Thoughts on Imagining the Future with CubeSats

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Inside all of us is an explorer...
...reaching for the stars.
“Why don’t you like me?”, Dontchev. “You don’t do anything”, Cutler. So Kiko built batteries for RAX and MCubed.
Kiko’s next batteries are here..
UMich/Aero/MXL enable bold flight and science to extreme and remote environments.

- Integrate into classes and co-curricular activity.
- 40+ students involved

What’s next?

- $90M startup – Skybox
- $150M NASA mission – CYGNSS

Harness multi-disciplinary research to advance flight.
The CubeSat paradigm is enabling innovation. Can they also enable innovation in ground systems?
Approach: End to End Missions

PCB rendering of the digital processing side.

Prototype radio under testing.

Custom data loggers and flash storage.

Flight computers.
Approach: Enabling spare aperture.

Peach Mountain – upgrading a 26 meter dish for high gain or deep space ops.
Approach: How do we measure capacity and Schedule?

_Clustered Satellite P-POD Launch_

3 satellites from P-POD TacSat3 launch vehicle from Minotaur I
Ann Arbor Ground Station (Latitude: 42.27 N, Longitude: 83.74 W)

### AeroCube3, CP6, HawkAat Orbital Parameters

- $i$: 40.5°
- $e_{avg} = 0.003$
- $a = 6.83 \cdot 10^3$ km

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<th>1 station, 3 satellites</th>
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### Separation of Satellite Pairs

- Aerocube2 to CP6
- Aerocube2 to HawkAat
- CP6 to HawkAat

### Individual and Total Network Capacity

[Graph showing capacity over time]
Approach: Federated networks

Can we leverage existing, under-utilized stations to talk to satellites 24/7?

Open source network software to support.
Approach: Automated tracking and ID.
Potential questions for the working group

• Why are people still building their own networks?

• What are the barriers to innovation?

• What challenges should we pose to the CubeSat community?

• How can we enable the CubeSat community to imagine and implement the future?

• Can GSAW help lead the ground ops side of OPSSAT?