Janus are the members of Project Janus. The members of Project Janus will gain experience in their respective fields. The outcome of this project will help those operating a constellation of CubeSats.
- The purpose is to develop a system to notify ground teams of objects in vicinity of a spacecraft, as well as their speed and direction.
Success Criteria

• Minimum Success Criteria:
  – The minimum success criteria is the primary CubeSat measuring and recording the average distance of the second CubeSat.

Comprehensive Success Criteria:
  – Comprehensive mission success is having full communication between the primary and secondary CubeSats and the primary and the ground team. The average distance between the two CubeSats and the speed of the secondary CubeSat will be measured and recorded by the primary CubeSat.
Concept of Operations

- **t = 0 min**
  - Altitude: 52 km
  - All systems on, Begin data collection

- **t = 0.6 min**
  - Altitude: 75 km
  - Secondary CubeSat begins moving.

- **End of Orion Burn**
  - Altitude: 52 km

- **Apogee**
  - t = 3 min
  - Altitude: 150 km
  - Second CubeSat continues to move. Data collection continues.

- **t = 1.3 min**
  - Altitude: 75 km
  - Iridium starts to communicate with the ground team.

- **t = 4.0 min**
  - Altitude: 95 km
  - Data collection and communication with the ground team continues.

- **t = 4.5 min**
  - Altitude: 75 km
  - Communication continues.

- **t = 5.5 min**
  - Chute Deploys

- **t = 15 min**
  - Splash Down
## Concept of Operations

<table>
<thead>
<tr>
<th>Event</th>
<th>Time On</th>
<th>Dwell</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSE 1</td>
<td>T-180 sec</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>GSE 2</td>
<td>T-180 sec</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TE-1</td>
<td>T+000 sec</td>
<td>N/A</td>
<td>Launch</td>
</tr>
<tr>
<td>TE-2</td>
<td>T+000 sec</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TE-3</td>
<td>T+000 sec</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TE-R</td>
<td>T+000 sec</td>
<td>1 sec</td>
<td>Sends the on signal to the pi's and the motor to power on.</td>
</tr>
</tbody>
</table>
Payload Location
2.0 Final Design Description
System Changes Since CDR

• Project Janus is no longer flying a radiation detector.
  – This is to save space on the base plate and ease the strain on our Raspberry Pi.

• The payload was rearranged to allow for better data from the lasers.

• None of these changes affect the mission objective
Functional Block Diagram

[Diagram of functional block diagram with various components such as Antenna, Iridium Modem, Battery Pack, Raspberry Pi Zero, etc., with connections indicated by lines and labels such as 'SVin', '7.4V out', '3.3V out', 'Power Line', and 'Data Connection'.]
## Detailed Weight Budget

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Total Weight (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Cube</td>
<td>5.570</td>
</tr>
<tr>
<td>Secondary Cube</td>
<td>0.549</td>
</tr>
<tr>
<td>Track System</td>
<td>0.831</td>
</tr>
<tr>
<td>U2-Pi Imager</td>
<td>0.481</td>
</tr>
<tr>
<td>Payload Deck</td>
<td>3.425</td>
</tr>
<tr>
<td>Wires</td>
<td>4.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14.856</strong></td>
</tr>
<tr>
<td><strong>Over/Under</strong></td>
<td><strong>0.144 (under)</strong></td>
</tr>
</tbody>
</table>
Materials List

- 0.25" Aluminum Plate 6061-T651
- 0.125" Aluminum Plate 6061-T651
- Raspberry Pi Zero
- 4 Port USB Hub for Raspberry Pi Zero v1.3
- Raspberry Pi Adapter - 1A (Micro USB)
- Mini HDMI Adapter
- SanDisk Ultra 32GB microSDHC
- MICRO HDMI(M) TO HDMI(F) ADAPTER
- USB Female to Micro USB Converter
- LeddarTech LeddarOne Optical Rangefinder
- LeddarTech Leddar One USB to 3.3V UART Cable
- Extruded Aluminum Bare Round 6061 T6511
- Drawn Aluminum Bare Tube 6061 T6
- Worms and Worm gears, Worm material: 303 stainless steel, Worm wheel material: bronze QQ-B-637 alloy 464
- Acrylic Extruded Clear Sheet
- Phillips Flat Machine Screws, 5-Inch (Steel)
- USB Y Adapter
Hazardous Mechanical Items

• Batteries could considered hazardous, as they are stored energy.
  – They will not be charging during flight, which will reduce the risk of danger.

• The Iridium systems transmits, which may interfere with rocket.
  – However, Iridium is designed to receive interference without outputting any.
Hazardous Mechanical Items

• The movement of the secondary CubeSat slightly changes the center of gravity of the project.
  – This change is very small and still remains within 1" of the center of the baseplate.
Electrical Design
Electrical Design: Voltage Regulator 1 (VR1)
Electrical Design: Power Supply (PS1)
Electrical Design: Power Supply (PS2)
Electrical Design: Power Supply (PS3)
Electrical Design: Power Supply (PS4)
## Updated Power Budget

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Voltage (V)</th>
<th>Current (A)</th>
<th>Time On (min)</th>
<th>Amp-Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Relay Circuit</td>
<td>28.0</td>
<td>1.50</td>
<td>0.0333333 (2 secs)</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Total (A*hr):</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Over/Under</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.5 Under</td>
</tr>
</tbody>
</table>
## Pin Assignments: Power

<table>
<thead>
<tr>
<th>Power Pin</th>
<th>Function</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GSE 1</td>
<td>N/C</td>
</tr>
<tr>
<td>2</td>
<td>Timer Event Redundant (TE-RA)</td>
<td>Signal onboard batteries to turn on</td>
</tr>
<tr>
<td>3</td>
<td>Timer Event Redundant (TE-RB)</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>Timer Event 1 (TE-1)</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground for TE-RA signal</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>9</td>
<td>GSE 2</td>
<td>N/C</td>
</tr>
<tr>
<td>10</td>
<td>Timer Event 2 (TE-2)</td>
<td>N/C</td>
</tr>
<tr>
<td>11</td>
<td>Timer Event 3 (TE-3)</td>
<td>N/C</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>N/C</td>
</tr>
<tr>
<td>15</td>
<td>GND</td>
<td>N/C</td>
</tr>
</tbody>
</table>
## Pin Assignments: Telemetry

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>20</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>21</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>22</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>23</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>N/A</td>
<td>24</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td>25</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>N/A</td>
<td>26</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>N/A</td>
<td>27</td>
<td>N/A</td>
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<tr>
<td>9</td>
<td>N/A</td>
<td>28</td>
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<tr>
<td>10</td>
<td>N/A</td>
<td>29</td>
<td>N/A</td>
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<tr>
<td>11</td>
<td>N/A</td>
<td>30</td>
<td>N/A</td>
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<tr>
<td>12</td>
<td>N/A</td>
<td>31</td>
<td>N/A</td>
</tr>
<tr>
<td>13</td>
<td>N/A</td>
<td>32</td>
<td>N/A</td>
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<tr>
<td>14</td>
<td>N/A</td>
<td>33</td>
<td>N/A</td>
</tr>
<tr>
<td>15</td>
<td>N/A</td>
<td>34</td>
<td>N/A</td>
</tr>
<tr>
<td>16</td>
<td>N/A</td>
<td>35</td>
<td>N/A</td>
</tr>
<tr>
<td>17</td>
<td>N/A</td>
<td>36</td>
<td>N/A</td>
</tr>
<tr>
<td>18</td>
<td>N/A</td>
<td>37</td>
<td>N/A</td>
</tr>
<tr>
<td>19</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hazardous Electrical Items

• Batteries could be considered hazardous, as they are stored energy.
  – They will not be charging during flight, which will reduce the risk of danger.
System Overview: Description of Partnerships

• As of yet, Team Janus does not have any official partnerships.

• Team Janus is working with a collection of students with learning disabilities from various schools. The partnership will allow the students to complete a project in the STEM field.

• Team Janus will also be working with members from previous Capitol Technical University RockSat mission. They are advising and helping Team Janus complete the project.
De-Scopes and Off-Ramps

- A redesign of the secondary CubeSat and its track could cause delay in fabrication.
- If DC step motor will not work in a space environment, a suitable replacement will have to be found, this could cause a delay in assembly.
- If any minor pieces, such as supports, are delayed, we have access to a 3-D printer.
System Overview: Special Requests

• Team Janus needs to use two IR lasers to take measurements. The lasers have 850 nanometer wavelength.
• The Iridium antenna needs to be zenith pointed to ensure proper communication.
3.0 Hardware Procurement Status
Hardware Procurement

- Team Janus has not bought any materials needed to complete the project
  - This is because we do not have our funding yet.
  - We do know where we will buying our materials and how much each component cost.
Mechanical Elements

- Primary and secondary CubeSat outer structure will be manufactured
- (6061 ¼ inch aluminum plates will be purchased and assembled by Janus team)
- Iridium antenna covers will be manufactured
  (plexiglass will be purchased and made to fit antennas)
- IR laser covers will be manufactured
  (plexiglass will be purchased and made to fit antennas)
- Secondary CubeSat track will be manufactured (6061 T6 solid tubing and 6061 round tubing)
Electrical Elements

• As of yet, no electrical component has been made.
  – The entire design still needs to be soldered.
  – Team Janus still need buy all the components necessary for the electrical system.

• The entire electrical system will be made in house.
Software Elements

• What discrete blocks of code are completed?
  • None due to lack of testing
4.0 Subsystem Testing Results
Software

• Power Usage
  • Maximum: ~140 mA
  • Minimum: ~70 mA

• Mechanical and Electrical Interference
  • None, subject to testing

• Hardware: Raspberry Pi
• Weight: ~226 Grams

• Current Design: Final-ish
  • General Design: Final
  • Implementation: Not Final
Software

• Quick Status
  • General Setup
    • Iridium
      • Programming Language
      • AT Commands
  • Implementation
    • Laser Interaction
      – Interpretation from laser to Rasp Pi
    • Iridium GPS
      – GPS Codephase
      – Simple GPS

– OS
  • Low overhead
  • Headless
  • Stripped of all non-essential processes
  • Contenders
    Arch Linux
    Debian
    Damn Small Linux
    Puppy Linux
Software

• Tests:
  – Sufficient RAM and CPU clock speed
  – OS installation tests
Software

• Results
  – System Requirements
    • Ram
      – 512 MB
    • CPU
      – 1 GHz single-core
  – OS
    • Raspbian
      – Moderate Ram usage
      – Moderate Overhead
Primary CubeSat

- 5.570 lbs.
- 5 volt, 2A
Primary CubeSat

• No tests were complete as we do not have any materials yet.
• The following slides will show the plans for the testing as soon as we have the proper materials.
Primary CubeSat

- Primary CubeSat will be tested to ensure CubeSat is water tight
- Primary CubeSat will be tested to ensure security to base plate
- IR Laser covers and antenna covers will be tested to ensure they can withstand the heat from re-entry
- The laser will be tested to ensure proper measurements.
- The iridium will be tested on the ground to ensure proper data transfer.
Secondary CubeSat and Track

- 1.380 lbs.
- 5 volts, 2A
Secondary CubeSat

• No tests were complete as we do not have any materials yet.
• The following slides will show the plans for the testing as soon as we have the proper materials.
Secondary CubeSat

• Secondary CubeSat track will be tested to ensure security to base plate
• Secondary CubeSat will be tested to ensure it slides along track and interacts properly with worm gear and motor
• The motor will be tested to ensure it reverse at the right time, and to ensure it will not move before the desired time.
• The antenna covers will be tested to ensure they can withstand the heat from re-entry
• The iridium will be tested on the ground to ensure proper data transfer.
U2-Pi

- 0.481 lbs.
- 5 volts, 2A
U2-Pi

• No tests were complete as we do not have any materials yet.
• The following slides will show the plans for the testing as soon as we have the proper materials.
The U2-Pi will be tested to ensure the pi inside is secure.

The camera and storage will be optimized and perform a dry run to ensure that it functions properly.
5.0 Plan for Integrated Subsystem Testing Review (ISTR)
Mechanical Testing

• The entire payload will be subject to "dry run" to ensure all the components can function in tangent.

• The payload will be placed in thermal vacuum and on a vibration table to test the strength of the materials.

• Representative sections will be sent up on an high altitude balloon test against cold and low pressure.
Electrical Testing

• The entire electrical design will be tested to make sure they function properly using a single "on signal"
  – Integrated electrical testing is very similar to the subsystem electrical testing as each subsystem has an independent power supply.
Software Testing

• The software will also perform a project-wide test to ensure that the subsystems can work together.
  – Much like the electrical design, the software works independently in each subsystem, so integrated software is very similar to subsystem testing.
System Level Testing

- As stated before, the entire system will be subject to a dry run which will test component and subsystem in a simulated flight to find any possible flaws.
6.0 User Guide Compliance
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Status/Reason (if needed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center of gravity in 1&quot; plane of plate?</td>
<td>Within 1&quot;</td>
</tr>
<tr>
<td>Weight 30.0 +/- 1.0 (15.0 +/- 0.5) lbs?</td>
<td>15lbs</td>
</tr>
<tr>
<td>Max Height &lt; 10.75&quot; (5.13&quot;)</td>
<td>4&quot;</td>
</tr>
<tr>
<td>Bottom of deck has flush mount hardware?</td>
<td>YES</td>
</tr>
<tr>
<td>Within Keep-Out Zone</td>
<td>NO</td>
</tr>
<tr>
<td>Using &lt; 10 A/D Lines</td>
<td>N/A</td>
</tr>
<tr>
<td>Using/Understand Parallel Line</td>
<td>N/A</td>
</tr>
<tr>
<td>Using/Understand Asynchronous Line</td>
<td>N/A</td>
</tr>
<tr>
<td>Using X GSE Line(s)</td>
<td>NO</td>
</tr>
<tr>
<td>Using X Non-Redundant PWR Lines (TE-1, TE-2, TE-3)</td>
<td>NO</td>
</tr>
<tr>
<td>Using X Redundant Power Lines (TE-R)</td>
<td>YES, TE-R</td>
</tr>
<tr>
<td>Using &lt; 1 Ah (&lt; 0.5 Ah for half payload)</td>
<td>YES</td>
</tr>
<tr>
<td>Using &lt;= 28 V</td>
<td>YES</td>
</tr>
<tr>
<td>Using RF (If yes, list frequency and TX Power)</td>
<td>YES, 1616-1626.5 MHz, 15W Max Transmit</td>
</tr>
<tr>
<td>Using deployable?</td>
<td>NO</td>
</tr>
<tr>
<td>Whole team consists of US Persons</td>
<td>YES</td>
</tr>
<tr>
<td>Using ITAR and/or Export Controlled hardware</td>
<td>NO</td>
</tr>
</tbody>
</table>
7.0 Project Management Update
## Latest Contact Matrix

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Day Phone</th>
<th>Cell Phone</th>
<th>Receive Texts?</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabrication</td>
<td>Garvin</td>
<td>910-584-7759</td>
<td>910-584-7759</td>
<td>Yes</td>
<td><a href="mailto:garvinn27@hotmail.com">garvinn27@hotmail.com</a></td>
</tr>
<tr>
<td>Liaison/CAD</td>
<td>Josiah Hall</td>
<td>706-580-2273</td>
<td>706-580-2273</td>
<td>Yes</td>
<td><a href="mailto:jdhall2@captechu.edu">jdhall2@captechu.edu</a></td>
</tr>
<tr>
<td>Fabrication</td>
<td>Keith Gorschboth</td>
<td>443-895-2019</td>
<td>443-895-2019</td>
<td>Yes</td>
<td><a href="mailto:Kagorschboth@captechu.edu">Kagorschboth@captechu.edu</a></td>
</tr>
<tr>
<td>Fabrication</td>
<td>Marcus Bailey</td>
<td>443-983-0741</td>
<td>443-983-0741</td>
<td>Yes</td>
<td><a href="mailto:mjbailey400@gmail.com">mjbailey400@gmail.com</a></td>
</tr>
<tr>
<td>Fabrication Lead</td>
<td>Phillip Lentz</td>
<td>610-698-8858</td>
<td>610-698-8858</td>
<td>Yes</td>
<td><a href="mailto:phillip.lentz.1@gmail.com">phillip.lentz.1@gmail.com</a></td>
</tr>
<tr>
<td>Programming</td>
<td>Syiera Williams</td>
<td>240-427-7317</td>
<td>240-427-7317</td>
<td>Yes</td>
<td><a href="mailto:siwilliams@captechu.edu">siwilliams@captechu.edu</a></td>
</tr>
<tr>
<td>Electronics</td>
<td>TJ Krauel</td>
<td>301-885-9355</td>
<td>301-885-9355</td>
<td>Yes</td>
<td><a href="mailto:6970mustang@comcast.net">6970mustang@comcast.net</a></td>
</tr>
<tr>
<td>CAD</td>
<td>Matthew Hinkle</td>
<td>443-416-1985</td>
<td>443-416-1985</td>
<td>Yes</td>
<td><a href="mailto:Mdhinkle@captechu.edu">Mdhinkle@captechu.edu</a></td>
</tr>
<tr>
<td>Electronics</td>
<td>Matthew Lewin</td>
<td>845-661-6328</td>
<td>845-661-6328</td>
<td>Yes</td>
<td><a href="mailto:Matt2.01701@gmail.com">Matt2.01701@gmail.com</a></td>
</tr>
<tr>
<td>Programming Lead</td>
<td>Jacob Karnes</td>
<td>302-331-0076</td>
<td>302-331-0076</td>
<td>Yes</td>
<td><a href="mailto:jskarnes@captechu.edu">jskarnes@captechu.edu</a></td>
</tr>
<tr>
<td>Programming</td>
<td>Edward Emmett</td>
<td>302-430-4741</td>
<td>302-430-4741</td>
<td>Yes</td>
<td><a href="mailto:ejemmett@captechu.edu">ejemmett@captechu.edu</a></td>
</tr>
<tr>
<td>General</td>
<td>Connor Schnitzer</td>
<td>410-299-7641</td>
<td>410-299-7641</td>
<td>Yes</td>
<td><a href="mailto:conman1029@gmail.com">conman1029@gmail.com</a></td>
</tr>
<tr>
<td>Electronics Lead</td>
<td>Michael rarkin</td>
<td>301-512-8132</td>
<td>301-512-8132</td>
<td>Yes</td>
<td><a href="mailto:mrrick13@gmail.com">mrrick13@gmail.com</a></td>
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<tr>
<td>Programming</td>
<td>Sam Schatz</td>
<td>301-751-2453</td>
<td>301-751-2453</td>
<td>Yes</td>
<td><a href="mailto:sjsschatz@captechu.edu">sjsschatz@captechu.edu</a></td>
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<tr>
<td>Advisor</td>
<td>Rishabh Maharaja</td>
<td>401-967-8703</td>
<td>401-967-8703</td>
<td>Yes</td>
<td><a href="mailto:rymaharaja@captechu.edu">rymaharaja@captechu.edu</a></td>
</tr>
</tbody>
</table>
Team Organization Chart

- Avisor Rishabh Maharaja
  - Electronics
    - Lead: Michael Rarick
      - TJ Krauel
      - Matthew Lewin
  - CAD
    - Lead: Matthew Hinkle
      - Connor Schnitzer
    - Lead: Phillip Lentz
      - Garvin
      - Keith Gorschboth
      - Marcus Bailey
  - Fabrication
  - Programming
    - Lead: Jacob Karnes
      - Edward Emmett
      - Syiera Williams
      - Sam Schatz
Team Picture
### Availability Matrix

**Capitol Technology University**

**Spring RS-X Team Availability Matrix**

**PLEASE USE MOUNTAIN TIME ZONE TIMES**

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7:00 AM</strong></td>
<td>3</td>
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</tr>
<tr>
<td><strong>8:00 AM</strong></td>
<td>3</td>
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</tr>
<tr>
<td><strong>9:00 AM</strong></td>
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<tr>
<td><strong>10:00 AM</strong></td>
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<tr>
<td><strong>11:00 AM</strong></td>
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</tr>
<tr>
<td><strong>12:00 PM</strong></td>
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<tr>
<td><strong>1:00 PM</strong></td>
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</tr>
<tr>
<td><strong>2:00 PM</strong></td>
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<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>3:00 PM</strong></td>
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<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>4:00 PM</strong></td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>5:00 PM</strong></td>
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</tbody>
</table>
Monetary budget

- As of now, Team Janus has access to $25,000 from a grant.
- $15,000 will be used to pay for launch.
- $3,000 will be used to pay for equipment and materials used to build project Janus.
- The remaining $7,000 will be used to pay for travel.
Preliminary schedule

• Team Janus meets every Monday at 5:00 p.m. ET

• Team Janus also meets every other Saturday at 12:00 p.m. ET

• Every Wednesday, a majority of Team Janus meets with Professor Maharaja and relays information about the project.

• Meeting times are subject to change
Worries and Concerns

- The primary concern for Project Janus is a piece of technology breaking during launch
  - Raspberry Pi's
  - Iridium modems
- These breakages could prevent Team Janus from collecting useful data.
- We are using yoga mats to reduce vibrations
Conclusion

• Team Janus deserves to fly as we are working on a system to ease the burden on ground teams controlling large constellations in orbit.
• We have and will continue to show dedication towards completing Project Janus' mission.
• Continuing to work on the RockSat-X 2018 will provide invaluable experience for all the members of the team and help them progress in their future careers.
Appendix
Capitol Technology Heritage

• Teams from Capitol Technology University have successfully flown projects on RockSat-X 2015, 2016 and 2017
Team Mentors

- Professor Rishabh Maharaja – Janus Advisor/Concept Developer, RockSat-X 2017
- Christopher Murray – Janus Advisor, RockSat-X 2017
- Pierce Smith – Janus Advisor, RockSat-X 2016 and 2017
Pointing Request: Overall