CubeSat Components: A Collection of Ideas from AFRL Space & Phillips Scholars

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Outline

• The Space and Phillips Scholar Program
• The CubeSat Dilemma
• Scholar Ideas
• Summary
Scholar Program

Mission Statement

• To gather the best and brightest science and engineering students from around the United States

• Perform cutting-edge research at the Air Force Research Laboratory facilities

• The summer laboratory internship is geared to current and future Air Force technology needs,

• Mentored by world-renowned AFRL researchers

To Train, Nurture, and Mentor the Nation’s Future Scientists & Engineers while performing research of significance and value to the Air Force
CubeSat Dilemma

• Most are one of a kind “Swiss Watch” designs
• Current structure is fixed which makes repair difficult
• Not many standard components available
• Market is small and cost margin is slim
• Growing capability for CubeSats has increased visibility
• The need for innovation is apparent
New Hinged Structure

• Skeleton based design
• Hinged sides for easy access
• Standard mounting holes
3-Axis Stabilization

- 3D CAD View to 3D Printer Version
- Fits in a 1U CubeSat
- Nested wheels for compact size
- Still needs control algorithm
Inexpensive Propulsion

- Uses standard CO2
- Controlled Manifold
- Distributed Thrusters
- Some issues with temperature stability
- Fits in 1U frame
Power Generation

- CAD drawing to 1st prototype
- Focus heat on Sterling engine to generate energy
Miscellaneous Ideas

• Torque Coil

• Micro-Thrusters

• De-orbit Module
The Students

• From high school to undergrad to graduate level

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<thead>
<tr>
<th>Bryan Bortner</th>
<th>Victoria Burke</th>
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<tr>
<td>Daryk Harder</td>
<td>Duanni Huang (Tony)</td>
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<td>Eric Murray</td>
<td>Jonathan Gallegos</td>
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<td>Sylvia Reiser</td>
<td>Bryan Wyss</td>
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<td>Matthew Robertson</td>
<td>Ravi Patel</td>
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<td>Darin Leonhart</td>
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<td>Preston Edwards</td>
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• Self-organizing team

• New innovative ideas

Our future appears to be in good hands
Summary

• Scholar program is a valuable experience for mentors and students alike
• CubeSats are still an evolving technology
• CubeSat components are slowly maturing
• New ideas will come from our brightest young students