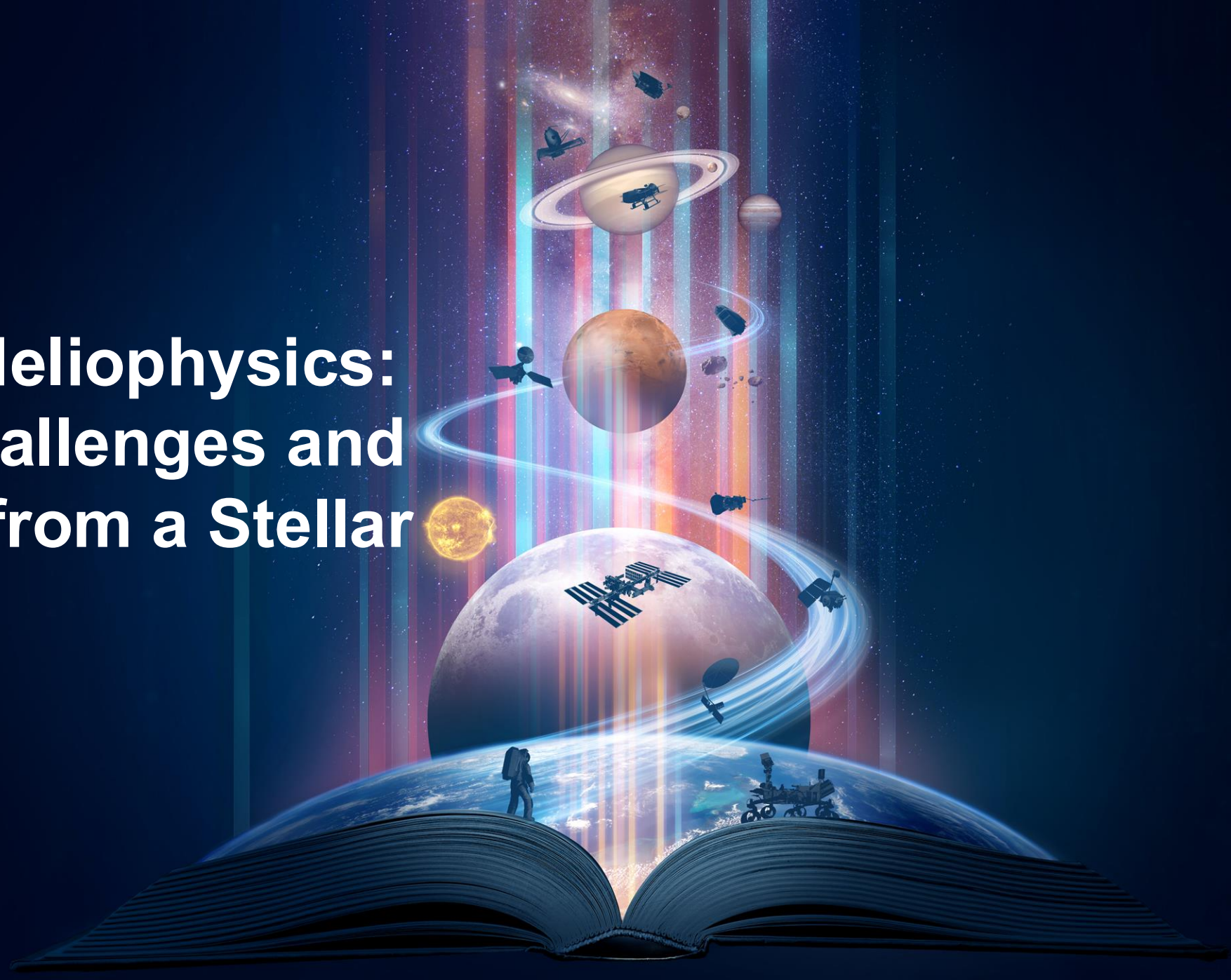
Lessons from Heliophysics: Engineering Challenges and Best Practices from a Stellar Launch Cycle

Bradley Williams

Program Executive, NASA

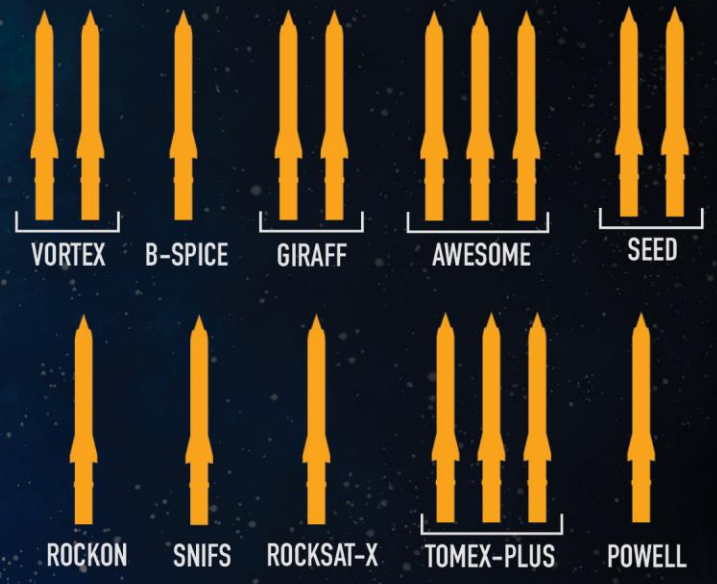


HELIOPHYSICS 2025

7 MISSIONS LAUNCHED
13 SPACECRAFT + 1 INSTRUMENT



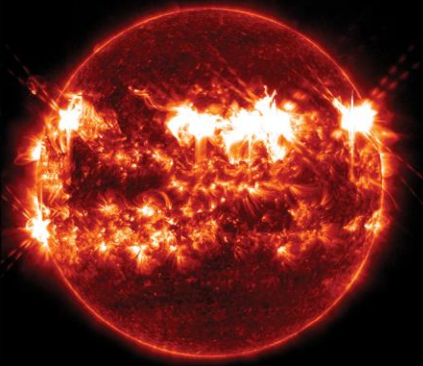
10 SOUNDING ROCKET CAMPAIGNS WITH 17 ROCKETS



3 CUBESATS DEPLOYED

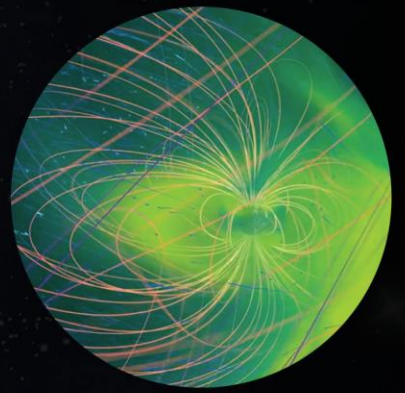


415 SOLAR FLARES
INCLUDING 17 X-CLASS FLARES AS OF DEC 8



A blended composite image of all six X-class flares from November 2025

22 GEOMAGNETIC STORMS



The most powerful geomagnetic storm of the year was a G4 recorded on November 12

Rideshare Integration

- Tight coordination across integration teams, from launch service provider to primary and secondaries.
- Timeline alignment and flexibility to adapt to primary needs
- Robust to changing LV environments – lock interfaces early and maintain margins



Credit: NASA/Kim Shiflett



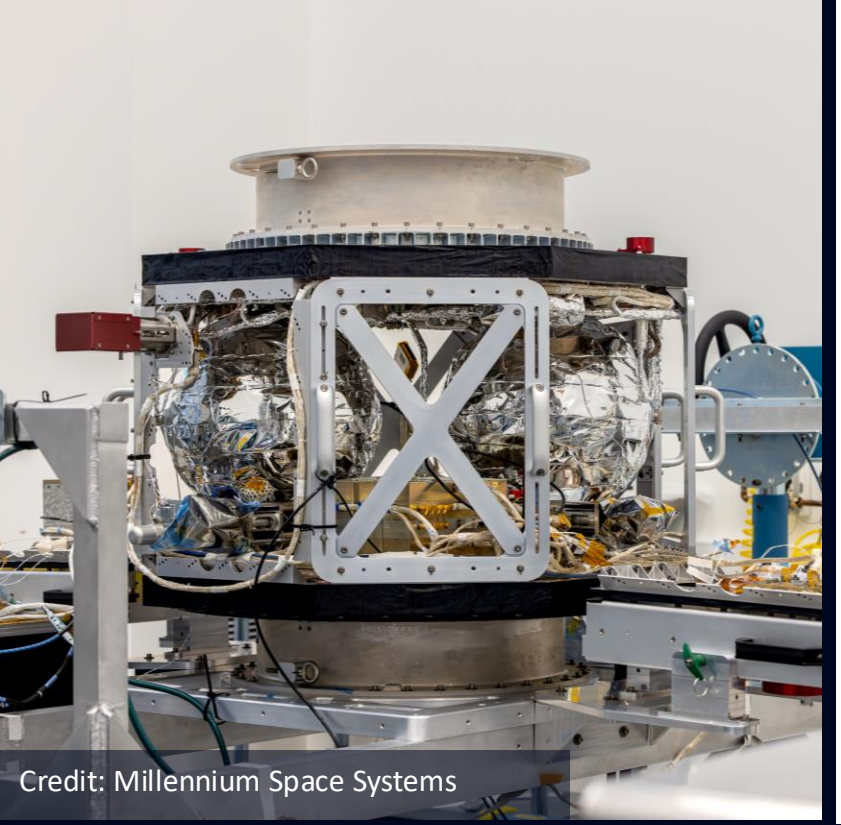
Credit: SpaceX



Credit: BAE Sytems/Benjamin Fry

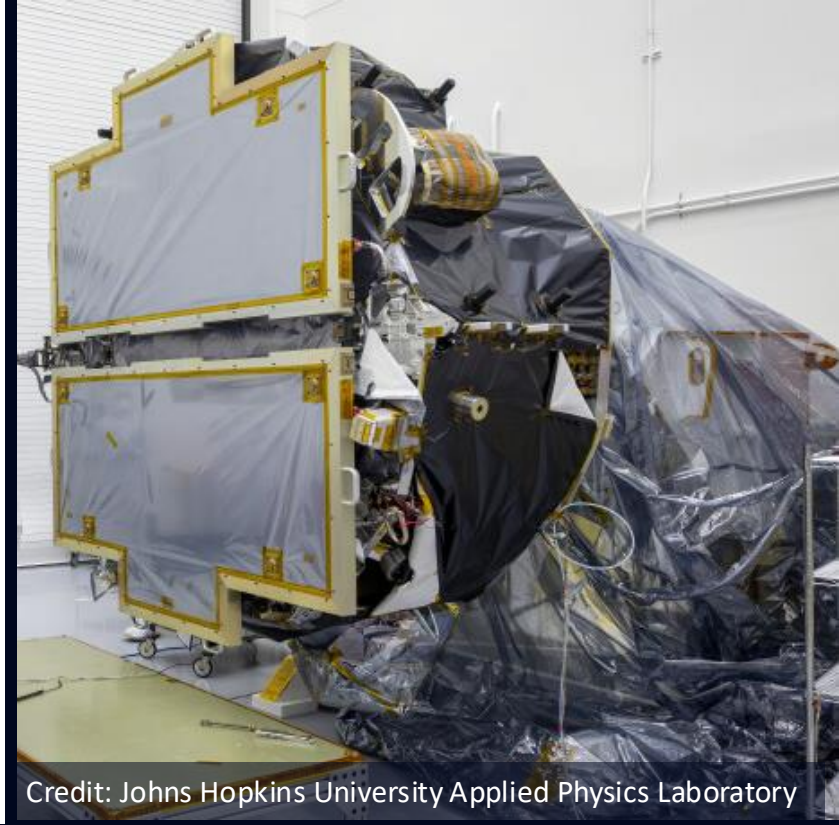
Flexible

Collaborative


Credit: Millennium Space Systems

Requirements Foundation

- Science First
  - Decompose and simplify down to what is actually necessary to close science.
- Distribute margins reasonably and practically understanding your risk
- Scope creep and ill-defined requirements destroy small satellite cost and schedule margins


Credit: Johns Hopkins University Applied Physics Laboratory

Responsive


Credit: Rocket Lab

Agile

Resilient

Right-Sized Risk Posture

- Anchor assurance practices directly to top-level science objectives
- Constellation inherited assurances
- Enable ops flexibility with sufficient margins (power, comms, navigation, etc.) but not excessive-enough to drive overdesign

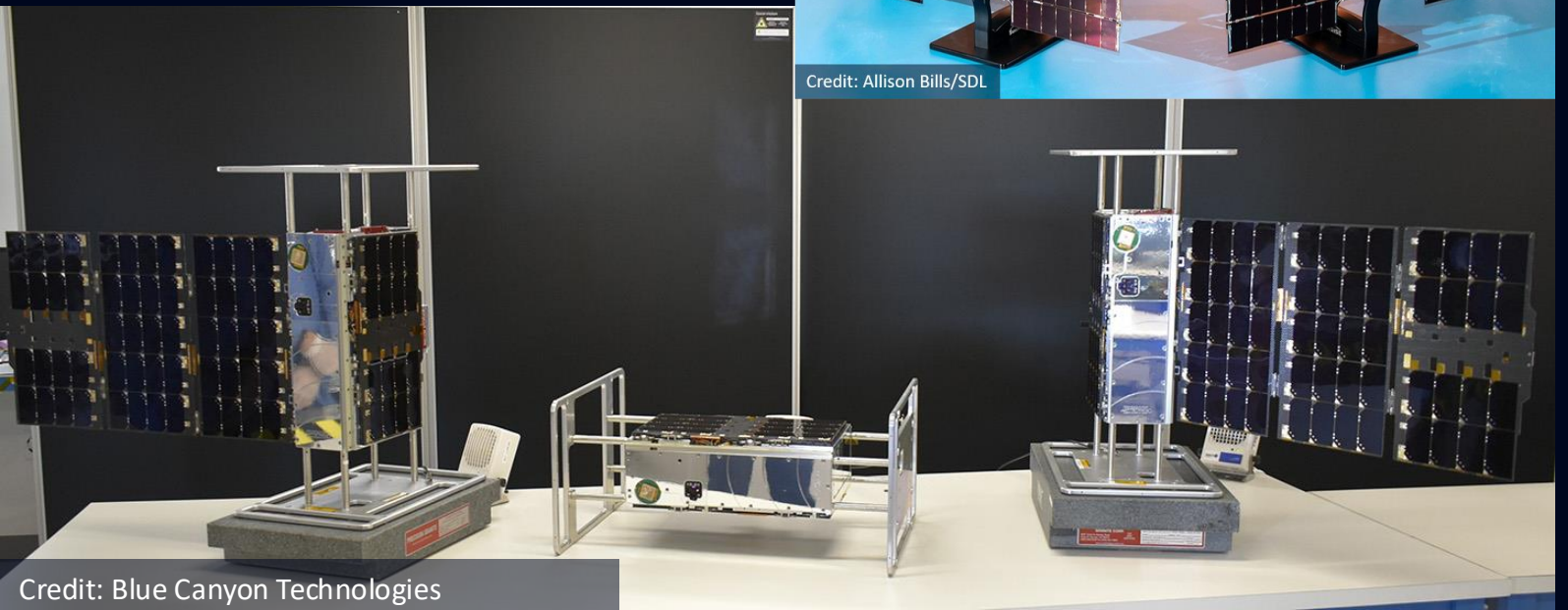
Robust

HELIO SWARM



Credit: Allison Bills/SDL





Credit: Blue Canyon Technologies



Credit: NASA/BAE Systems Space and Mission Systems

Test-As-You-Fly

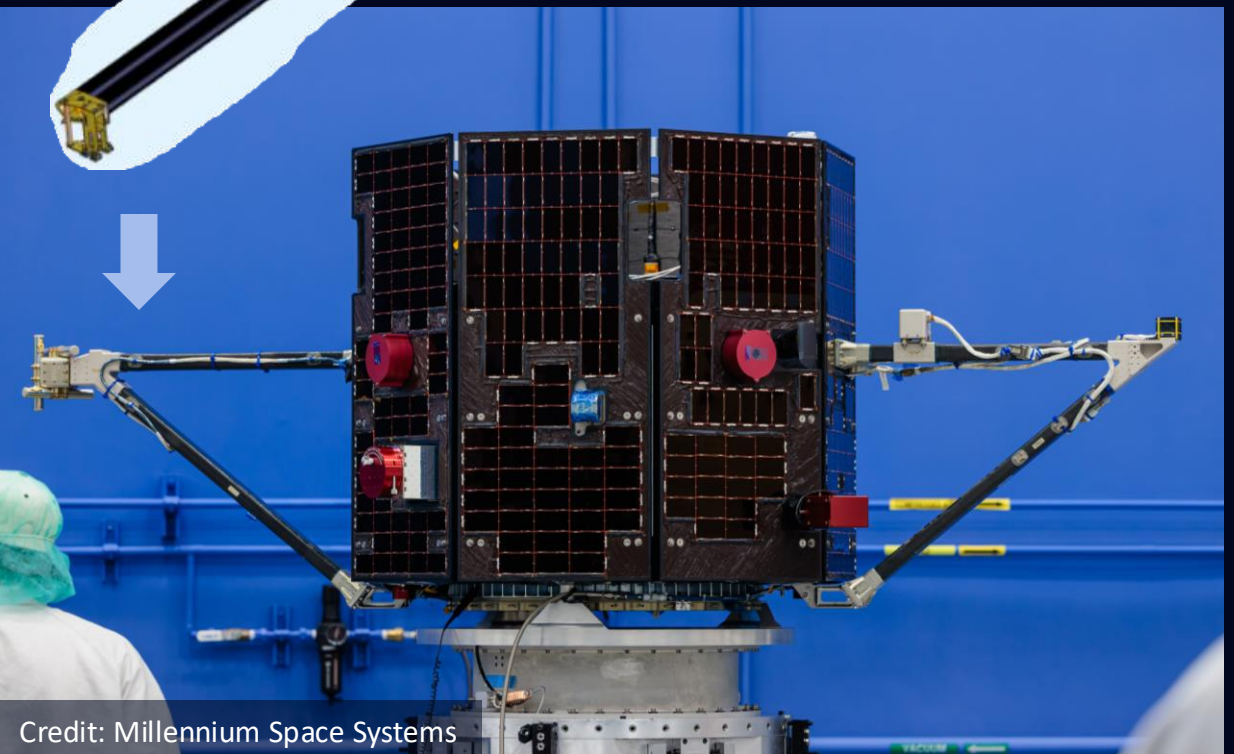
Test Don’t Guess

- “Trust but **verify**”
- "Designed-for" ≠ "Tested-for“
  - Never rely on unverified vendor claims
- Comprehensive ground testbeds remain the ultimate discriminator for mission success

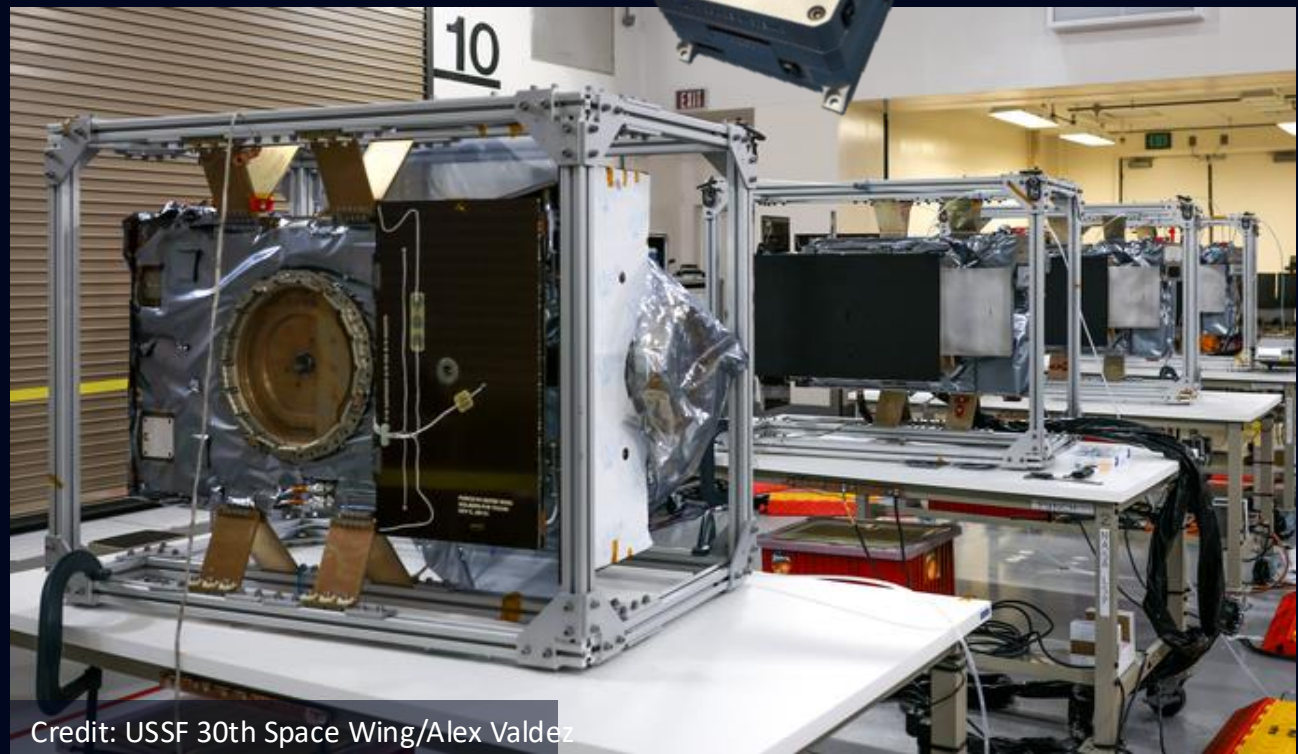
Trust but Verify







Credit: Millennium Space Systems



Credit: USSF 30th Space Wing/Alex Valdez



Credit: /MLive.com/The Flint Journal