# CubeSats, 18 SPCS and the Orbital Environment

- Community Interests
  - Commercial Operator concerns?
  - Stifled Innovation?
- How can we serve the CubeSat community most effectively?
- How can the CubeSat community help us?
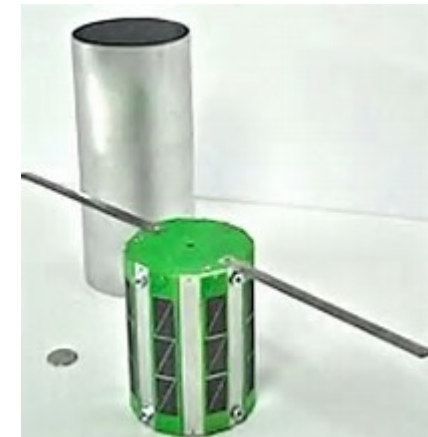
# Defining the Question

- Starting point: "What is a (launched) CubeSat?" (i.e. who are the study objects/ community).

- Currently using 1U, 2U etc for CubeSats, other nanosats considered separately.

- Refinement/ expansion-
  - Repeatability, modularity manner of deployment?

# Study Population-1

- 558 CubeSats (1U, 2U, 3U… ) of which 116 are known to be decayed

- 50 Small Satellites (tubesats, other), 2 known to be decayed
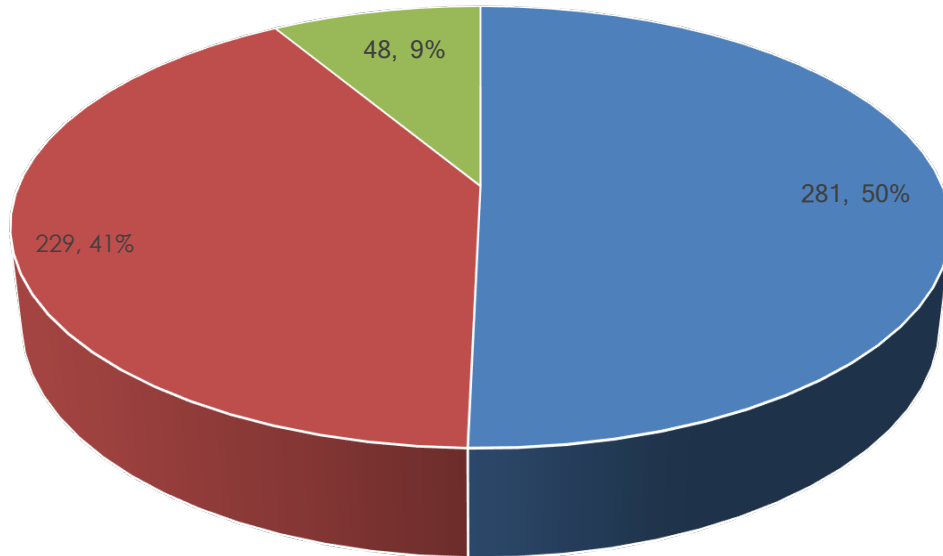
- Overall on-orbit catalog of ~19000 (~2-3%)



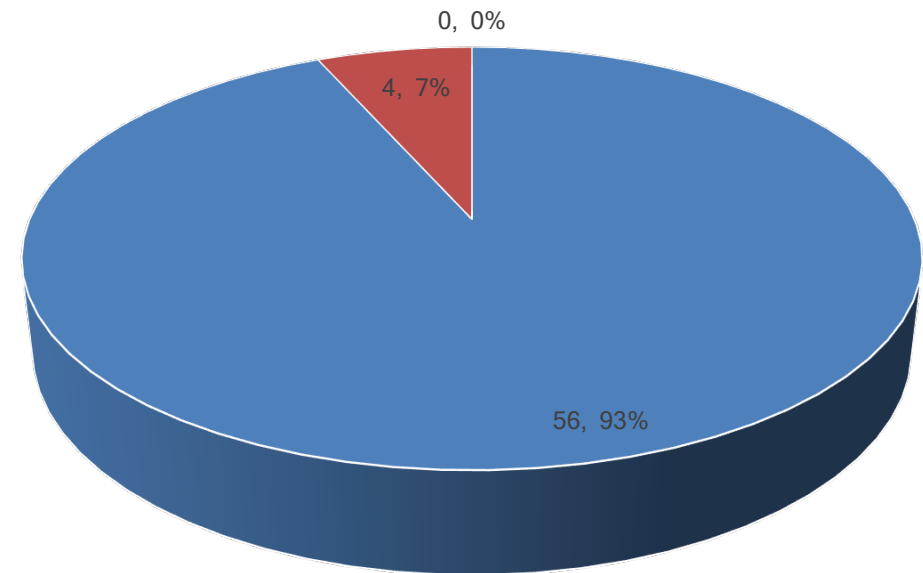Picture Credit Spaceref.com



Picture Credit gizmag.com

ai-solutions.com

# Study Population-2

- ISS period ~93 minutes, Apogee ~400 km



Small Sats Launched

# Study Population-3



CubeSats (558)

- 281, 50% — >ISS
- 229, 41% — <ISS
- 48, 9% — Unlisted

■ >ISS ■ <ISS ■ Unlisted

Non-Cube (50)

- 0, 0%
- 4, 7% — <ISS
- 56, 93% — >ISS

■ >ISS ■ <ISS ■ Unlisted

## Study Population

- Superimposing individual objects launched/ deployed since 2010*



Launches 2010 Onwards -1
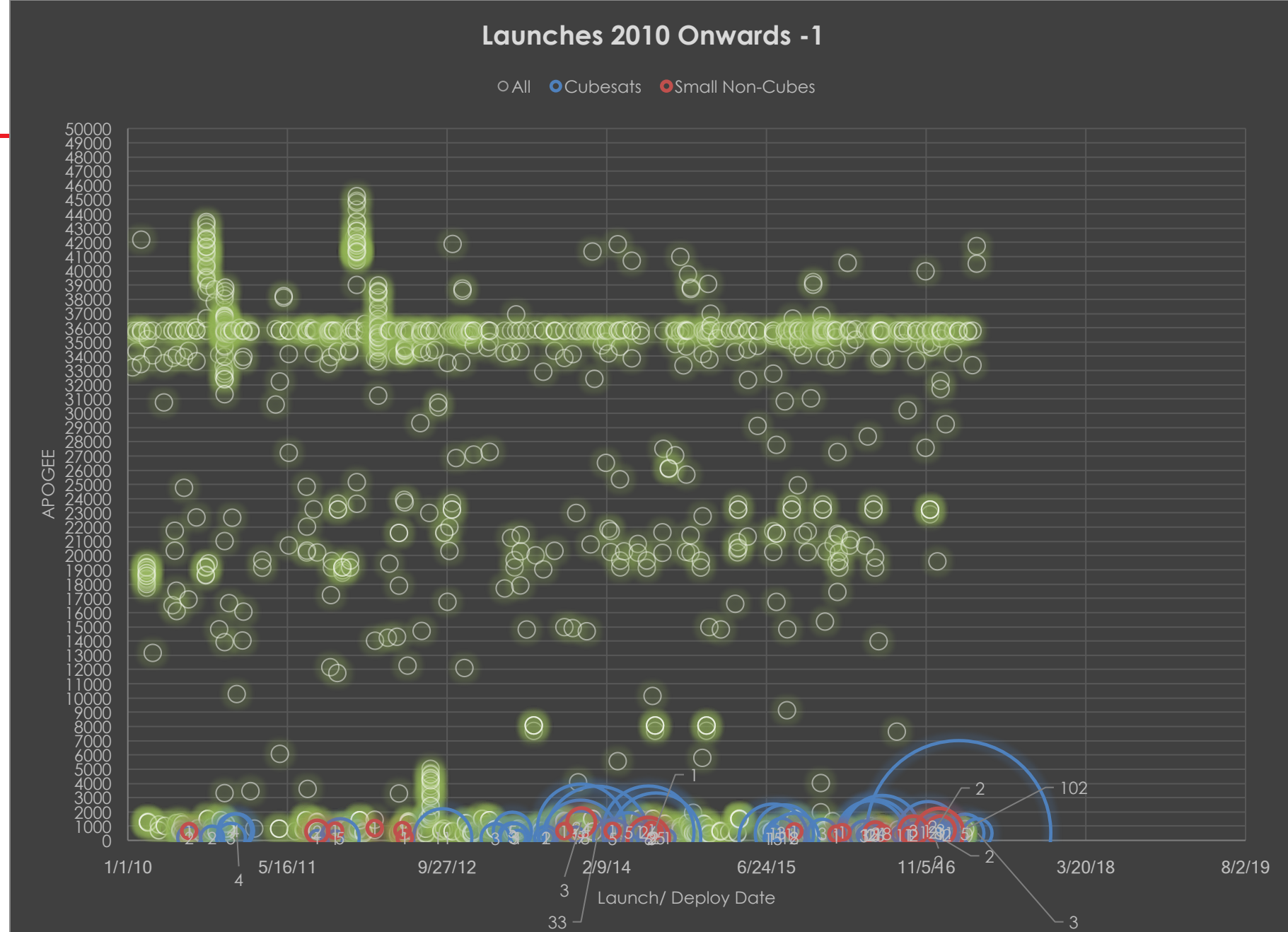
# Study Population

- Shifting focus towards LEO



Launches 2010 Onwards -2
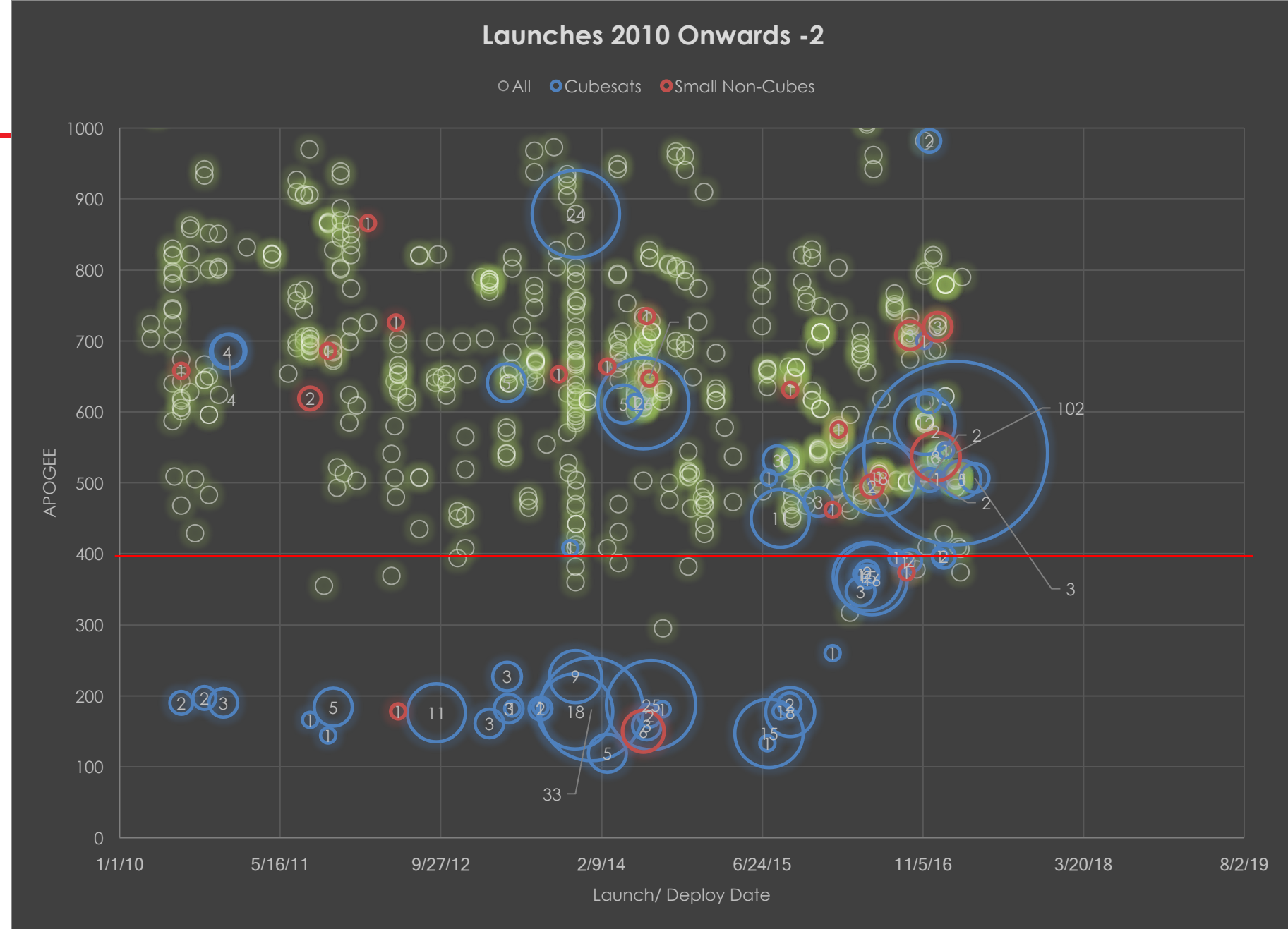
# Future Work: In the pipeline

- Conjunction statistics
  - Proportion of high interest events involving study population
    - How well does the percentage of events reflect the percentage of objects
  - Sensor tasking changes due to conjunctions with study population
- Statistical comparison of regularly calculated Pc to Pc based on more realistic sizes
- Typical timeline for spacecraft identification
  - Launch > Deployment > Identification > Cataloging

# Future Work: Wishlist

- Knowledge of propulsion tests
  - Improves ability to maintain orbit knowledge
  - Potential to help evaluate maneuvers
- Re-entry Statistics/ Operational Status
  - More accurate portrayal of the on-orbit community.

# Conclusion/ Recommendation

- Community Interests
  - Concern Factor?
  - Stifled Innovation?



DON'T PANIC

- How can we serve the CubeSat community most effectively?
- How can the CubeSat community help us?