



COSMIAC Presentation for the CubeSat Workshop – Innovations in AM

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COSMIAC Overview

- COSMIAC proudly serves as a Tier-2 Research Center under the School of Engineering at the University of New Mexico
- COSMIAC's role is to promote aerospace innovation through the reliable and responsible use of configurable technology in military and defense systems
- COSMIAC's 13,000 square foot facility provides excellent design capabilities including labs and cleanrooms
- All COSMIAC personnel are US citizens with active security clearances (up to TS or Q for DOE)
- 2014 operating budget approximately \$2M



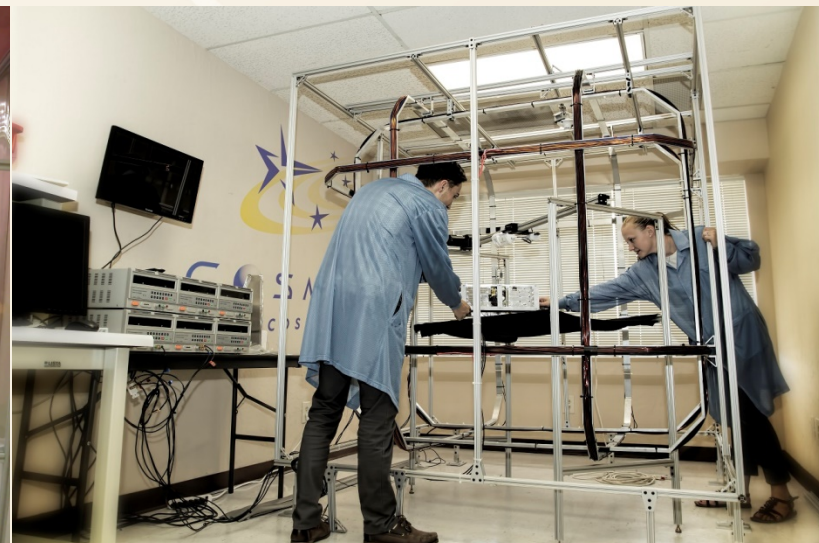
UNM

SCHOOL of ENGINEERING



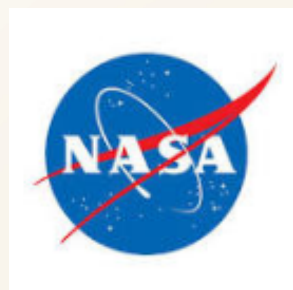
COSMIAC Capabilities

- **Cleanroom**
 - COSMIAC has a sixteen foot by eight foot cleanroom designed for satellite integration and testing
- **Helmholtz Cage**
 - Six foot cubed Helmholtz cage for attitude control testing





The Partners in 3D





The Contracts

NASA SmallSat Technology Program

- 24 month activity with UNM/COSMIAC as the lead
- Focus on radiation mitigation, communications and propulsion

America Makes

- 18 month activity with UTEP/Keck as the lead
- Focus on wiring, propulsion, communication, workforce development, and equipment development

Both activities ending this fiscal year

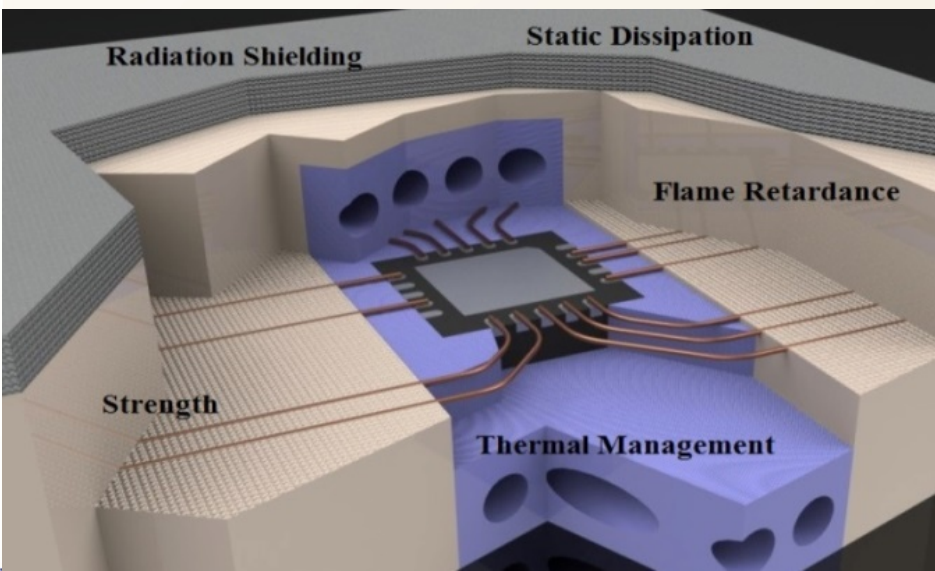




AM Overview

Additive Manufacturing (AM) and Micro Dispensing (MD)

- AM in general
- The game changing component
- SMDC Challenge



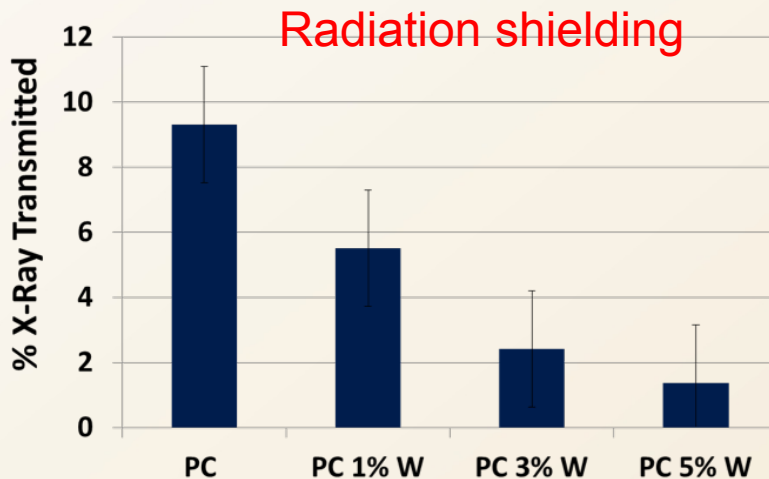
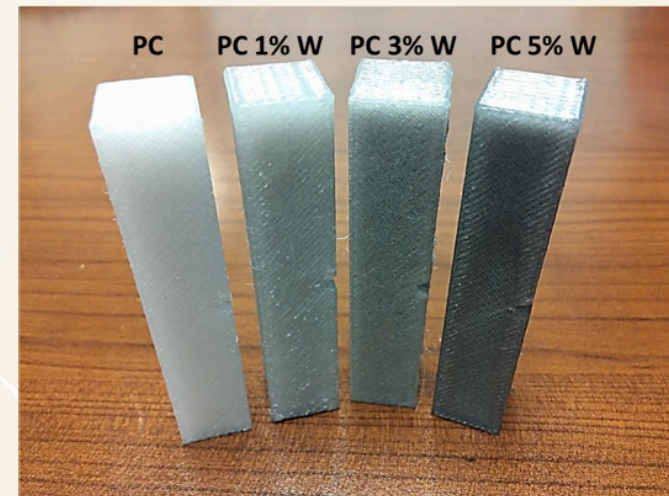
COSMIAC's 3D Lab



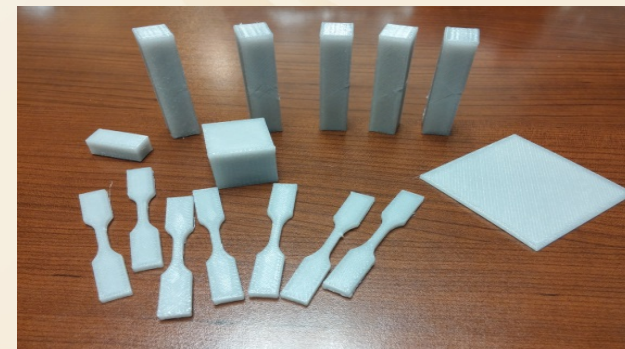


Radiation Testing

- Tungsten powder in Polycarbonate
 - Trade-off between:
 - Weight
 - Strength
 - Thermal / electrical conductivity
 - Radiation attenuation
 - 3D printed geometries for shielding
 - Optimize unused volume for protection



Publications available

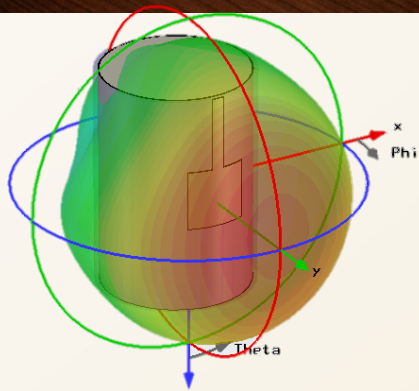
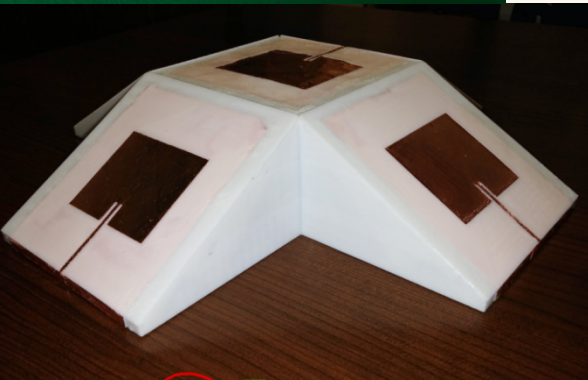




Communications

Printing and Testing Antennas

- Planar
- Nonplanar
- Holy Grail – phased array with embedded mems in nonplanar shape
- ALASA
- Publications available



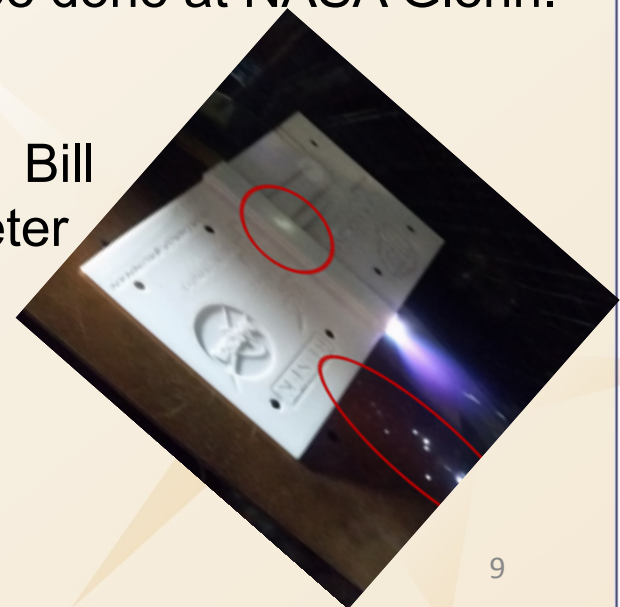
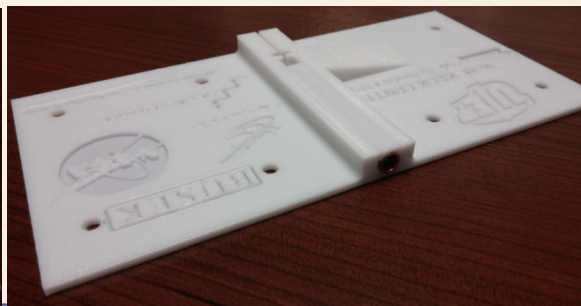


Thrusters

- Busek Pulsed Plasma Thrusters
 - requiring high voltage (1-10kV)
 - non-toxic Teflon propellant
- Dielectric strength and leakage testing coupons created in three materials:
 - ULTEM
 - Polycarbonate
 - Nylon
- Propulsion (micro-newton) testing will be done at NASA Glenn.



John Frongillo in audience. Bill Marshall, Andy Kwas and Peter Hruby next week





SnapSat Version 3.0 Bluetooth

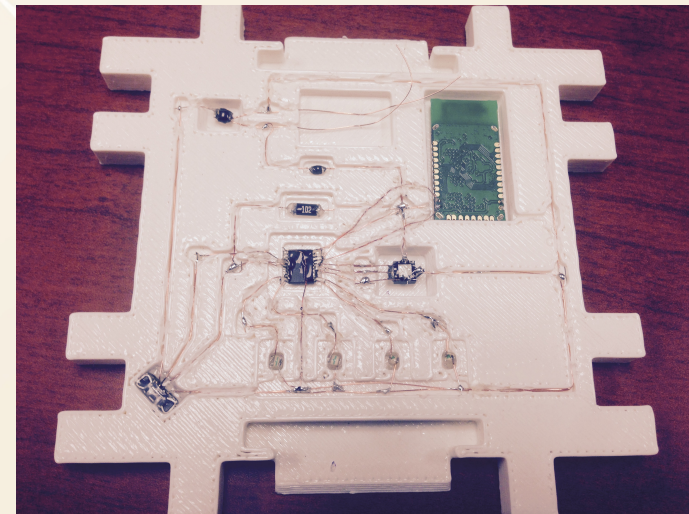
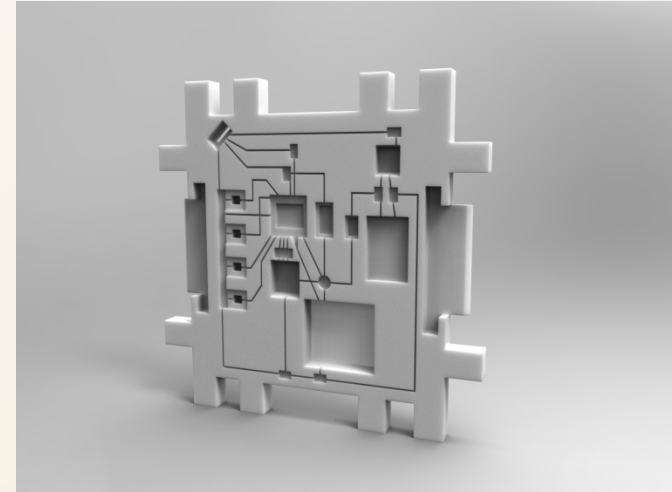
Bluetooth module now added.

RF module with RX and TX

Will control with phone app

Shows attitude on python program.

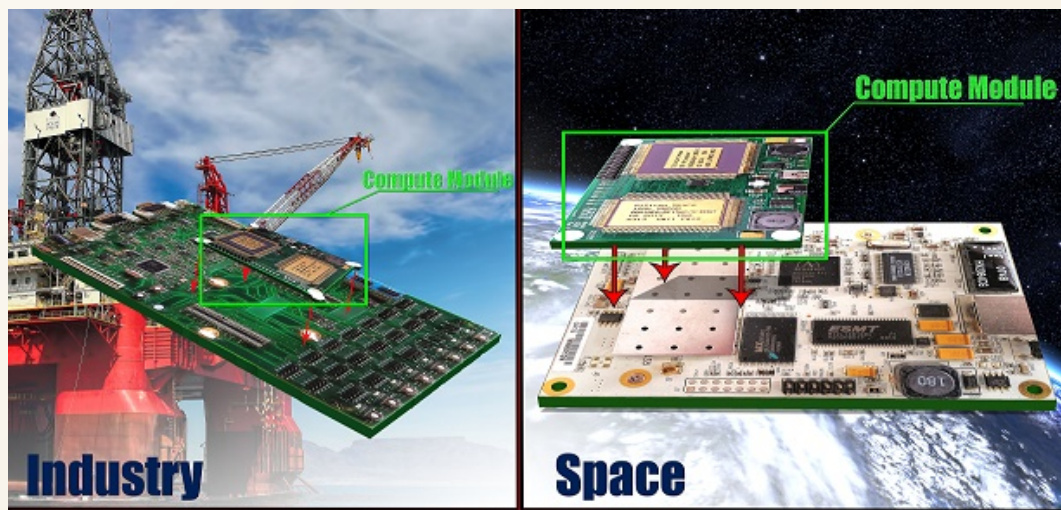
Picture shows during mid-fabrication.





Rad Hard M0 for Space

- Ongoing work with the Silicon Space Technologies (SST) company to develop projects with Rad Hard ARM processor
- NASA SBIR funded activity to develop CubeSat Compute Module

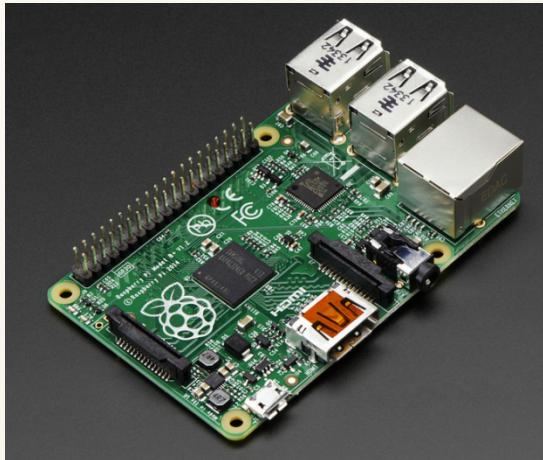
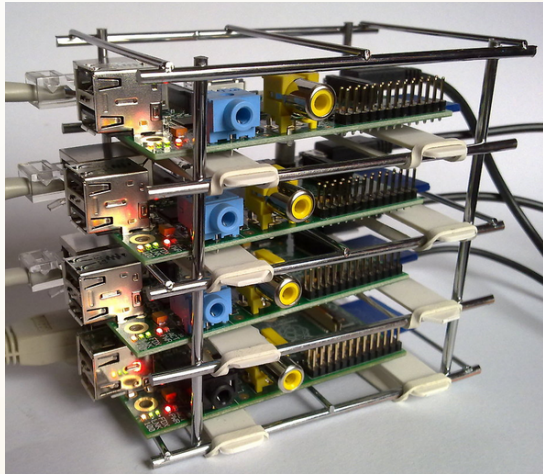


Come see the poster for more information



Game Changing Hardware

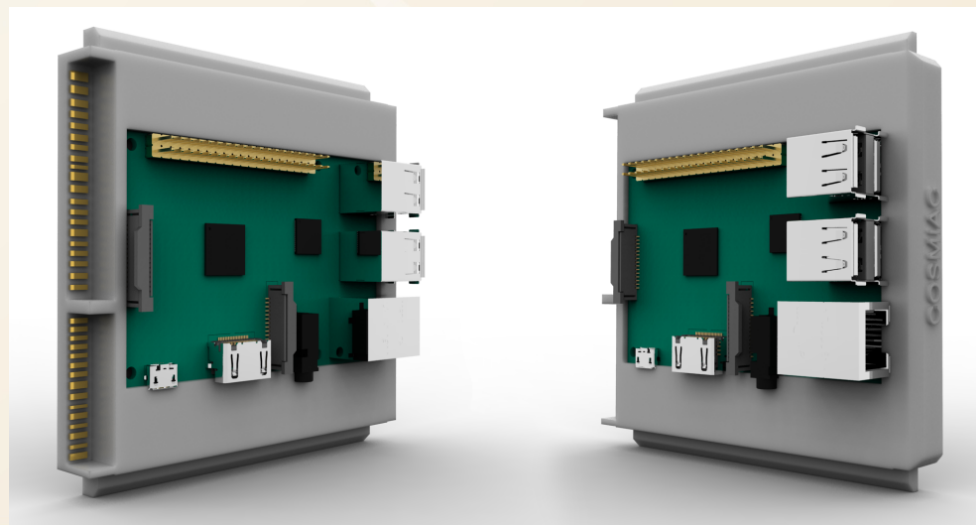
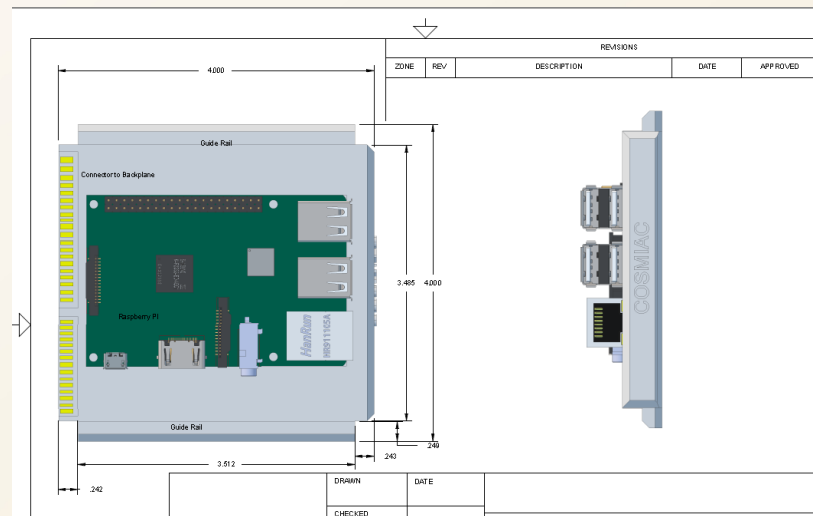
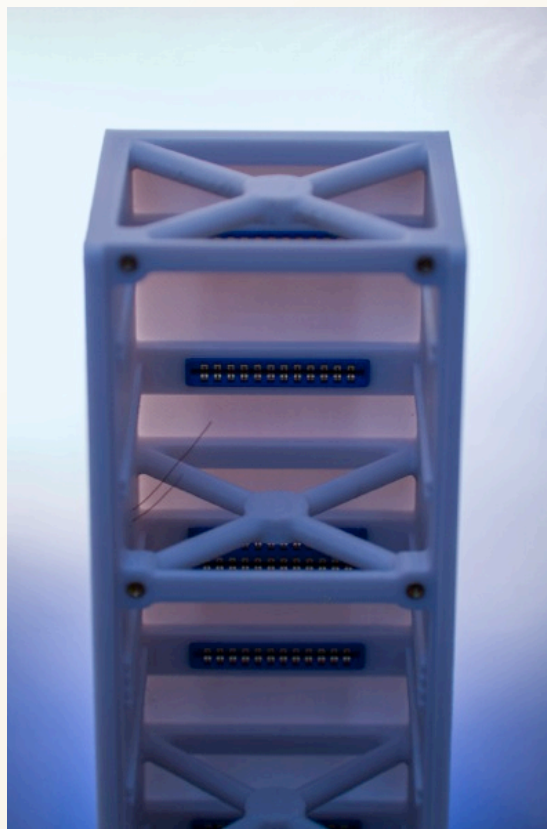
- Raspberry Pi
- Raspberry Pi Networks
- Beaglebone Black
- Globalstar
- Almost anything from Sparkfun





Easily adaptable “tray”

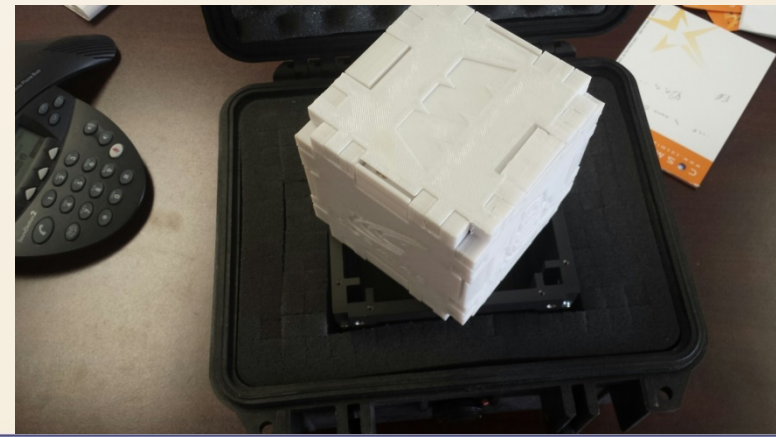
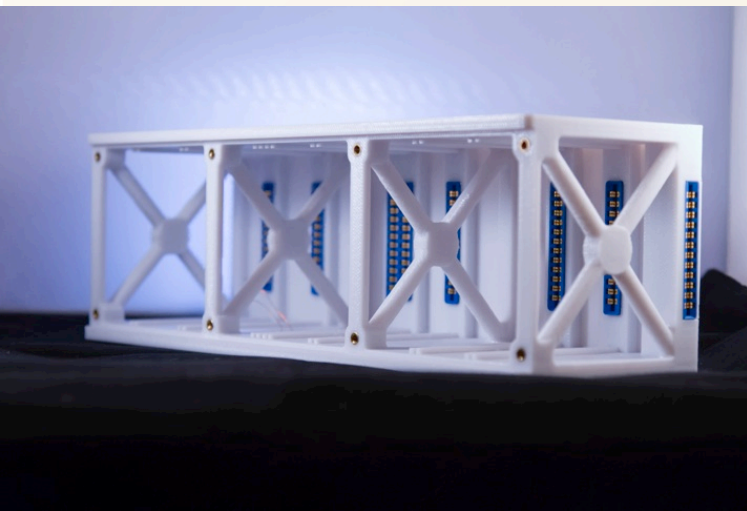
- Quickly adaptable 3D printed tray that will slide into a 1U – 6U printed backplane





KainotomíaSat

- Kainotomía (καινοτομία) – Greek for Innovation
- Creating a 2U Demo of the printed backplane printed in polycarbonate
- Joint ARC, AFOSR, UTEP/Keck and COSMIAC project
- Easily adapt off the shelf hardware to a spacecraft frame
- Going into Shake and Bake next couple of weeks





Backup Plan

If the engineering CubeSat thing doesn't work out, Brian and I can always become miners.





Contact Information

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- Questions, demos, more information, come by the SST Poster or catch up with Craig at the PSC Booth