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WELCOME TO THE COMMUNITY OF PRACTICE WEBINAR SERIES

Keep your mics muted and cameras off

- Helps ensure a clean recording

The recording will be posted online

- nasa.gov/flightopportunities
- Resources menu
- Community of Practice webinars

Please engage!

- Post your questions in the chat

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ABOUT THE COMMUNITY OF PRACTICE WEBINAR SERIES

An opportunity to hear from subject matter experts on best practices for preparing for suborbital flight tests

Researchers, program staff, and flight providers

Connecting and sharing information and lessons learned to:

- Increase the impact of suborbital flight tests
- Transfer best practices
- Optimize the experience of current and prospective program participants

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Subscribe to our newsletter for updates on future webinars!

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Future webinars

- Webinars are usually held 1st Wednesday of each month at 10 a.m. PT.
- Topics are announced in the Flight Opportunities newsletter and website.
- Session recordings are posted on the Flight Opportunities website.
- Let us know session topics you would like to see covered.

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TODAY'S SPEAKERS

Eric Jordan
Project Manager,
Aegis Aerospace, Inc.

Solange Massa, M.D. Ph.D.
Founder and CEO,
Ecoatoms, Inc.

Ethan Tsai, Ph.D.
Project Manager,
UCLA Electron Losses and Fields Investigation CubeSat Project

Joe Zimo
Space Technology Analyst,
NASA Headquarters

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NASA TECHLEAP OVERVIEW

Rapidly identify and develop technologies of significant interest to NASA through a series of challenges

- Cash prize and opportunity for a flight test
- Open to qualified businesses, universities, entrepreneurs, and other innovators

NASA TechLeap PRIZE

1 **Autonomous Observation Challenge**
Autonomously detect, locate, track, and collect data on transient terrestrial events
COMPLETED

2 **Nighttime Precision Landing Challenge**
Detect hazards from an altitude of $\geq$250m and process the data in real time to generate a terrain map
COMPLETED

3 **Universal Payload Interface Challenge**
Optimized interface system that enables rapid and seamless integration of diverse payloads onto various flight vehicles
ONGOING

4 **Space Technology Payload Challenge**
Advance transformative solutions and develop a flight-ready payload to address NASA's technology shortfalls
ONGOING

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NASA TechLeap Prize – No. 3 Universal Payload Interface Challenge

OBJECTIVES

- Enable **rapid and accessible transition of payloads** from the bench to flight vehicle integration for testing **on multiple different commercial flight vehicle types** (e.g., suborbital, orbital, lander)
- Enable payloads to be **as vehicle-independent as possible** to **facilitate rapid integration**
- Enable **early payload development without vehicle interface knowledge**
- An ideal universal payload interface system would not dictate, suggest, or attempt to predict all possible use cases to ensure the most extensible application

Credits: (left) Aegis Aerospace, Inc. and NASA

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AEGIS AEROSPACE

Easy-to-Use Payload Interoperable Integration Carrier (EPIIC)

The simple, robust, experiment-to-any-flight-vehicle integration solution

March 2026

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Background

- Aegis Aerospace, Inc. has a 30+ year legacy of enabling research, development and successful operation of spaceflight hardware
  - ISS external payloads include MISSE-FF (8 years in operation), 10 STP-H series since 2011
  - Lunar payload projects include Regolith Adherence Characterization (RAC) (2025) and Space Science & Technology Evaluation Facility (SSTEF) (2026)
  - Development of TAMU SPIRIT and other STP ISS payloads and satellites is ongoing
- NASA TechLeap Prize awarded to Aegis in 2025 for the TechLeap Universal Payload Interface Challenge (UPIC)
- Aegis has completed all phases of EPIIC development, manufacturing and testing
- Remaining phase to integrate and operate EPIIC in a Flight Opportunities vehicle is planned for 2026

 2

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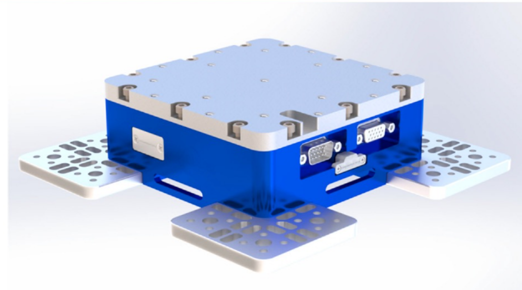
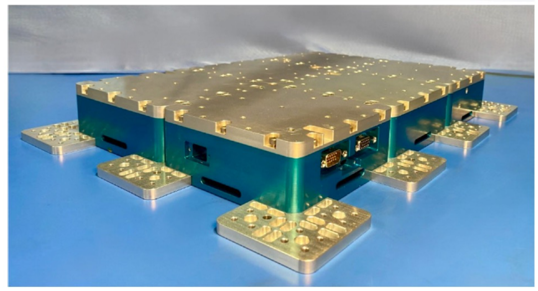
EPIIC Benefits

- Significantly reduces payload integration effort across various test vehicles
  - High-altitude balloons
  - Sounding rockets
  - Suborbital rockets
  - Small satellites
  - ISS payloads (future commercial space station payloads)
  - Lunar landers
- Simplifies payload integration to virtually any vehicle
- Saves time and expenses by using proven interfaces that are already designed, built and certified for spaceflight
- Aegis engineering support available with consultation agreement
- EPIIC system designed and built using robust components to handle rigorous environments and to reduce risk to enhanced mission success
  - Modular structural housing
  - Proven variable electrical power supply
  - Multiple data connection options
  - Onboard data storage





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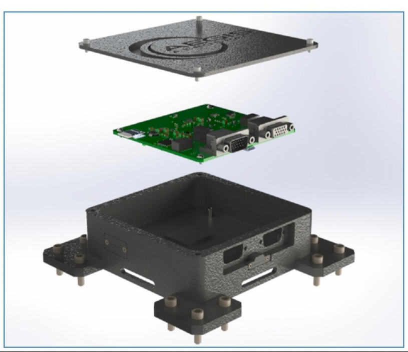
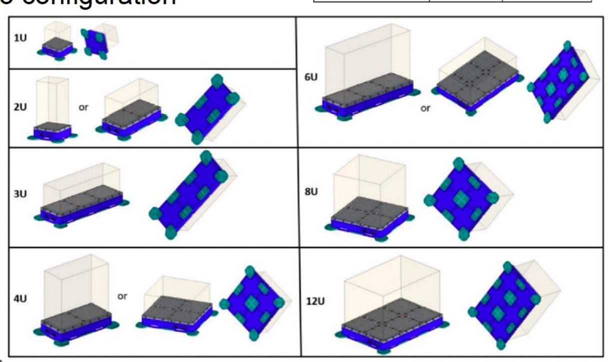
EPIIC Modular Configurations

- Modular aluminum structure designed to handle standard CubeSat 'U' sizes and mass.
- Increased size allows for larger mass / volume payloads.
- Additional structural capacity may be available subject to engineering review
- Alternative materials and PCB available in solo configuration

Payload Size (l x w x h)	Mass Limit	Max CG Height
1x1x1U	2 kg	5 cm
1x1x2 U	4 kg	10 cm
1x2x1 U	4 kg	5 cm
1x3x1 U	6 kg	5 cm
1x2x2 U	8 kg	10 cm
1x3x2 U	12 kg	10 cm
2x2x2 U	16 kg	10 cm
2x3x2 U	24 kg	10 cm





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EPIIC Capabilities

- Power
  - From vehicle – 9-36 Vdc
  - To payload(s) – 5-36 Vdc (two independent power channels)
  - Max 2A on any circuit
- Data
  - Payload can stream data over Ethernet, RS-422 and/or I2C
  - Two-way data exchange (from payload(s) to vehicle)
  - Onboard eMMC and removable SD card for storage
  - Onboard accelerometer
- Environment
  - Temps: -40 to 85 deg C
  - Limit load – 42.3gs
  - Pressure – 0 to 15 psi
- Software configuration
  - Payload power voltage
  - Data storage location
  - Data transfer options

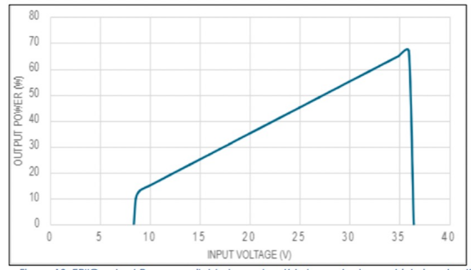

Figure 10: EPIIC output Power available to payload(s) dependent on vehicle input voltage

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EPIIC Hardware Evolution

- EPIIC is the latest evolution of an Aegis interface for third-party payloads, leveraging designs that have already achieved TRL 9 in LEO and Lunar
  - MISSE Experiment Computer – Used in LEO since 2014
  - RAC – Lunar payload on Firefly Blue Ghost – Landed and operated in 2025
  - SSTEF – Lunar interface relaying C&DH to and from six third-party payloads
  - EPIIC
    - Completed vibration testing to 14.1Grms (MSFC-STD-7000B limit for qualification)
    - Completed thermal cycling from -40 to 85 deg C
    - Completed EMI testing MIL-STD-461G: CE101, CE103, RE102
    - Integrate into ISS on orbit MISSE facility in June 2026
    - Launch planned on Virgin Galactic suborbital in 2026
    - Used to replace MISSE Experiment Computer in TAMU SPIRIT hardware in 2026 (launch NET 2027)
    - Potential use in In Space Manufacturing Research

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EPIIC Availability

- Aegis Aerospace, Inc. offers payload integration services using EPIIC and traditional services using new hardware and documentation
  - Interface design and management
  - Verification of launch vehicle requirements
  - Assembly of payload with EPIIC and harness fabrication
  - Complete required payload testing
  - Perform physical, electrical and data integration
  - Customized software
- Purchase of EPIIC units for easy customer-led experiment flight vehicle integration
  - Modular structural hardware
  - Printed circuit assemblies
    - Development kits
    - Flight kits – completed acceptance burn in, vibration testing, thermal cycling
  - Availability, lead times and pricing available upon request (STaaS@aegisaero.com)

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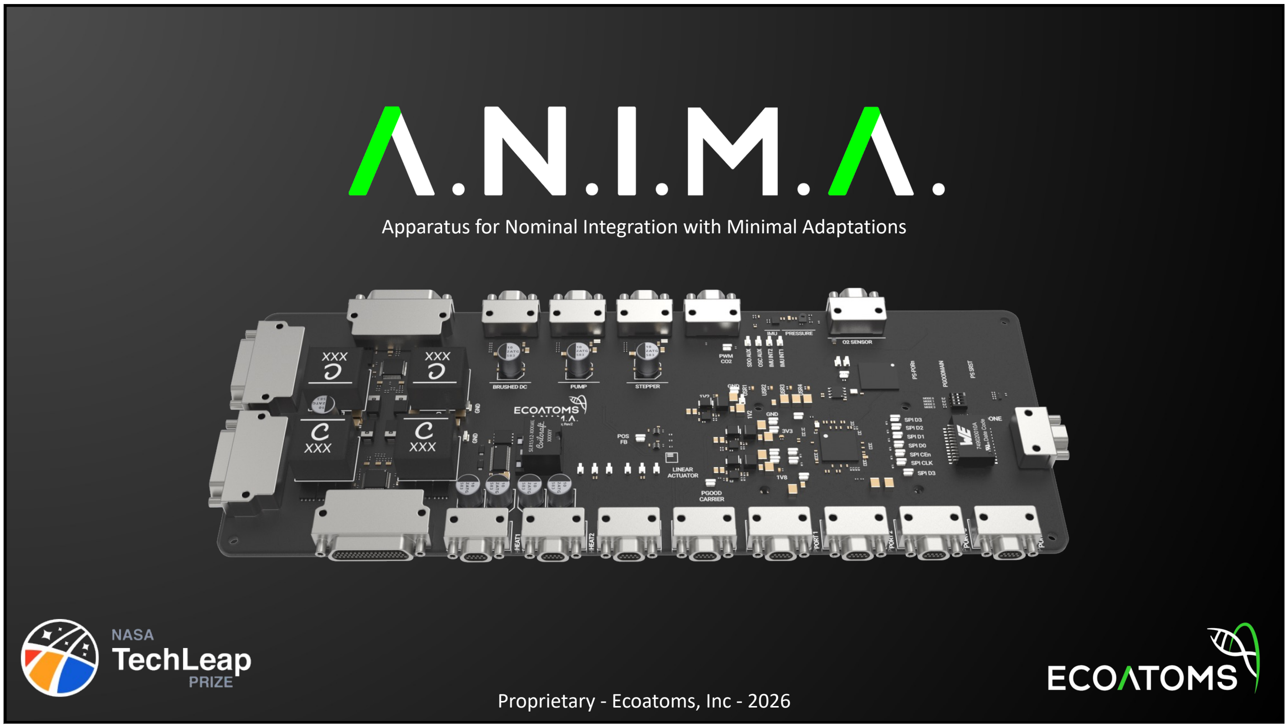
Λ.N.I.M.Λ.
Apparatus for Nominal Integration with Minimal Adaptations
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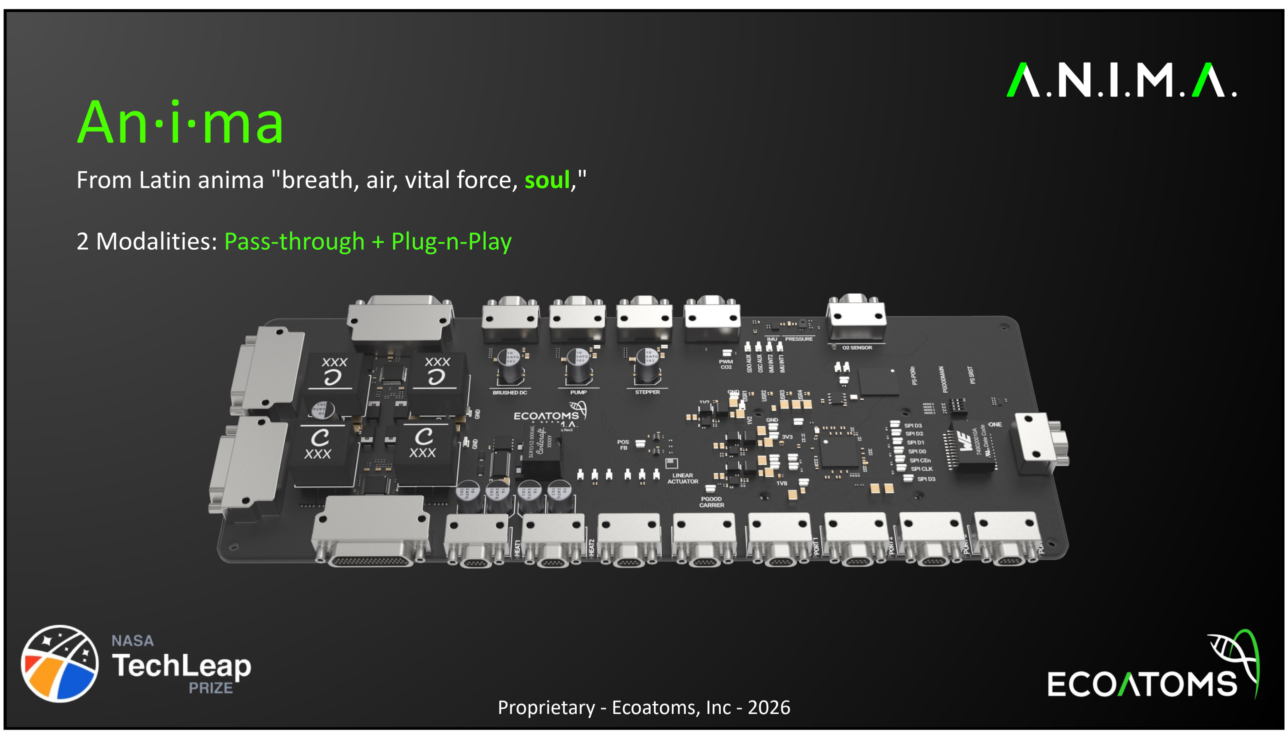
Λ.N.I.M.Λ.
An·i·ma
From Latin anima "breath, air, vital force, soul,"
2 Modalities: Pass-through + Plug-n-Play
NASA
TechLeap
PRIZE
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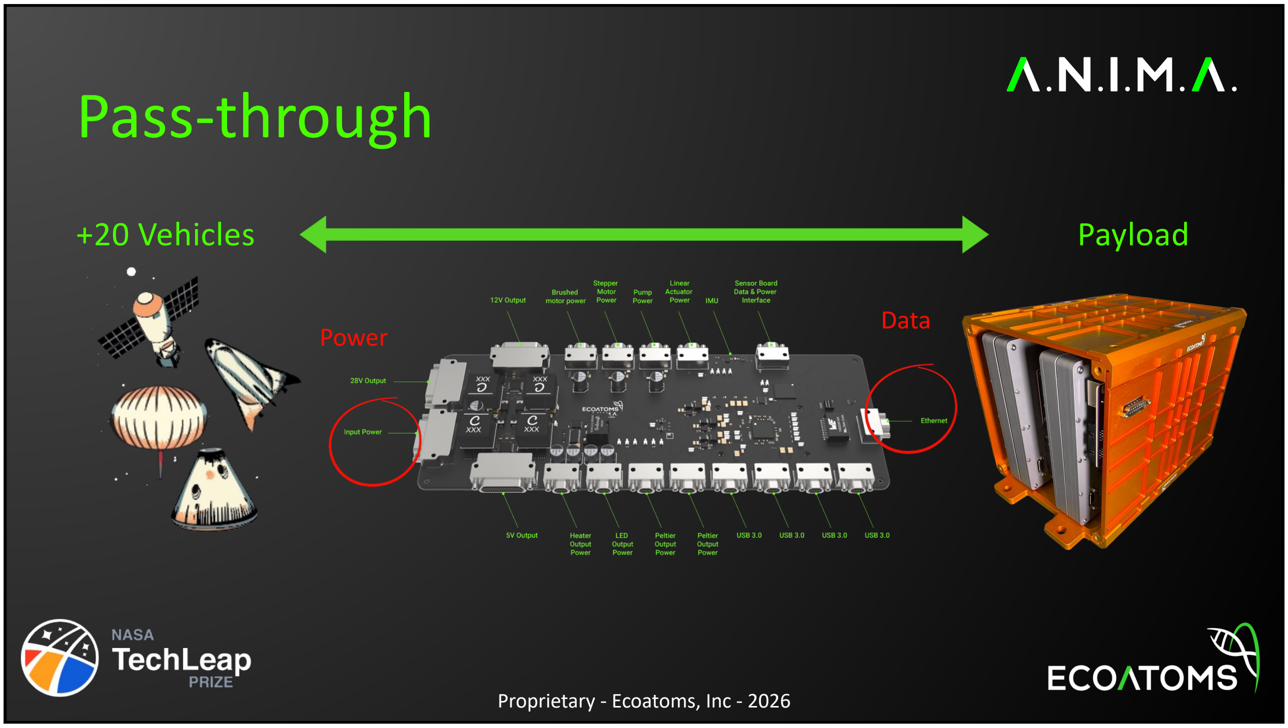
A.N.I.M.A.
Pass-through
+20 Vehicles
Payload
Power
Data
12V Output
Brushed motor power
Stepper Motor Power
Pump Power
Linear Actuator Power
IMU
Sensor Board Data & Power Interface
28V Output
Input Power
Ethernet
5V Output
Heater Output Power
LED Output Power
Peltier Output Power
Peltier Output Power
USB 3.0
USB 3.0
USB 3.0
USB 3.0
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A.N.I.M.A.
Plug-n-Play
ECOATOMS
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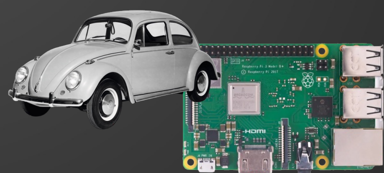
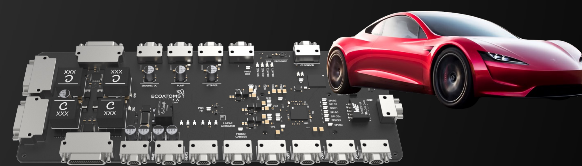
A.N.I.M.A.

Raspberry Pi

A.N.I.M.A.





Platform	Raspberry Pi (Beetle: fun & cheap)	A.N.I.M.A. with FPGA (Roadster: space beast)
Brain power style	Regular computer brain	Super-custom hardware brain
Toughness in crazy places	Fine on Earth, dies fast in space/radiation/heat	Built for space, can handle radiation, vacuum, extremes
Reliability & timing	Normal OS, can lag sometimes	Perfecty instant timing, no surprises
Power use	Uses more juice (needs cooling when busy)	Sips a tiny amount of power, great for spacecraft batteries

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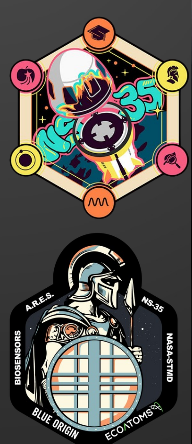
A.N.I.M.A.

A.N.I.M.A. - TRL 9



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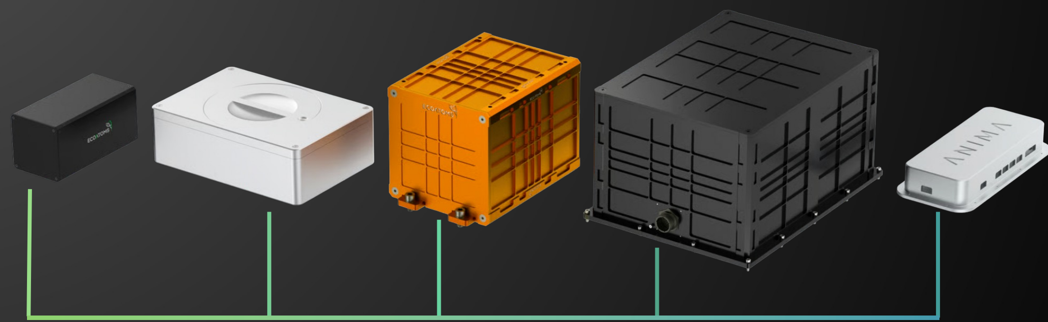
Payloads



- Drones
- Semiconductor crystals
- Chemical/Bio proceses
- Edge compute systems

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A.N.I.M.A.

Options

Options: lease or buy

Three types:

- Type 1: Power and data
- Type 2: Power, data and peripherals
- Type 3: Power, data, peripherals and IMU
- + Custom

Constantly upgrading our FPGA system to stay up-to-date with the chip industry

Payload Interface Guide: solange@ecoatoms.com

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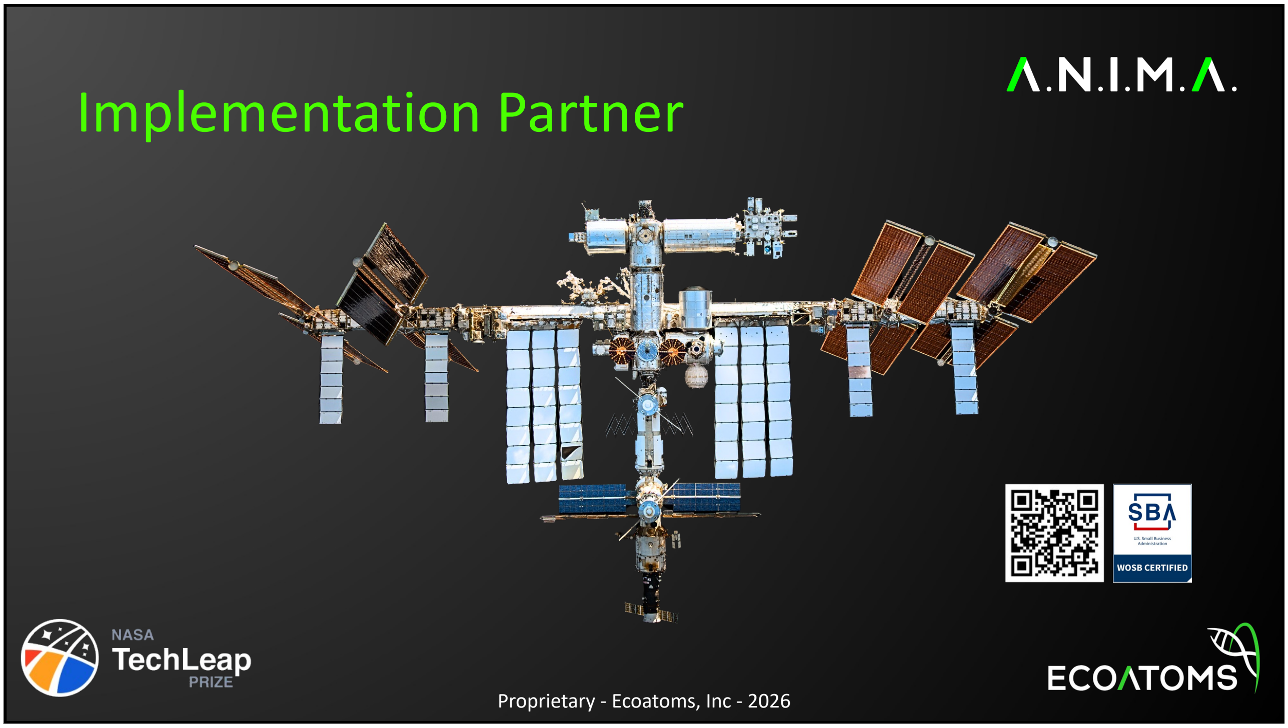
Implementation Partner
A.N.I.M.A.
SBA
WOSB CERTIFIED
NASA
TechLeap
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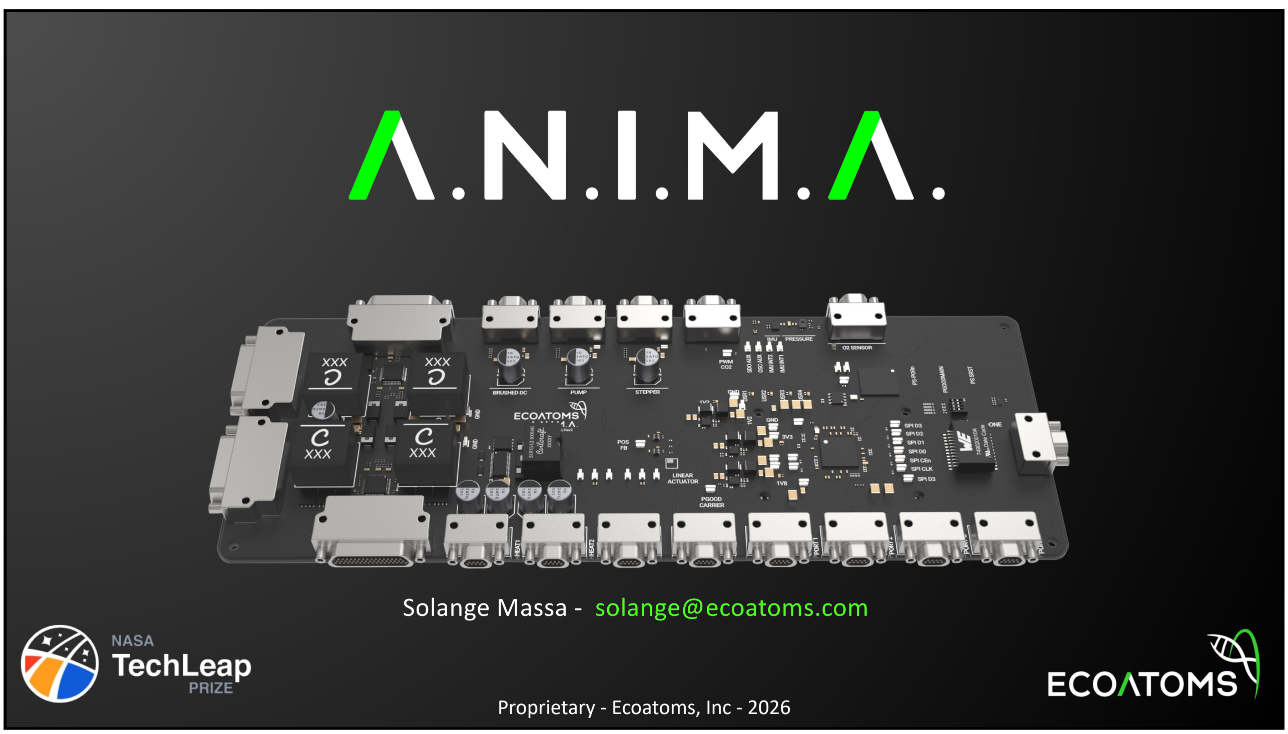
A.N.I.M.A.
Solange Massa - solange@ecoatoms.com
NASA
TechLeap
PRIZE
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EXPLORE SPACE TECH
NASA Flight Opportunities Community of Practice
March 2026 I Ethan Tsai, Ph.D., UCLA
SDPI (Software-Defined Payload Interface)

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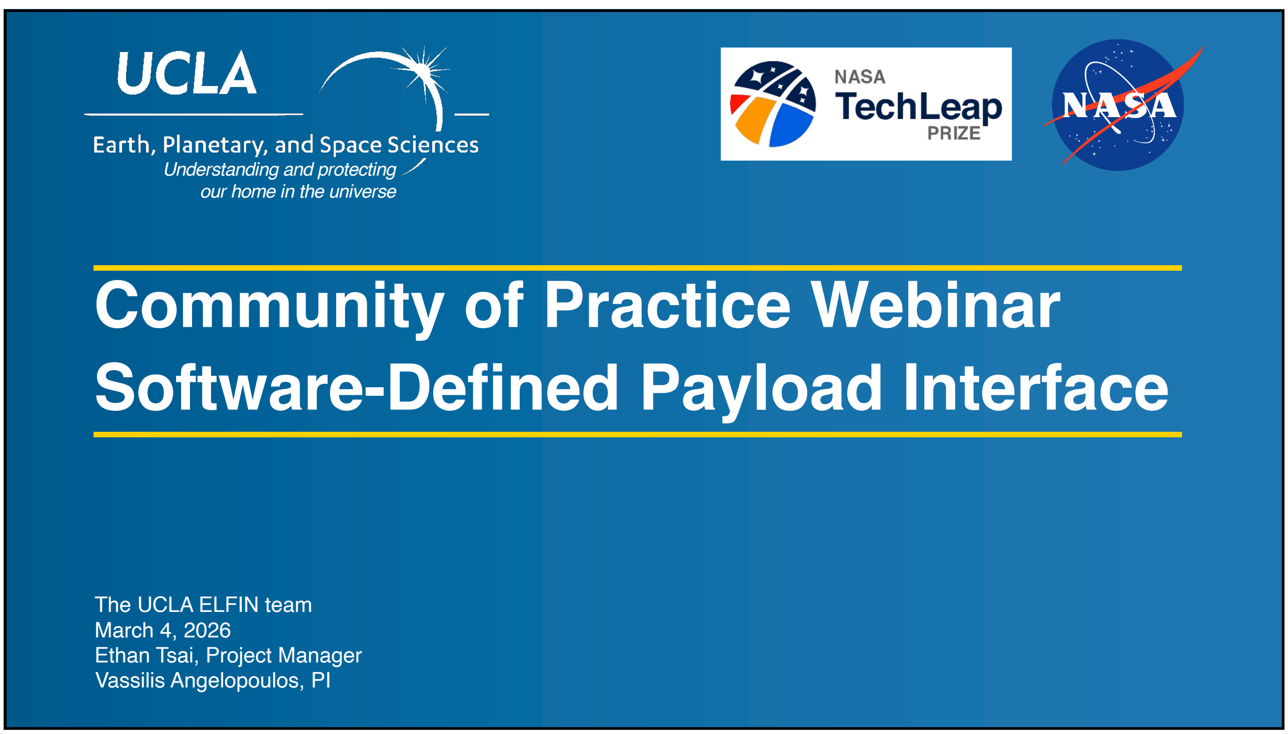
UCLA
Earth, Planetary, and Space Sciences
Understanding and protecting our home in the universe
NASA TechLeap PRIZE
Community of Practice Webinar
Software-Defined Payload Interface
The UCLA ELFIN team
March 4, 2026
Ethan Tsai, Project Manager
Vassilis Angelopoulos, PI

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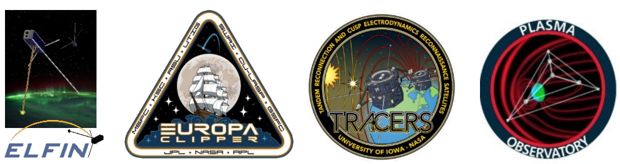
UCLA Earth, Planetary, and Space Sciences

Our Background

- We are the Experimental Space Physics Lab at UCLA!
  - Undergraduate student engineering team that builds magnetometers, particle detectors, and CubeSats
- SDPI has been worked on by over 40 students in the last 2 years with support from 5 UCLA staff engineers
- We are primarily a payload developer; importantly, **we are our own customer!**
- The primary use case is the payload interface for a proposed CubeSat concept (2 internal payloads, 2 external payloads), with many other fun ideas ;)



Heritage expertise from payload teams on these missions^

← future CubeSat??

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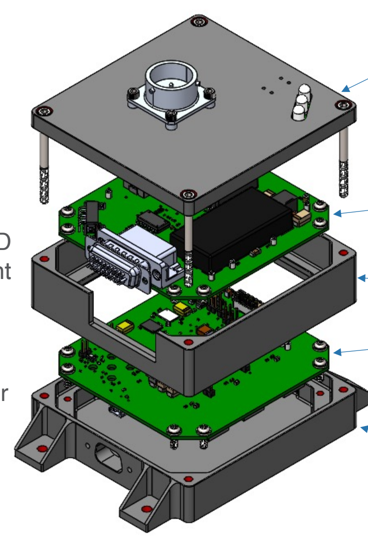
UCLA Earth, Planetary, and Space Sciences

SDPI Design Overview

- Design Tenets:
  - Optimize for small size, high reliability, high versatility

SDPI for ELVES High Altitude Balloon Flight

SDPI for MUD Upcoming Flight



- General SDPI Features:
  - Data interface: Single S/C to 0-4 payloads over UART, RS232/422/485, or CAN
  - Power interface: 3-36V unregulated DC input, 3x power rail output of 3.3-20VDC and 1x power rail of 5-36VDC
  - 4 GB flash for storing data
  - Flexible commanding/scripting via ground software

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ELVES Balloon Flight

UCLA SDPI

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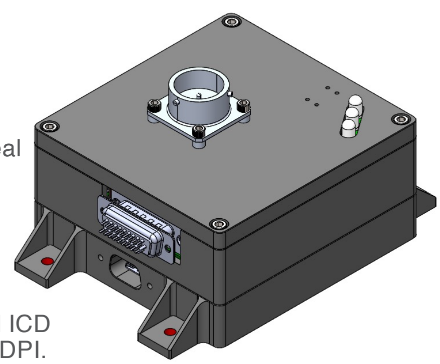
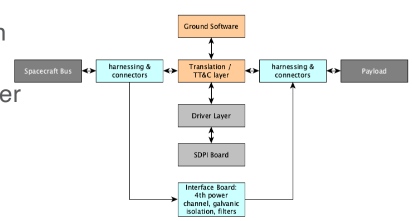
Current Status

- SDPI Rev2.2
  - Since ELVES, added more robust data protection features, real time clock (for syncing and retaining time thru power cycles)
- MUD Interface Board (MIB)
  - Added galvanic isolation, LEDs, and an isolated transceiver
- The process:
  - First, we design the interface board to the payload's electrical ICD and order it ASAP. This is the critical path/drives delivery of SDPI.
  - Based on the flight and mechanical ICD, we select harnessing/connectors/additional features as needed and design the lid (and mid-layer as needed).
  - We flash the appropriate firmware into the SDPI board driver layer and add any TT&C/translation accommodations as needed
  - The chassis are machined/fabricated in-house
  - Depending on student availability, SDPI can be delivered to customer in 3 months, 2 months without environmental testing.





UCLA SDPI

3/4/2026

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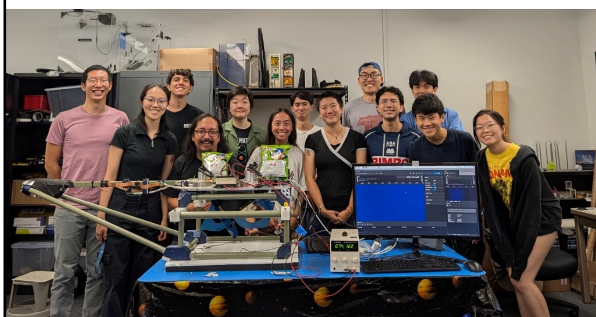
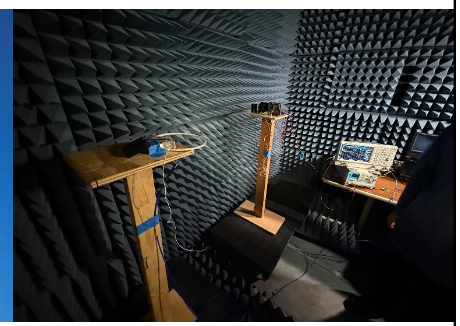
UCLA Earth, Planetary, and Space Sciences

Lessons Learned

- Pursue flights early and often: for us, the balloon campaign turned many assumptions into tested design and gave us a highly productive sprint that retired risk quickly
- ICDs only exist in paper: interfaces must be robust enough to handle integration mistakes…nobody is perfect! Design margin always buys down risk
- Isolation is expensive: treat galvanic isolation as an early architecture trade…grounding, power, data, EMC, and packaging are all coupled and it can be difficult to add in late





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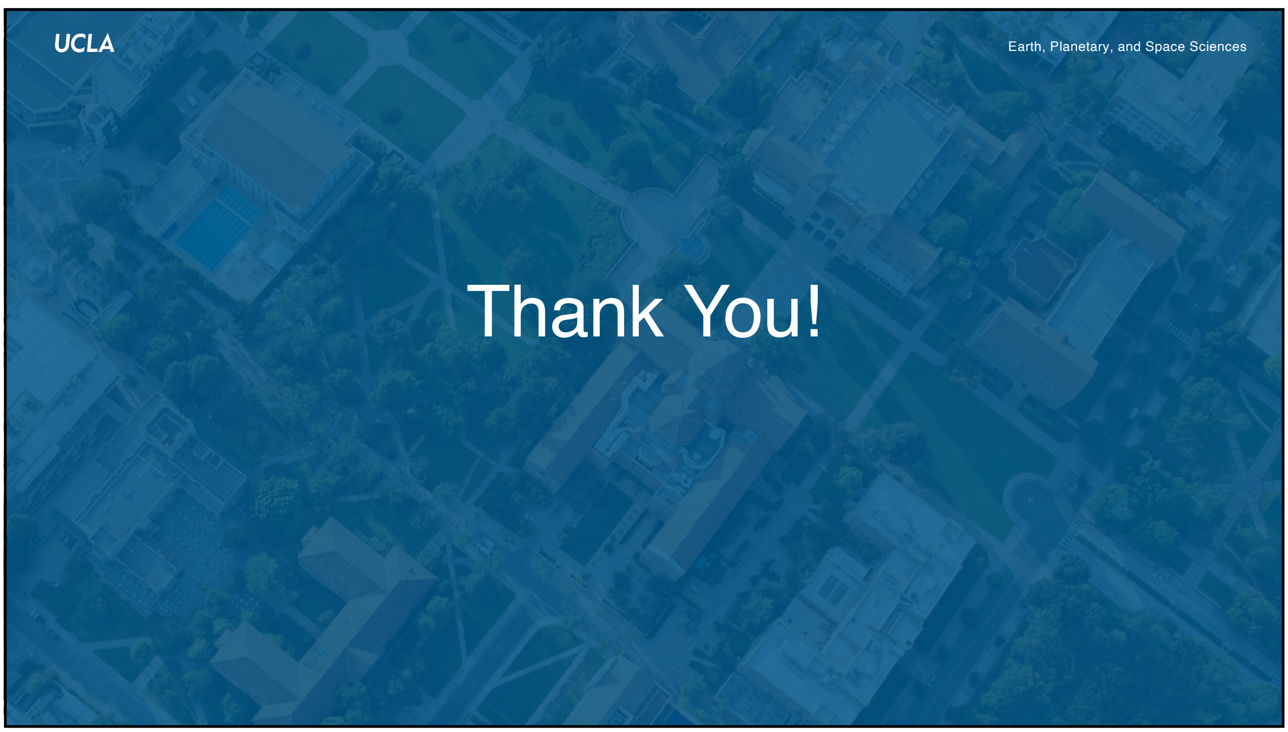

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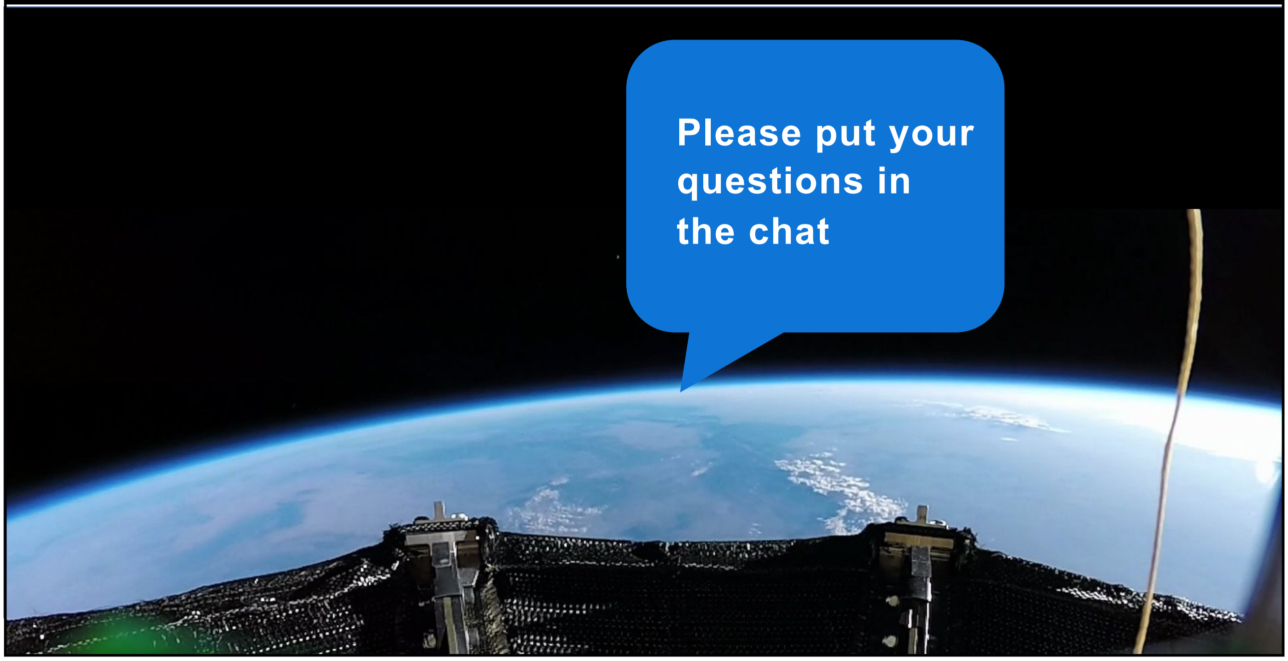
WHAT QUESTIONS DO YOU HAVE?



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Reach out:

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