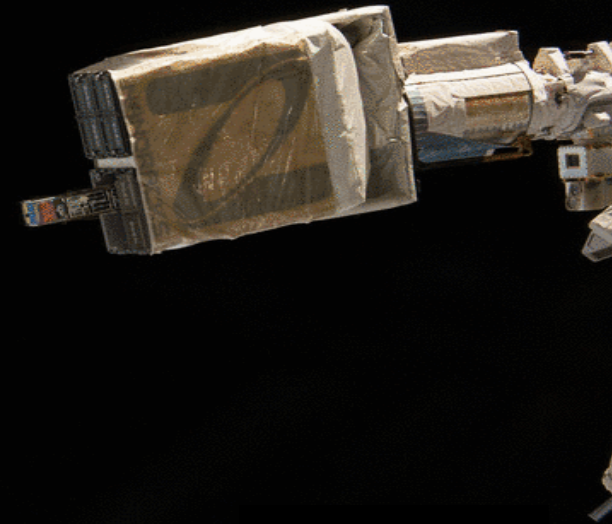




CubeSat Launch Initiative (CSLI) Update

CDW 2024

National Aeronautics and
Space Administration



Norman Phelps
Liam Cheney
Creg Raffington

Launch Services Program

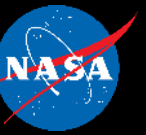
NASA-KSC

CSLI
CubeSat Launch Initiative



Scan the QR code
for more information about
NASA's CubeSat Launch Initiative

CubeSat Launch Initiative



Mission

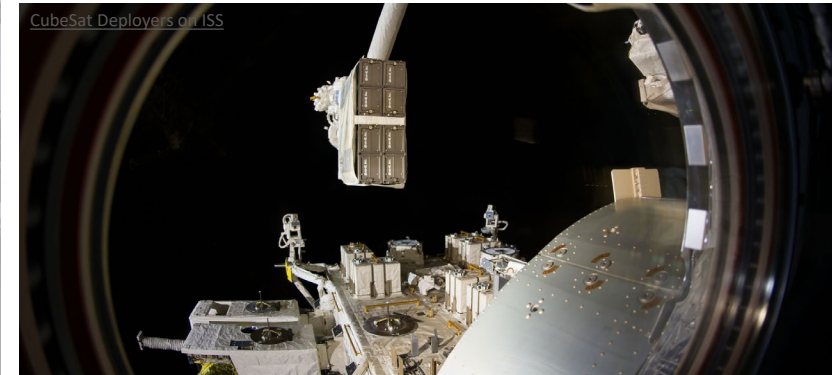
Providing launch opportunities to U.S. CubeSat developers, thereby giving them a pathway to conduct research in the areas of science, exploration, technology development and education.

Accomplishments to Date

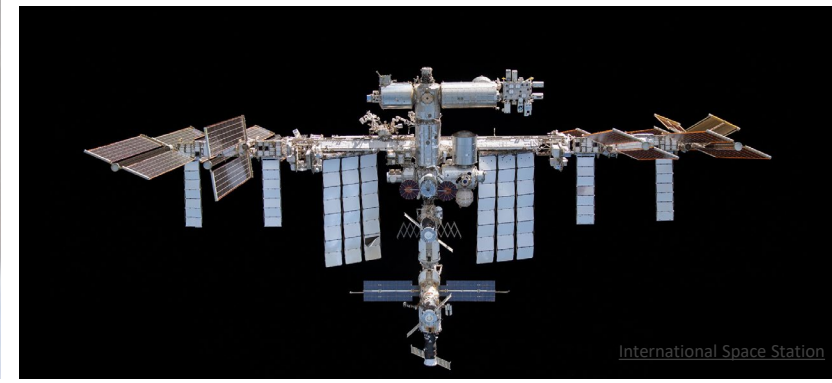
- 200+ CubeSat Projects selected from 100+ organizations from 42+ states, Washington DC and Puerto Rico
- 162+ CubeSats launched to date



LightSail, Credit: The Planetary Society



CubeSat Deployers on ISS



International Space Station

Image: ELaN 19 Launch, Credit: Rocket Lab/Trevor Mahlmann



Recent Launches (2023-2024)



ELaNa 50, SpX-27, Falcon 9, 03/14/2023

- ARKSAT-1, University of Arkansas
- LightCube, Arizona State University



ELaNa 47, Transporter 7B, Falcon 9, 4/14/2023

- CIRBE, University of Colorado at Boulder



ELaNa 40, Transporter 7A, Falcon 9, 4/14/2023

- LLITED, The Aerospace Corporation



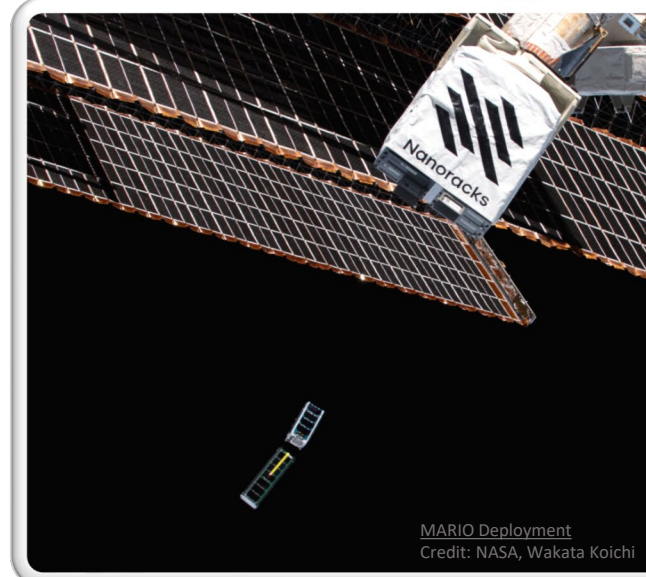
ELaNa 57, Transporter 10, Falcon 9, 3/4/2024

- M3, Missouri University of Science and Technology

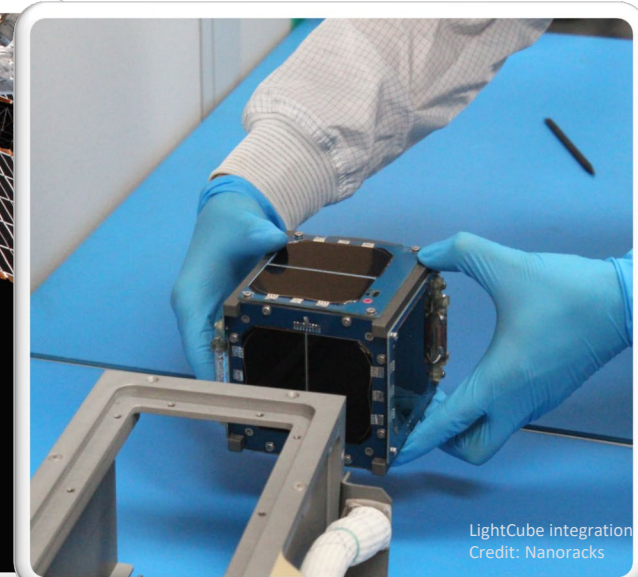


ELaNa 51, Transporter 10, Falcon 9, 3/21/2024

- Big Red Sat-1 University of Nebraska at Lincoln
- BurstCube, NASA Goddard Space Flight Center
- HyTI, University of Hawaii at Manoa
- SNoOPI, Purdue University



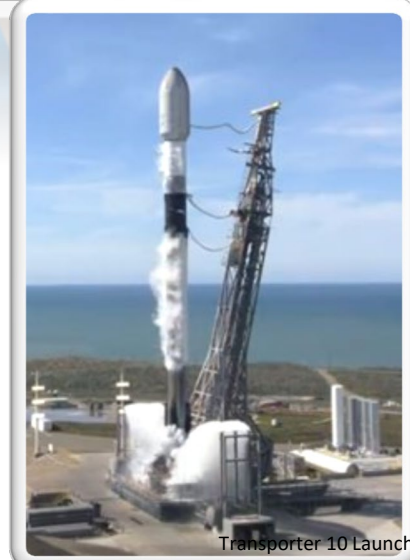
MARIO Deployment
Credit: NASA, Wakata Koichi



LightCube integration
Credit: Nanoracks



©2024 by Nebraska Big Red Satellite-AXP



Transporter 10 Launch



Upcoming Launches (with Tentative Manifests)



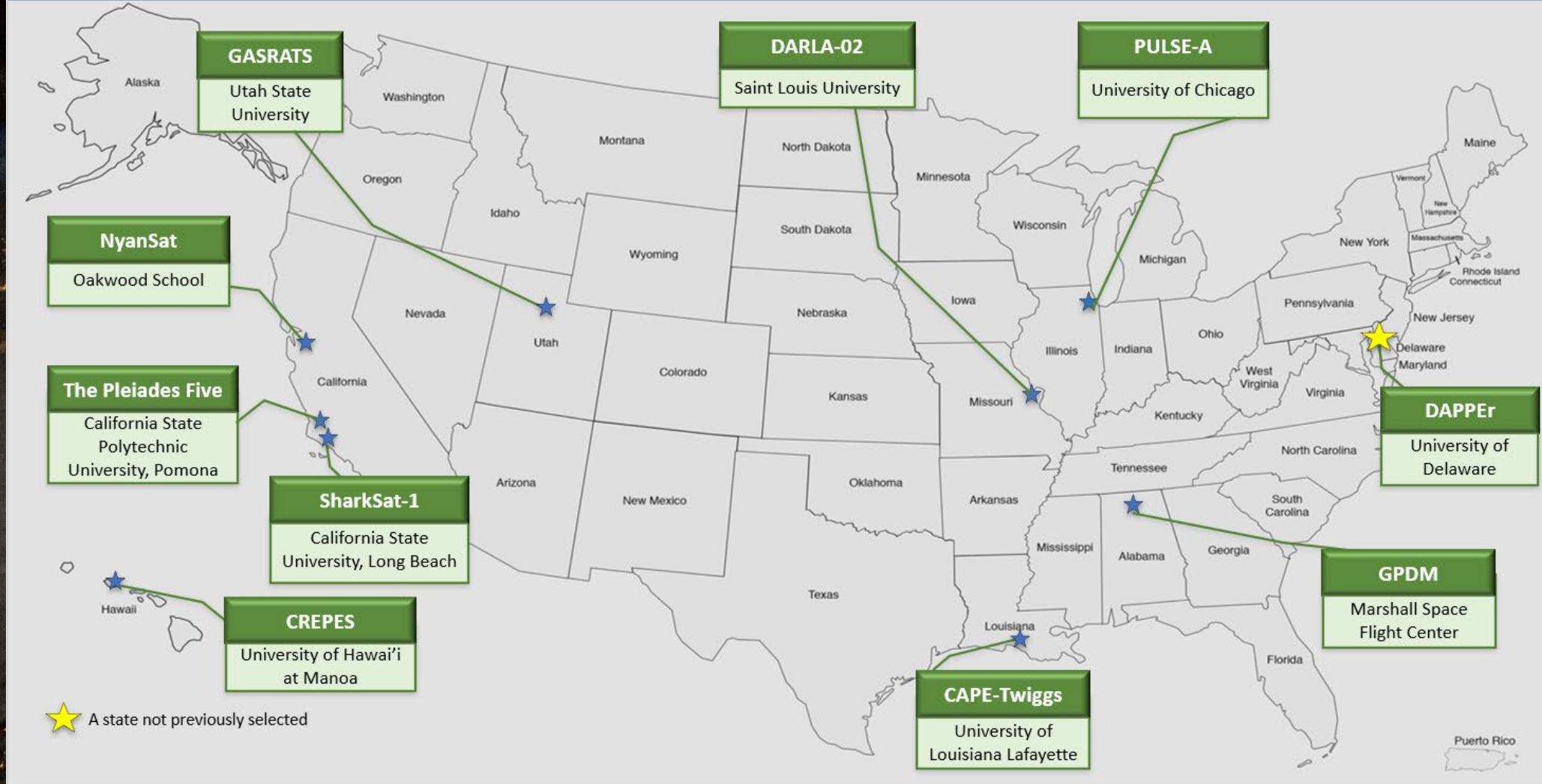
- **ELaNa 43**
 - CatSat, University of Arizona
 - KUBEsat-1, University of Kansas
 - MESAT-1, University of Maine
 - OwlSat, Rice University
 - R5-S2-2.0, NASA Johnson Space Center
 - R5-S4, NASA Johnson Space Center
 - Serenity, Teachers in Space
 - SOC-i, University of Washington
 - TechEdSat-11, NASA Ames Research Center
- **ELaNa 48**
 - CURIE, University of California at Berkeley
- **ELaNa 52**
 - CySat-1, Iowa State University
 - DORA, Arizona State University
 - Foras Promineo, Perkins School District
- **ELaNa 42**
 - AEPEX, University of Colorado at Boulder
 - DARLA, Saint Louis University
 - OrCa2, Georgia Tech
 - R5-S3, NASA Johnson Space Center
 - R5-S5, NASA Johnson Space Center
 - TechEdSat-16, NASA Ames Research Center
- **ELaNa 54**
 - TechEdSat-22, Nasa Ames Research Center
 - VISORS, University of Illinois at Urbana Champaign
- **ELaNa 46**
 - TechEdSat-12, NASA Ames Research Center
- **ELaNa 58**
 - BLAST, Yale University
 - EagleSat-2, Embry-Riddle Aeronautical University
 - QubeSat-2, University of California at Berkley
 - RHOK-SAT, Rhodes College
- **ELaNa 59**
 - OpenOrbiter 1, North Dakota State University
 - R5-S6, NASA Johnson Space Center
 - SWARM-EX, Olin College
- **ELaNa 56**
 - ARCSTONE, NASA ESTO, NASA Langley Research Center
- **ELaNa 55**
 - CANVAS, University of Colorado at Boulder
 - INCA-2, New Mexico State University



Recent CSLI Selectees



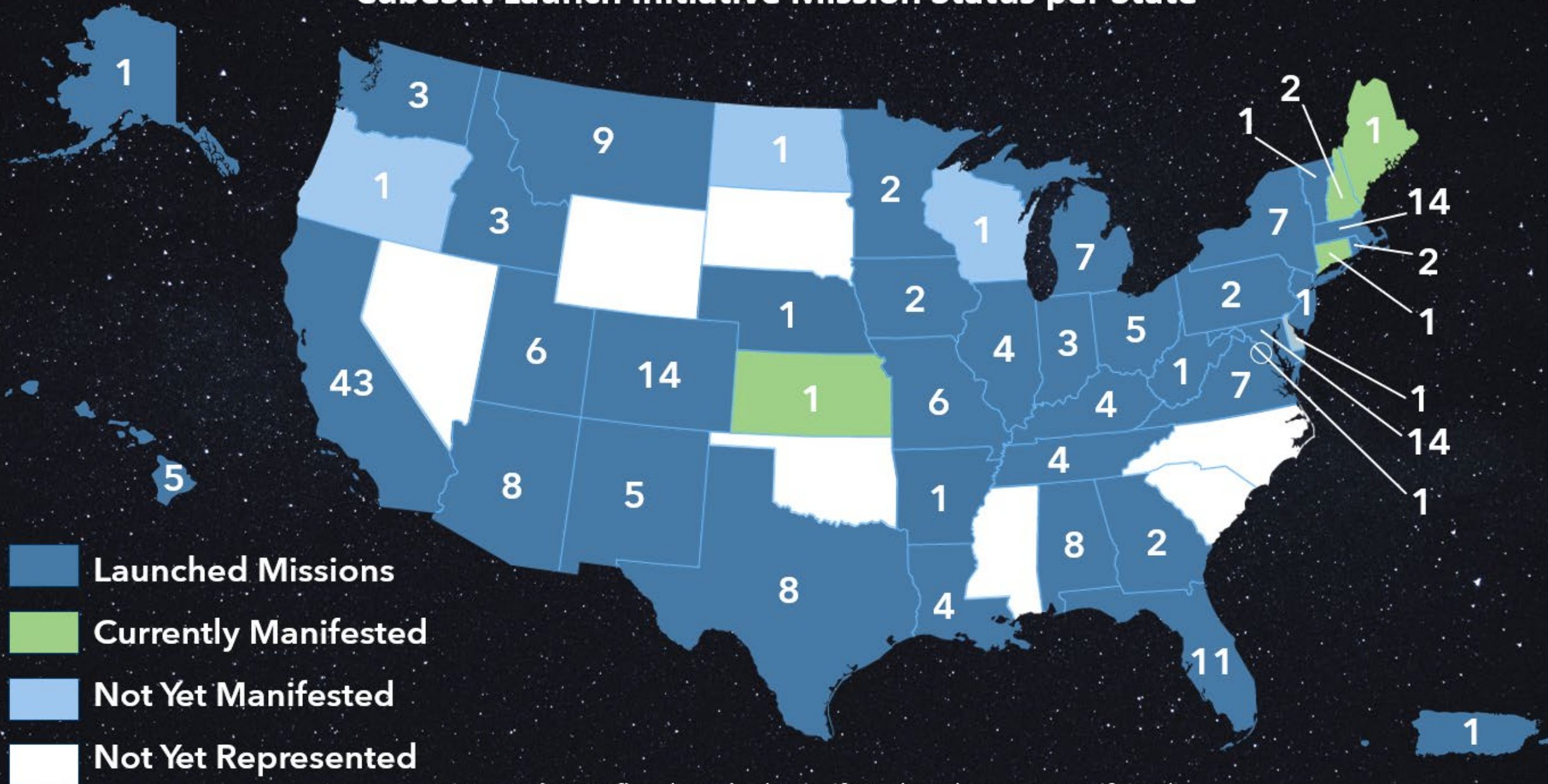
CSLI Call 15 Selections



Background: Earth
Credit: Samantha Cristoforetti



CubeSat Launch Initiative Mission Status per State



State numbers reflect launched, manifested, and not yet manifested

The CSLI Announcement of Partnership Opportunity is divided into two Appendices

A

Educational Institutions and Non-Profits

Eligibility under Appendix A is limited to US Accredited Educational Organizations and US. Non-Profits. Entire project must be led, built and managed by students, with designated student project managers. Professional and Faculty Mentors allowed and encouraged

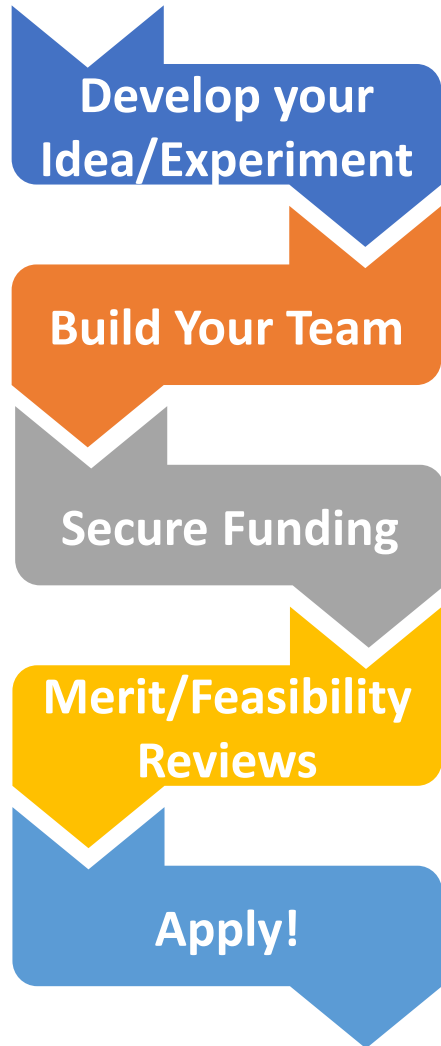
B

Internal NASA Projects

Eligibility Limited to NASA Centers and/or JPL for the purpose of early career workforce development. One or more team mentor(s) consisting of senior NASA employee(s) is encouraged to promote knowledge transfer



How to join CSLI...



1

With the assistance of a faculty advisor, professor and/or mentor, develop a scientific experiment/demonstration that is in line with NASA's strategic goals and objectives

2

If you are an educational institution, your team must be composed of students and be student run and student led. Professional and Faculty mentors are not only encouraged but required. Clearly define all roles and responsibilities and maintain redundancy for all roles

3

Secure all funding required for your mission. CSLI submittals must show evidence that all funding is secured prior to submittal

4

Conduct a **structured** (if possible competitive) merit and feasibility review, with independent reviewers not affiliated with your project. List the names and qualifications of all your reviewers, record action items and how you addressed each one.

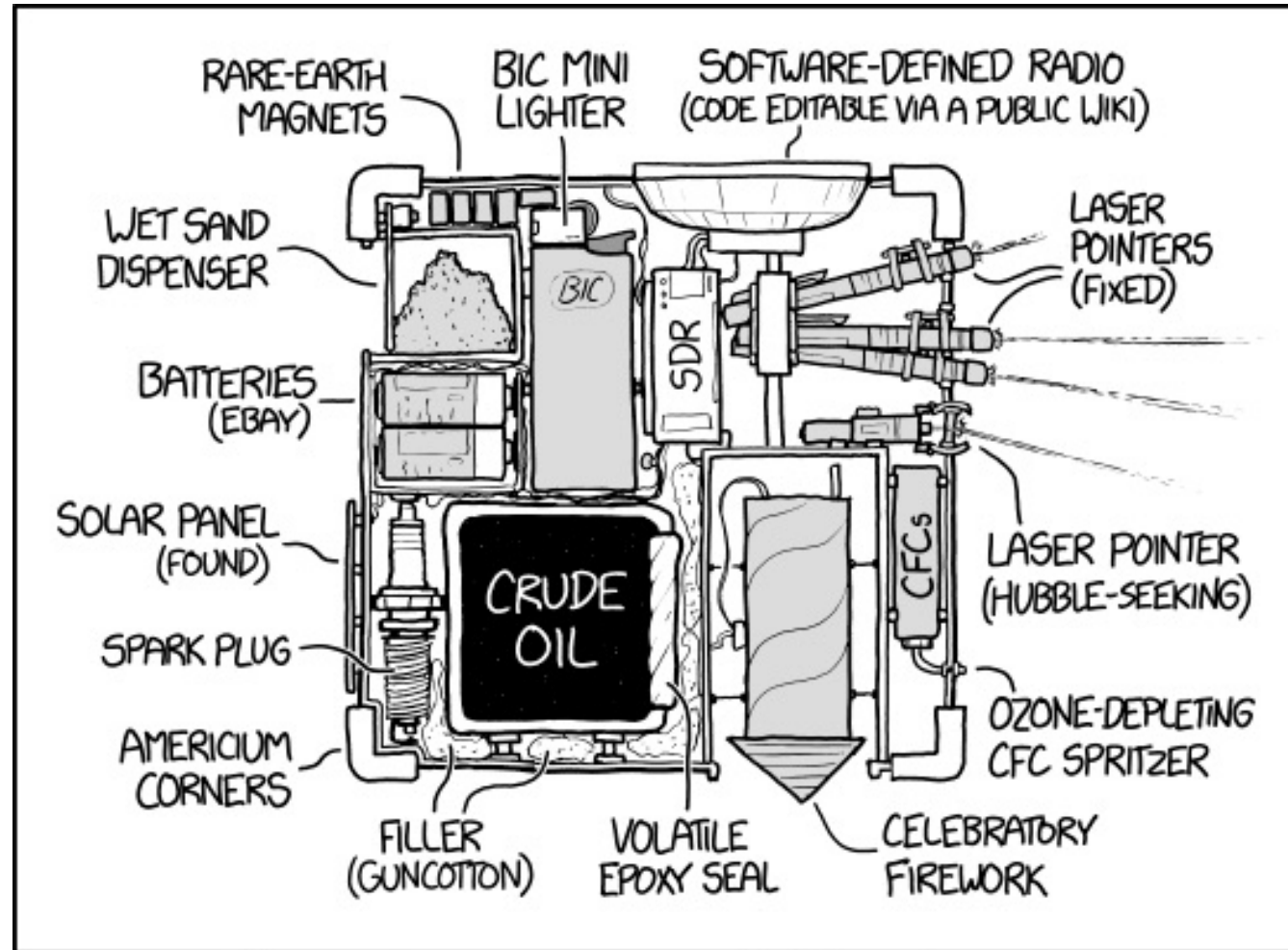
5

Announcement of Partnership Opportunity is released around the first week of August every Year. Applications are due around Thanksgiving.

Follow all Directions in the Application and the scoring Rubric!



Lessons Learned...



MY CUBESAT PROPOSAL WAS THE FIRST TO BE REJECTED FOR VIOLATING EVERY DESIGN AND SAFETY REQUIREMENT SIMULTANEOUSLY.

Credit: XKCD
<https://xkcd.com/1992/>
<https://xkcd.com/license.html>



Lessons Learned...



128hp | CVT

CVT
w/1.5L 4-Cyl. Engine



MPG = 29 City 36 Highway

Need
vs
Want



807

HORSEPOWER

707

LB-FT OF TORQUE



MPG = Seriously? Do you really want to know?



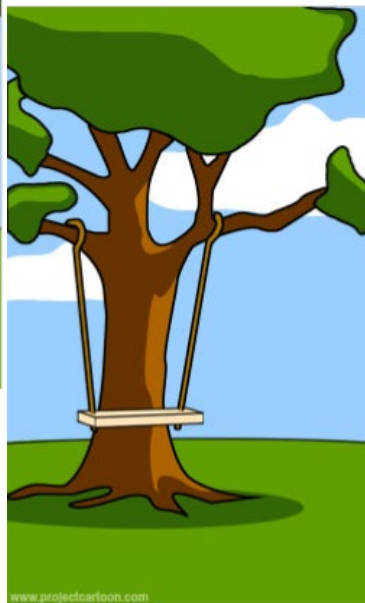
Lessons Learned...



Project Management and Communication



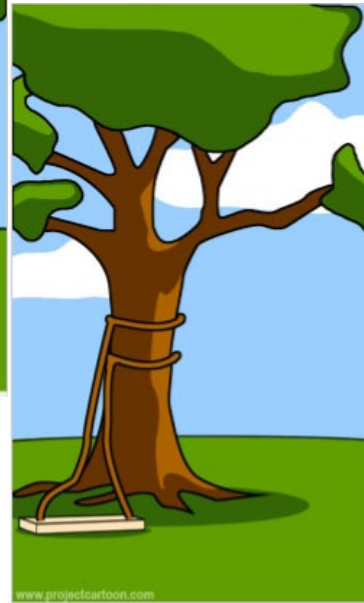
How the CubeSat team explained it



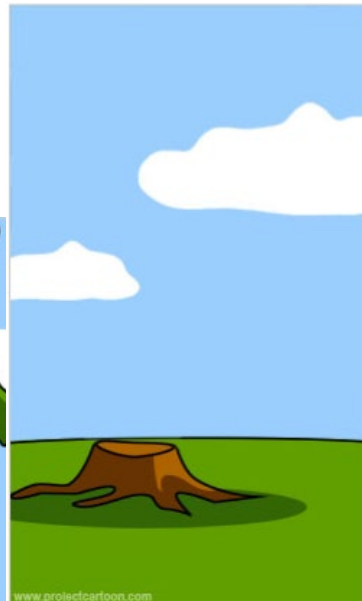
How the project leader understood it



How the CubeSat team designed it



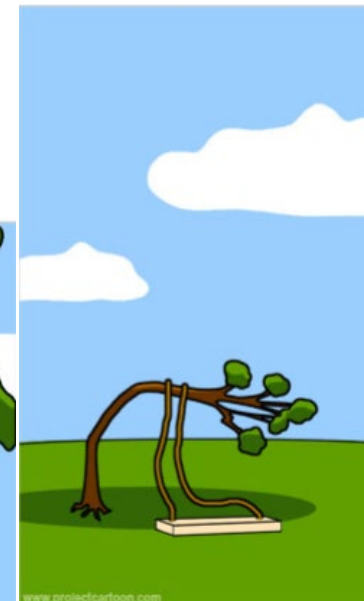
How the programmer wrote it



How the project was documented



What the CubeSat team really needed



The disaster recovery plan

<https://amalgamated-contemplation.com/2011/02/13/the-project-management-tree-swing-cartoon-past-and-present/>



- Be flexible to optimize manifesting options (and reduce launch cost)
 - ❖ Be compatible with many dispensers
 - Comply with CubeSat Design Specification (CDS)
 - Comply with LSP-REQ 317.01 whenever possible
 - ❖ Be flexible with orbit requirements
 - Unique orbits drive costs & reduce launch opportunities
 - Avoid overly congested orbits
- CSLI's contribution to your launch service is capped at \$300K – you or your sponsor are responsible for covering any “overages”
- Choose a UNIQUE name for your CubeSat and BE CONSISTENT! Avoid names that are a single common word (“Chart,” “Press,” “Hello 5”). Avoid special ch@r@cter\$, exponents, subscripts, emojis, etc.
- Communicate with LSP about any hazardous materials or “provocative features”
- If your SC can affect its orbit (ex., propulsion system or drag device)
 - Use GPS and reflectors to assist in tracking
 - Consider cybersecurity
- Design to passivate your SC at end of mission (ex., deplete batteries, disconnect solar panels, vent stored pressure)



Tips on Licensing



- Start early and be persistent!
- We cannot integrate your spacecraft for launch without all applicable licenses. **This can cause you to miss your launch!**
- Plan which licenses you will need (IARU, NTIA, NOAA, FCC)
- Be able to disconnect your transmitter via ground command
- Be flexible in case your preferred frequency/band is not available to you
- Prepare your ground station (and backup) to be operational and tested well before launch. Practice tracking/listening to existing spacecraft.



Image Credit: NASA/JPL-Caltech



... persistence ...



Reference Documents



NASA CubeSat 101: https://www.nasa.gov/sites/default/files/atoms/files/nasa_csli_CubeSat_101_508.pdf

NASA Spacecraft Conjunction Assessment and Best Practices Handbook: [NASA Releases Best Practices Handbook to Help Improve Space Safety | NASA](#)

NASA CSLI: https://www.nasa.gov/directorates/heo/home/CubeSats_initiative

NASA Small Spacecraft Virtual Institute: <https://www.nasa.gov/smallsat-institute>

CubeSat.org: <https://www.CubeSat.org/>

Space-track.org: <https://www.space-track.org/auth/login>

NOAA Remote Sensing Licensing: <https://www.nesdis.noaa.gov/CRSRA/generalApplication.html>

IARU: <https://www.iaru.org/on-the-air/satellites/>

FCC Experimental Licensing System Search: <https://apps.fcc.gov/oetcf/els/reports/GenericSearch.cfm>

FCC Generic License Search: <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp>

Sarah Rogers Collection: <http://phxCubeSat.asu.edu/resources/documents>

GSFC-STD-7000 (GEVS)

GSFC-HDBK-8007

FCC DA: 13-445

NASA/SP-2007-6105

NASA/SP-20205011318

SMC-S-016

NASA-STD-6016

TOR-2016-02946

NASA-STD-8719.14

LSP-REQ-317B

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for more information about
NASA's CubeSat Launch Initiative



Questions?



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Email: liam.j.cheney@nasa.gov

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