



CONSORTIUM FOR SPACE MOBILITY
AND ISAM CAPABILITIES

COSMIC Capstone Challenge (C3) Advisor On-Boarding

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C3 Organizers

September 10, 2025

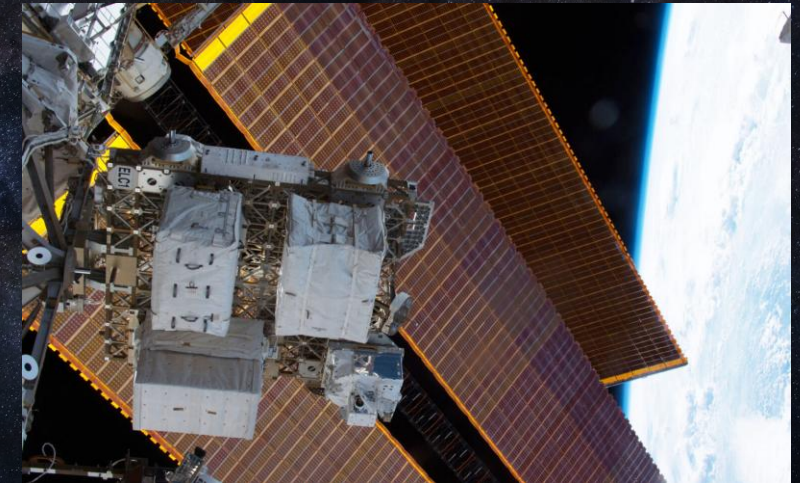
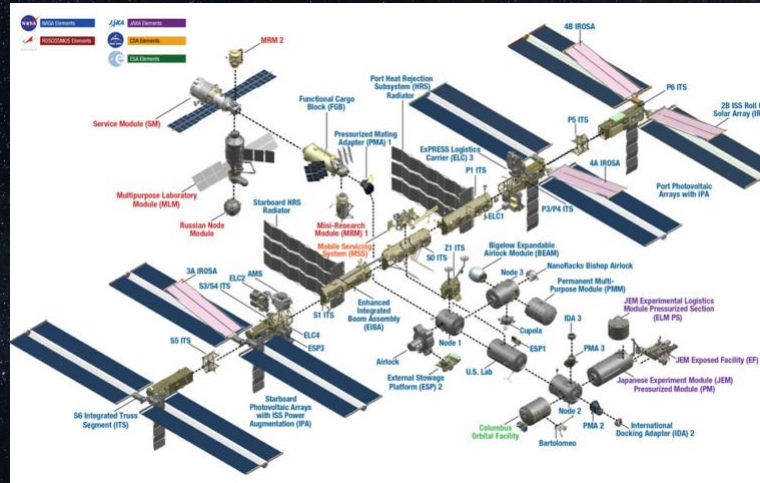
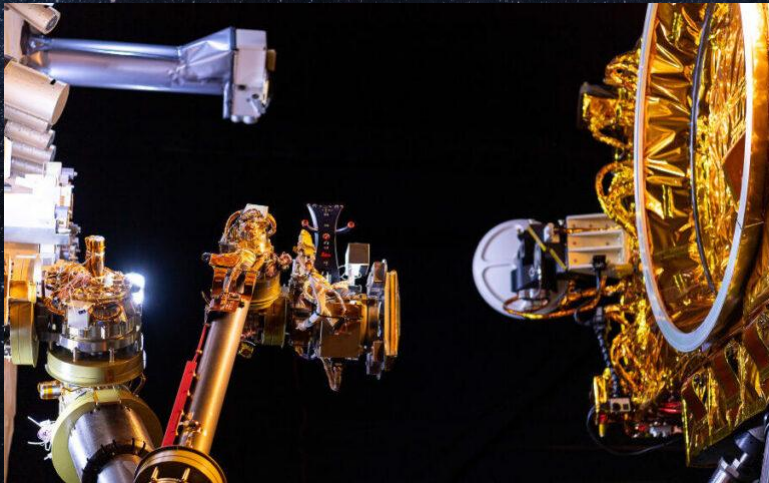
C3 Advisor On-Boarding Agenda



- Gather and Review Meeting Agenda
- Introduction to COSMIC and the Workforce Development Focus Area co-leads, Jacob Rome & Joey Heying
- Overview of the COSMIC Capstone Challenge (C3)
- Review of Advisor Responsibilities
- Perspectives from Past & Current Advisors: Michael Thorburn & TBD
- Participant Q&A
- Wrap-up

What is ISAM?

- Design of modular, serviceable, upgradeable, and evolvable systems
- Assembly of simple to complex space systems
- Manufacturing in space using Earth- and locally-sourced materials



Why Now?

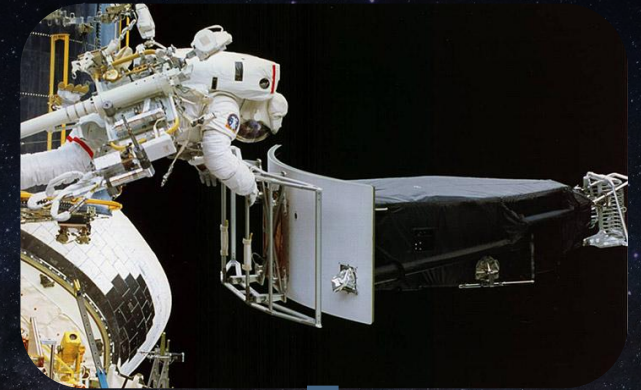
ISAM National Strategy and Implementation Plan

Foster an ecosystem to leverage ISAM capabilities

- Support and stimulate USG, academic, and commercial ISAM capability development
- Consistent with US Space Priorities Framework (Dec 2021)

Strategic goals

1. Advance ISAM research & development
2. Prioritize expanding scalable ISAM infrastructure
3. Accelerate the emerging ISAM commercial industry
4. Promote international collaboration and cooperation
5. Prioritize environmental sustainability
6. Inspire a diverse future space workforce



COSMIC: A Nationwide Alliance for ISAM



- Vision:

- Create a nationwide alliance that enables the U.S. space community to provide global leadership in ISAM.

- Mission:

- Making ISAM a routine part of space architectures and mission lifecycles.

Goals and Objectives

Capability Development

Develop, mature, and demonstrate ISAM technologies that enable and enhance mission utility.



Ecosystem Economics

Promote U.S. leadership in ISAM technologies and capabilities that change the business model away from single-use space assets.



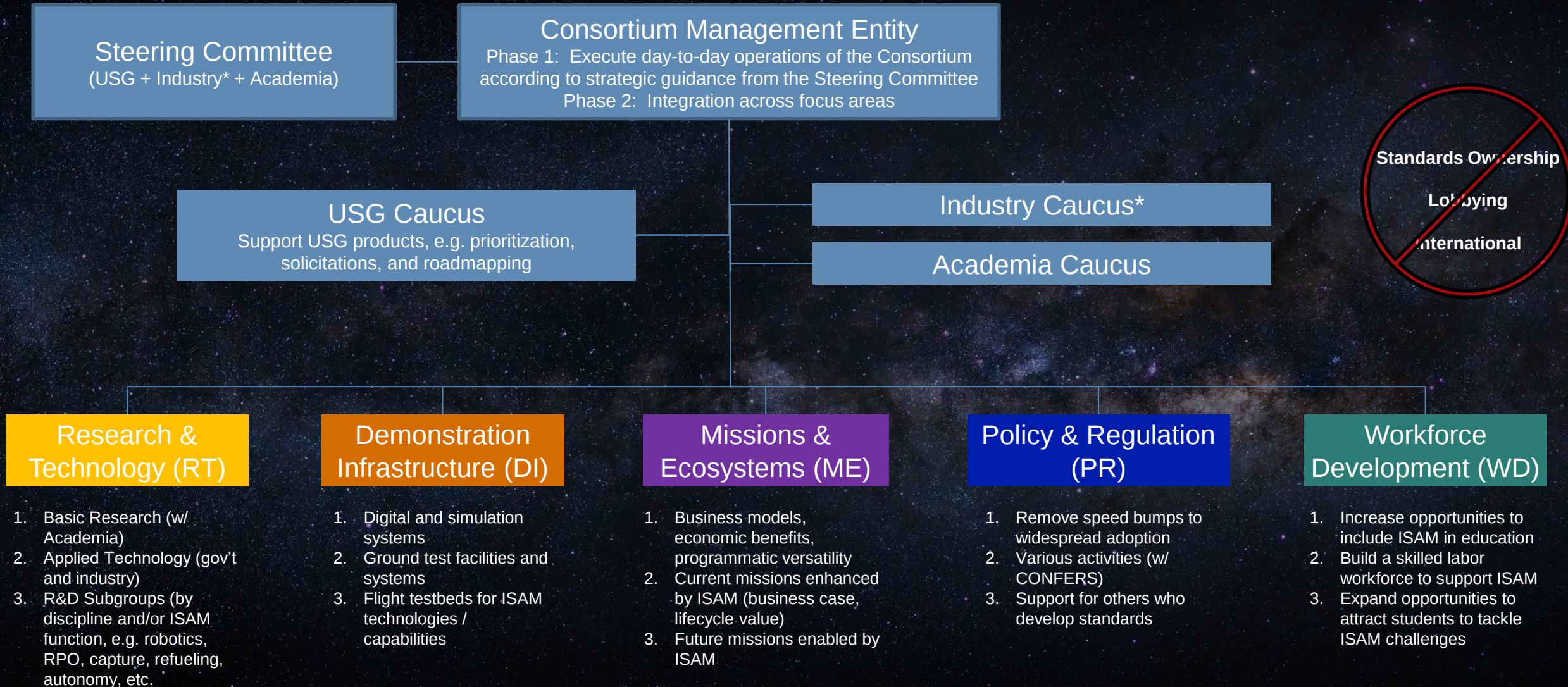
Mission Applications

Encourage and guide missions to use ISAM capabilities as part of commercial and government program lifecycles.



A nationwide alliance working collaboratively to make ISAM a routine part of the space mission lifecycle

Organization



* Includes ties to CONFERS

COSMIC Workforce Development Focus Area (WDFA)



- “To achieve the goals outlined in the ISAM National Strategy, the future space workforce must be diverse and be ready to tackle some of the most challenging space problems.”
- “Education and workforce training programs must **prepare and inspire the next generation** of space scientists, engineers, and technologists to advance ISAM capabilities.”
 - “Expand opportunities at the high school, undergraduate, graduate, and post-doctoral level to attract students from multiple disciplines – engineering, science, technology, policy, law, etc. – to tackle ISAM challenges through **learning activities**, awards and grants, internships, **research opportunities**, and other incentives to inspire a diverse workforce.”

The COSMIC Capstone Challenge (C3)



Review the C3 Information Packet

The Challenge:

- National student competition aimed at developing novel ISAM concepts
- The COSMIC Capstone Challenge is presented to college students who are invited to develop conceptual missions & designs for spacecraft operations in orbit or on the lunar surface.

The Vision:

- Leverage the COSMIC network to connect students and universities to organizations and commercial companies which would collaborate with student teams to adopt these ideas and fund them for internal development, strengthening the ISAM talent pipeline

Review the C3 Information Packet!!!

- It's neither long nor dense, yet covers key material that won't be discussed today

LinkedIn Group: <https://www.linkedin.com/groups/14485139/>

C3 in Context



Tech Development Roadmap Tie-In

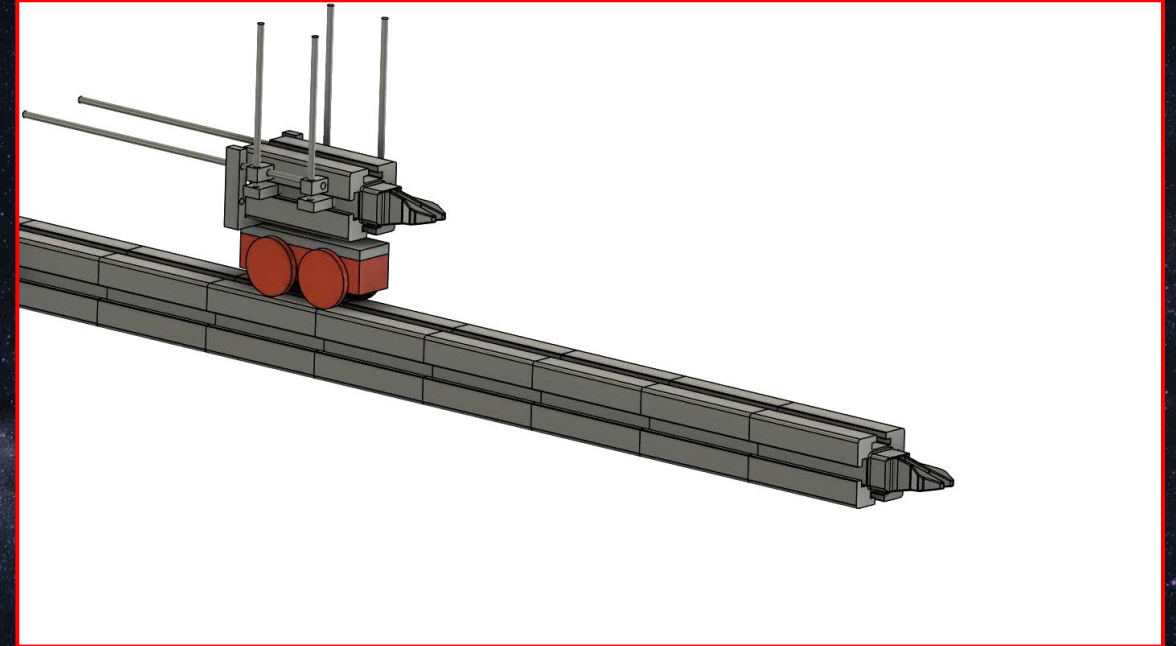
- Technology development roadmap began at Aerospace in Spring 2022 by developing a concept for an orbital satellite factory that could be put into service within 10 years
- Purpose of the goal was to motivate a focus on technologies that seemed viable in mid-term
- Roadmap identified key technologies, which are demonstrated at increasing complexity on orbit
- C3 plays a crucial role in developing orbital experiments that enable functional missions next decade

Example context for Track 1

- 2022-2025 Roadmap development
- 2022-2030 Advance key technology in the lab for orbital experiments
- 2023-2026 Develop & design five 12U-sized orbital experiments as hosted payloads through STP
- **2023-2026 Students in COSMIC Capstone Challenge conceptually design complex orbital experiments**
- 2026-2028 Integration, launch and execution of orbital experiments
- **2029-2031 Larger (ESPA-class), integrated orbital experiments inspired by Design Challenge**
- 2031 Enable government agencies to create request-for-proposal for orbital manufacturing

The Challenge Focuses on Conceptual Design

- Without requiring a prototype, engineering drawings and animations become essential for communicating the conceptual design
- While conceptual design is not focused on analysis, engineering assessments are a crucial part of the process
 - Trade studies
 - Feasibility
 - Size, weight, and power (SWAP) requirements
 - Utility
 - Novelty



Self-assembling modular network for transporting manufacturing, assembly, inspection and servicing tools around a satellite

Design Tracks for C3



- There are 4 design tracks that teams can participate in:
 - Track 1 Challenge: Orbital Manufacturing and Assembly (C3-Manufacturing)
 - Design a payload, to be hosted aboard Arkisys' Bosuns Locker, that would demonstrate a chain of three or more discrete operations providing a capability important for orbital manufacturing or assembly.
 - Track 2 Challenge: Lunar Operations (C3-Lunar)
 - Design a payload, to be delivered by the Griffin lunar lander, that can create infrastructure for a permanent lunar outpost.
 - Track 3 Challenge: Orbital Servicing (C3-Servicing)
 - Design a modular and maintainable spacecraft, capable of autonomously servicing multiple client satellites, to provide critical functions. The spacecraft can be designed around platforms such as ESPASat, or other practical, existent spacecraft that can accommodate the necessary servicing features, like robotic arms, refueling ports, grapple stations, etc.
 - Track 4 Challenge: In-Space Assembly (C3-Assembly)
 - Design orbital or surface infrastructure element(s) and outline the mission describing its construction using autonomous robotic assembly technologies. Teams should leverage previous work in modular building blocks and "builder robots" as referenced; teams may choose NASA's Project ARMADAS or other types of building blocks and robotic systems to address their mission needs.

The 2025-26 COSMIC Capstone Challenge



Mentoring-based approach

- Provide guidance to student teams and advise them in setting professional expectations and viewing the mission lifecycle holistically
- Drawn from across COSMIC membership to provide expertise and diversity of perspective
- Mentors will meet with students at least biweekly to support students and answer questions
- Students will mainly be focused upon addressing key milestones and completing coursework

Showcase events

- An informal midpoint showcase is planned for December to get informal feedback
 - This includes the **statement of intent** for each team which should effectively encapsulate the team's overall mission
- Industry professionals will judge during the 30-minute outbrief in mid-April at the C3 Final Showcase
 - There will be an in-person option at The Aerospace Corporation in Los Angeles
 - Other COSMIC member organizations are invited to host presentations on-site

Timeline for Academic Year 2025-2026



All days are week of unless noted otherwise, based a 2-semester Capstone

- July 8 C3 launched & registration opens
- September 9 Separate on-boarding briefs for professors, mentors & students
- September 16 Begin distinct weekly office hours for professors, mentors & students
- September 16 Recommend teams have selected Program Manager
- October 14 Select operations to form the foundation of the target capability
- November 15 Present internal Systems Requirements Review (SRR)
- December 9 Midpoint showcase (likely 5-minute flash talks open to all)
- January 13 Complete trade studies
- March 3 Complete internal Conceptual Design Review
- April 1 Develop plan to reach Preliminary Design Review
- April 14 Presentation & judging at C3 Final Showcase (Virtual & on-site in El Segundo)
- Late May Recommended time to submit paper or abstract to technical conference or journal
- June 2 Second-chance outbrief for teams that missed showcase (no prizes)

The Advisor's Role

Students, advisors (professors/ teachers), mentors and organizers each have different roles

- Enable the students to connect with the C3 community
 - [Register their teams](#) & provide email addresses (student on-boarding is September 12 at 4PM Pacific)
 - Join the [LinkedIn Group](#)
- Classroom priorities take precedence over C3 goals
 - Counsel students if they feel there is a conflict between C3 and your requirements
- Important to emphasize to students they need to act professionally with mentors
 - Come to meetings prepared
 - Avoid last-minute cancelations
 - Be pro-active when communicating with mentors
- Grading and evaluation is the advisor's role
 - Mentor's role is to provide guidance and expertise
 - Mentors should not be asked to evaluate students against each other
 - You can ask mentor for feedback about how teams did broadly, and provide an opportunity if they want to share more

Participant Perspective



- Dr. Michael Thorburn
 - Professor at Cal State Los Angeles
 - Advised 2 teams during ISAM Design Challenge in 2023-24
 - Advised 2 teams during C3 in 2024-25
 - Advising 2-3 teams for C3 in 2025-26

Next Step & Questions



- All student teams should register at: <https://forms.gle/8H618atsgtDw36Pq9>
 - This allows us to track the teams and communicate directly with the students
- Beginning next week, C3 organizers will host weekly office hours for
 - Mentors & advisors: every other Monday starting September 15 at 9AM Pacific
 - Students: Every Wednesday starting September 17 at 4PM Pacific

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Next Step & Questions



Questions?

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