

# A Standardized Geometry For Space Access Ports

A New Standard for 6 and 12U CubeSat  
Components

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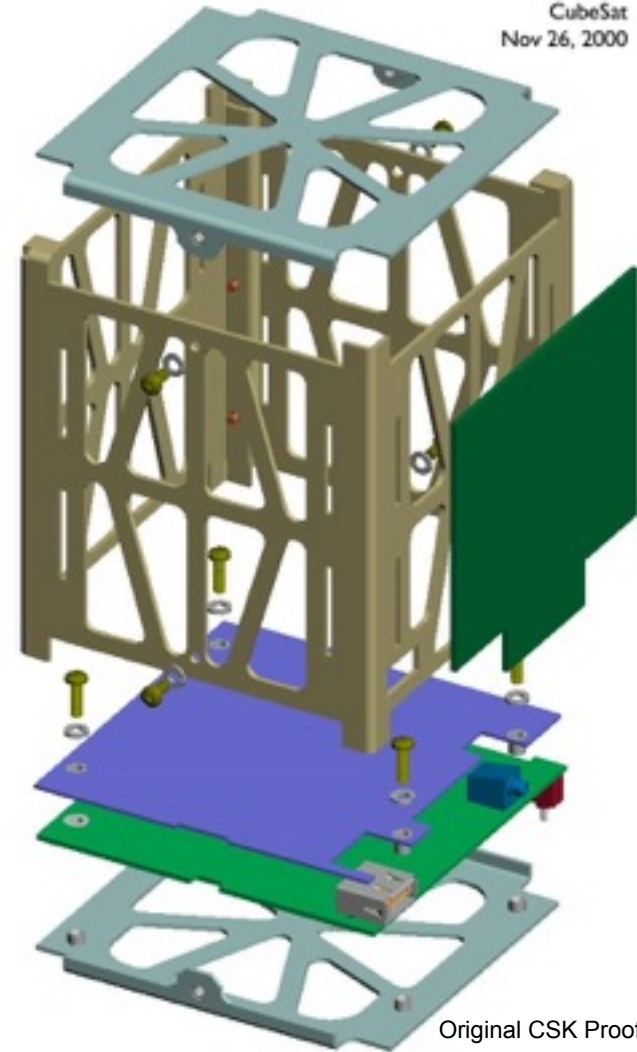
CubeSat Developers' Workshop  
April 20-22, 2016



# History : Early Standards

- CubeSat Design Specification (CDS) from Cal Poly – *outside*
- CubeSat Kit (CSK), 2000 Pumpkin release
- Included “PCB spec” loosely modeled on PC/104 standard – *inside*
- PCB spec evolved into 104-pin CSK module specification

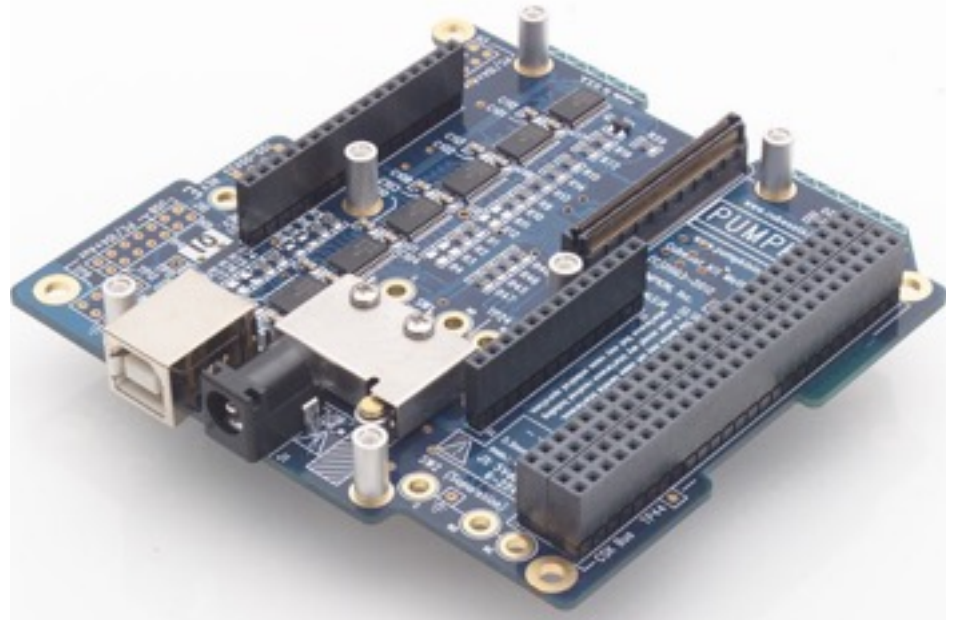
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Nov 26, 2000



Original CSK Proof of Concept

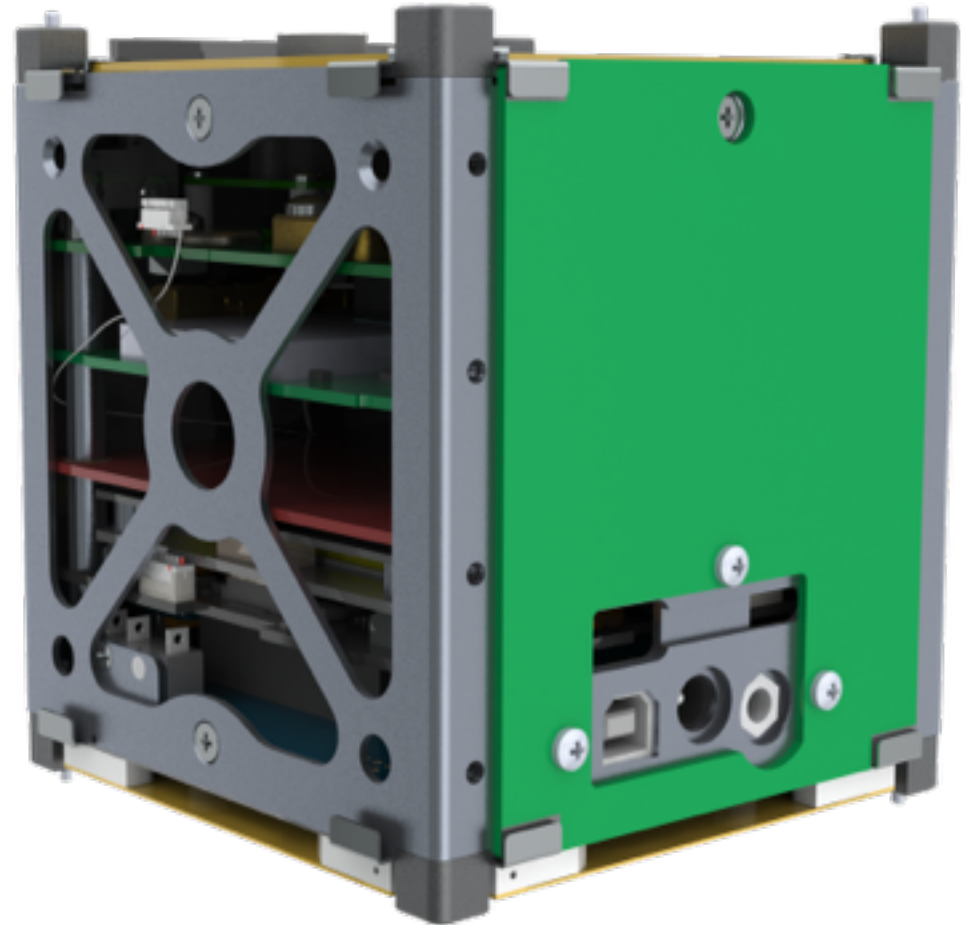
# History : Why it matters

- Solved problems of finding COTS parts
  - Many vendors support CSK standard so custom parts not required for every mission
- Sped up design time. No need to reinvent the wheel every time.
- End users can focus on payload design rather than bus



# History : 1U/2U/3U Limitations

- Structure separates externals from internals
- Only allow 6.5-10mm between exterior and X/Y deployer walls
- Module stacking biases apertures towards Z end(s)
- Feet break 3 axis symmetry



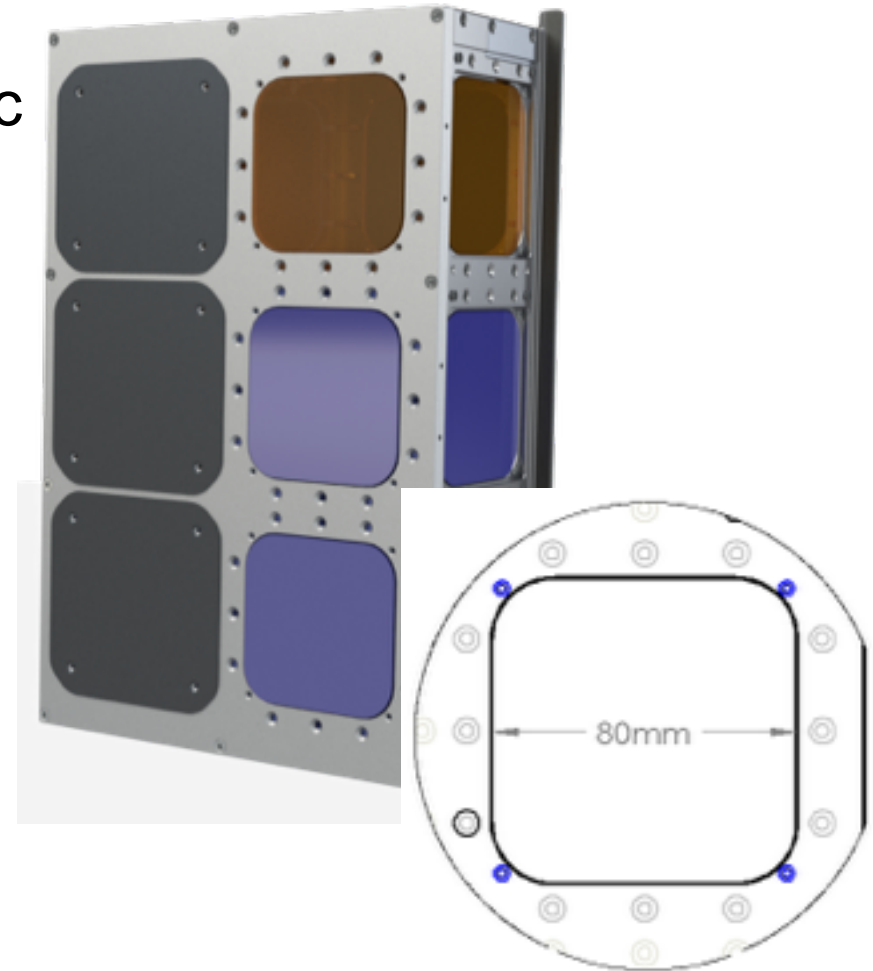
# A New Standard : SUPERNOVA Space Access Port (SAP)

- Developed in conjunction with *Air Force Institute of Technology (AFIT)*
- 6U Planetary Systems CSD compatible design
- Supersymmetric design for added configurability, design freedom and COTS availability



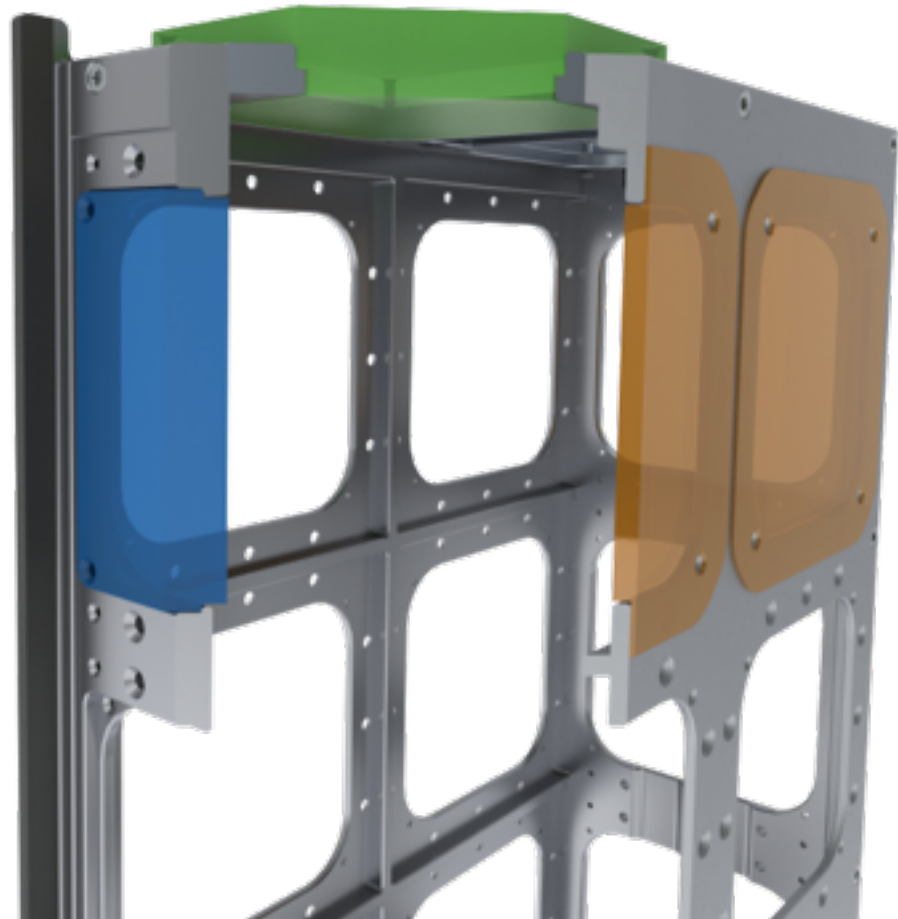
# A new Standard : SAP

- 80mm aperture with symmetric M2.5 bolt pattern on each exterior face
- Aligns with Unit Cube origins in all 3 axes
- Supersymmetry allows for easy payload alignment changes, minimizes reconfiguration for different orbits
- 6U: 22 SAPs, 14 typically available for payload



# A new Standard : SAP Adapters

- SAP Adapters can mount:
  - On an exterior surface (typically **Y**)
  - In a recessed exterior pocket (typically **X/Z**)
- SAP Adapter bounding volume is dependent on:
  - Exterior location
  - Volume of its associated Unit Cube
- SAP Adapters *need not impinge* into the internal 100x100x100mm Unit Cube volume



# SAP Standard : Basic Volumes

- External SAP Adapter height set for standard distance to bounding limit
- Internal SAP Adapter depth set to avoid unit cell bounding volume
- SAP Adapter depth may be increased to any convenient depth



Y



X

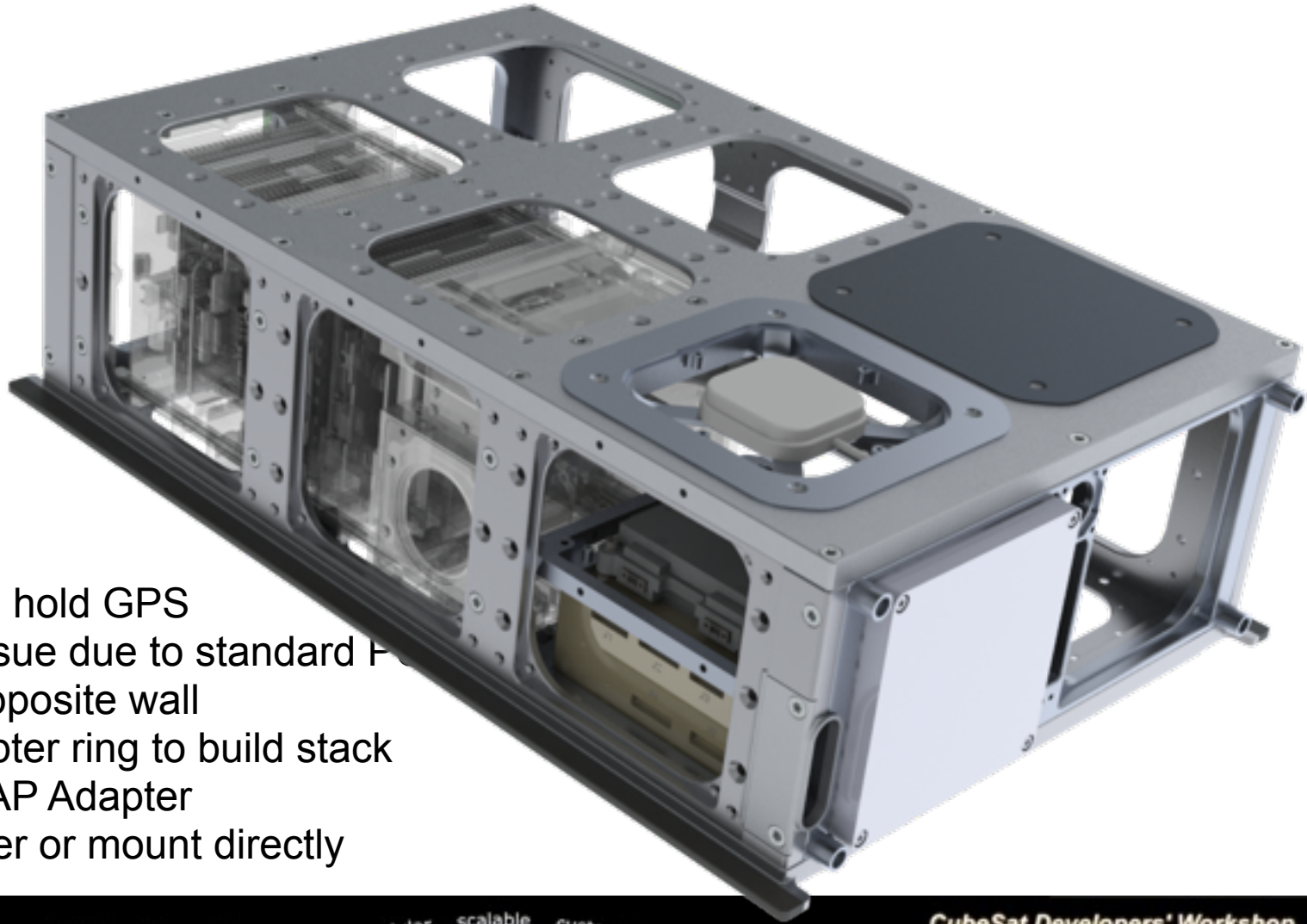


Z



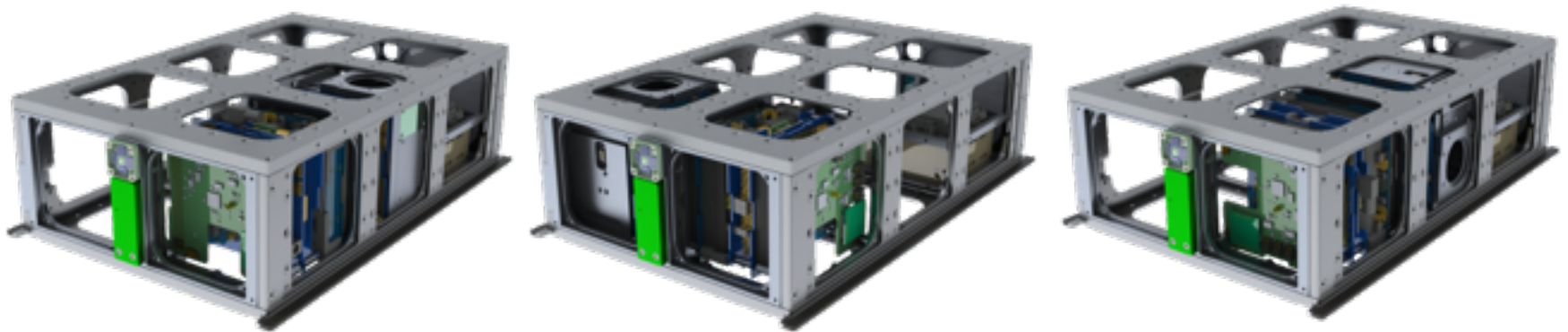


# SAP Standard : Sample Use Case



- SAP adapter to hold GPS
- Depth a non-issue due to standard P-104 mount on opposite wall
- Could use adapter ring to build stack directly under SAP Adapter
- Can use adapter or mount directly

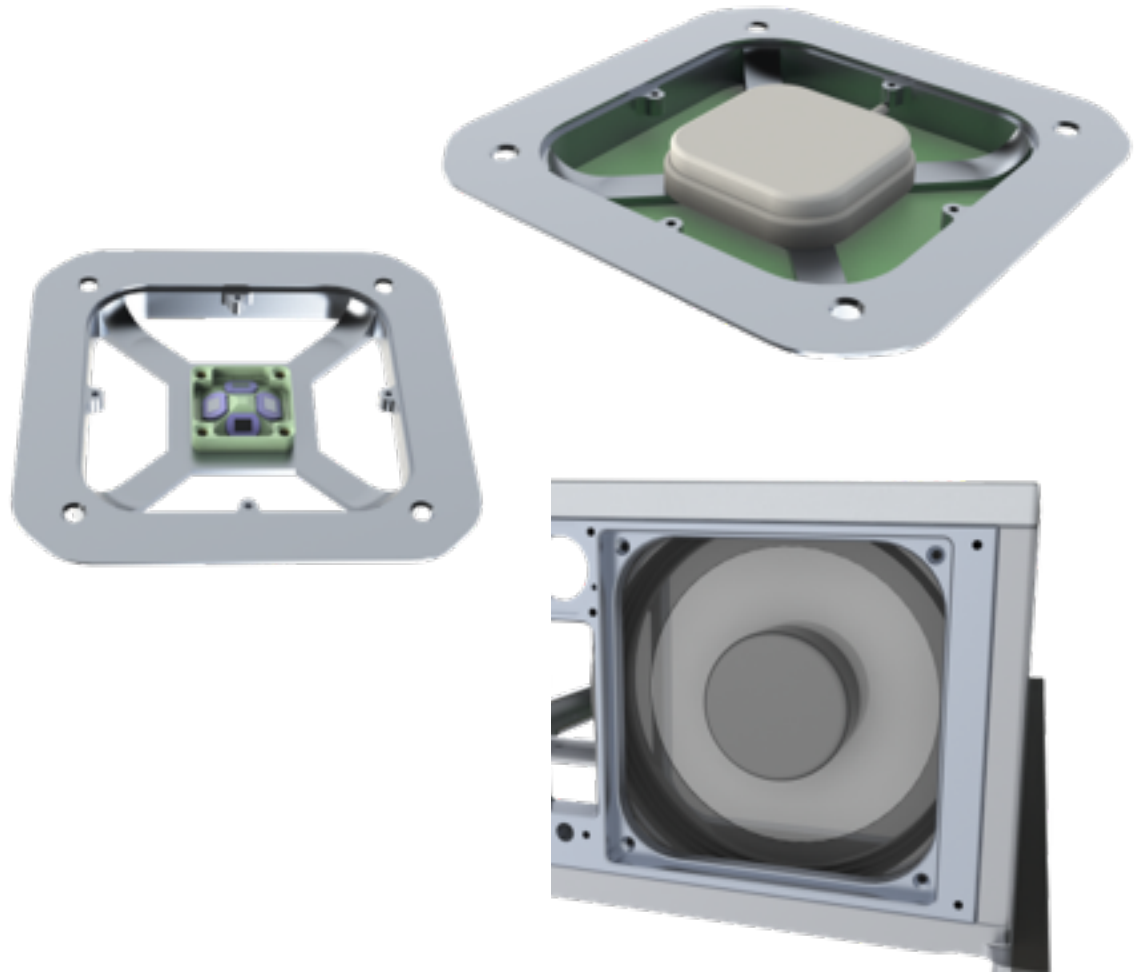
# Supersymmetry : Example



- To get 3 orientations of our standard bus, just:
  - Remove and reinstall 12 screws
  - Move the 6 relevant covers (not shown)
- Now ready for different payloads and orbits
- 30 minutes to reconfigure bus

# What to do with your SAP

- GPS Antenna
- Sun sensor
- Boom
- Camera
- Thruster
- Comms Antenna



# Summary

- New open standard for 6/12U nanosats
- Supersymmetry for modular, flexible design and reusable R&D investment
- Large ports for standardization of payload and peripherals
- Ideal for component and payload developers alike to work with a single unifying open standard



## Q&A Session

Thank you for attending this Pumpkin presentation at the 2016 CubeSat Developer's Workshop!



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# Notice

This presentation is available online at:

[www.pumpkininc.com/content/doc/press/20160420\\_Pumpkin\\_CSDWSLO\\_2016-2.pdf](http://www.pumpkininc.com/content/doc/press/20160420_Pumpkin_CSDWSLO_2016-2.pdf)



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# Appendix

## • Speaker information

- Dov Jelen is an r&d engineer at Pumpkin. Before joining Pumpkin he worked in the green energy and consumer electronics industries. Contact Dov at [dov@pumpkininc.com](mailto:dov@pumpkininc.com).

## • Acknowledgements

- Pumpkin's Salvo, CubeSat Kit, MISC and SUPERNOVA customers, whose real-world experience with our products helps us continually improve and innovate.
- Special thanks to Planetary Systems Inc for their support

## • CubeSat Kit information

- More information on Pumpkin's CubeSat Kit can be found at <http://www.cubesatkit.com/>. Patented and Patents pending.

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