Alaska and Oregon Space Grant Collaborative CubeSat Workshop

Morgan Johnson
USIP Grad Student Mentor
University of Alaska, Fairbanks
Our Team
Plan Of Action

Student CubeSat Workshop
Mcminnville, OR
August 19 – August 20, 2016

Thursday, August 18th
Day at Evergreen Wings & Waves Waterpark
12:00 – 6 PM Enjoy a day at the waterpark

Friday, August 19th
Plenary Session: Day 1
8:30 AM Breakfast and Registration, 1st Floor Conference Room in the Theater Building, Space Museum
9:00 AM Welcome – Introductions – Dr. Denise Thorsen, Director Alaska Space Grant
9:15 AM CubeSat 101 and ELANa Project - Scott Higginbotham, NASA

Hands on Learning: Day 1
10:15 AM Mock Satellite Design Part 1 – Morgan Johnson, Alaska Space Grant
- Introduction to Hands-On Design
- Coffee Break & Mission Development
- Concept of Operation
- Satellite Requirements: External and Internal
- Validation of Requirements: How do you know you passed/failed

12:00 PM Lunch

12:30 PM Mock Satellite Design Part 2 – Morgan Johnson, Alaska Space Grant
- Mission Operations
- Interface Control Documents
- Software Flow Chart

2:00 PM FlatSat Implementation – Bob Twigg, Moorhead University

6:00 PM Dinner, Lobby of the Theater Building, Space Museum (Ends 8:00 PM)

Saturday, August 20th
Plenary Session: Day 2
8:30 AM Breakfast, 1st Floor Conference Room in the Theater Building, Space Museum
9:00 AM Welcome – Introductions – Dr. Denise Thorsen
9:15 AM Mission Operations and Ground Stations – Justin Foley, CalPoly
10:15 AM Coffee Break
10:30 AM The non-technical aspects for a successful CubeSat mission – Brian Sanders, Deputy Director Colorado Space Grant Consortium
11:30 AM Set up Presentations for Lunch – Morgan Johnson, Alaska Space Grant
12:00 PM Lunch – Student/Participants 5 min presentations

Hands on Learning: Day 2 Breakout Sessions

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<tr>
<th>Time</th>
<th>Mechanical</th>
<th>Electrical</th>
<th>System</th>
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<tbody>
<tr>
<td>1:00 PM</td>
<td>Basic Structure (Matt Pacheco)</td>
<td>Command and Data Handling and Software Architecture (Morgan Johnson)</td>
<td>Mentor Session (Denise Thorsen)</td>
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<tr>
<td>2:00 PM</td>
<td>Advanced Structure (Robert Miller)</td>
<td>Communication (Justin Long)</td>
<td>Science Mission (Brian Sanders)</td>
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<td>3:00 PM</td>
<td>Propulsion (Darren Hitt and Ryan McDevitt)</td>
<td>Attitude Control and Determination (Chic O’Dell)</td>
<td>Mission Operations/Ground Station (Eric Pilger)</td>
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<td>4:00 PM</td>
<td>Orbit/STK/Simulation Modeling (Denise Thorsen)</td>
<td>Electrical Power Systems (Andrew Greenberg)</td>
<td>Testing Requirements and Facilities (Morgan Johnson)</td>
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<td>5:00 PM</td>
<td>Closing Remarks</td>
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CubeSat Launch Initiative

NASA is interested in opportunities to provide launch opportunities for the Cubesat developers, non-profit, companies, and universities. cube Sat is a small, flexible approach to deploying small satellites into orbit. This program is an opportunity for educational, commercial, or research organizations.
50 CubeSats from 50 States

Goal to broaden NASA’s CubeSat Launch Initiative to reach all states by targeting the 18 “rookie states” that have had no previous presence in space.

“will leverage the existing NASA Space Grant network of colleges and universities.”

~ White House Maker Faire Fact Sheet
Mission Goal
Improve environmental requirements for future CubeSats inside the launch vehicle.

Mission Objective
Characterize thermal and vibration environment inside the launch vehicle from ignition to orbit injection.
Mock Sat Design
Implement FLATSAT

![Diagram of FLATSAT components]

- Micro SD Card
- GPS Receiver
- ISM/SRD Transceiver
- Temp Sensor 1
- Temp Sensor 2
- AA Battery (1.2 volts)
- DC-DC Converter (7 volts)
- Voltage Regulator (3.3 volts, 5 volts)
- Prototype Board
- SPI BUS
- One-Wire
- Arduino Interface Connectors

Arduino Uno R3
Lunch Presentations

**KickSat-2**
- Created funded through Kickstarter by Zac Manchester, PhD.
- Goal was to launch a large number of small "micro" satellites from JHU's CubeSat Lab.
- KickSat-1 launched on a JAXA commercial rocket mission on April 18, 2014.
- Due to an unplanned restart, the Sprites did not deploy in time and were placed in the mothership.
- KickSat-2 has been selected by NASA's CubeSat Launch Initiative.

**UVM SAT**

**GOAL**
- Deploy solar sail utilizing a commercially available propulsion system.

**OBJECTIVE**
- Test and deploy solar sail, and record deployment via video.

**SECONDARY OBJECTIVE**
- Proof of concept of deployment propulsion system on CubeSat.

**Oregon TECH CUBESAT PROJECT**

**CubeSat Team**
- Alexis Hundley-Kennady
- Eric Shaw-Stamey
- Francis Bartholomew
- Mckie Cassady
- Dmitry Litvin

Newly established team at OIT-Winston
Prospective projects include renewable energy systems and high atmospheric radiation studies
Access to machine shop, rapid prototyping facility and 3D print

**Linn-Benton Community College**

**CRF**

- Power: 10W
- ADCS Power: 1.5W
- Communications: UHF/VHF
Break Out Session
My favorite part of the workshop...

- Hearing all the stories regarding CubeSat missions and their experiments.
- Breakout sessions, talking with mentors.
- Being able to mingle and learn about other project groups that were present.
- The Mock build, it was extremely helpful in understanding the process.
- The Breakout sessions were very valuable. The four lectures given especially on ground stations and student organization were hugely important.
- Hearing Scott from NASA talk about how to get a launch was very informative.
QUESTIONS???