

Orbital Reef Update

Tara M Ruttle, PhD – Blue Origin

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NASEM Washington, DC

Truttley@blueorigin.com

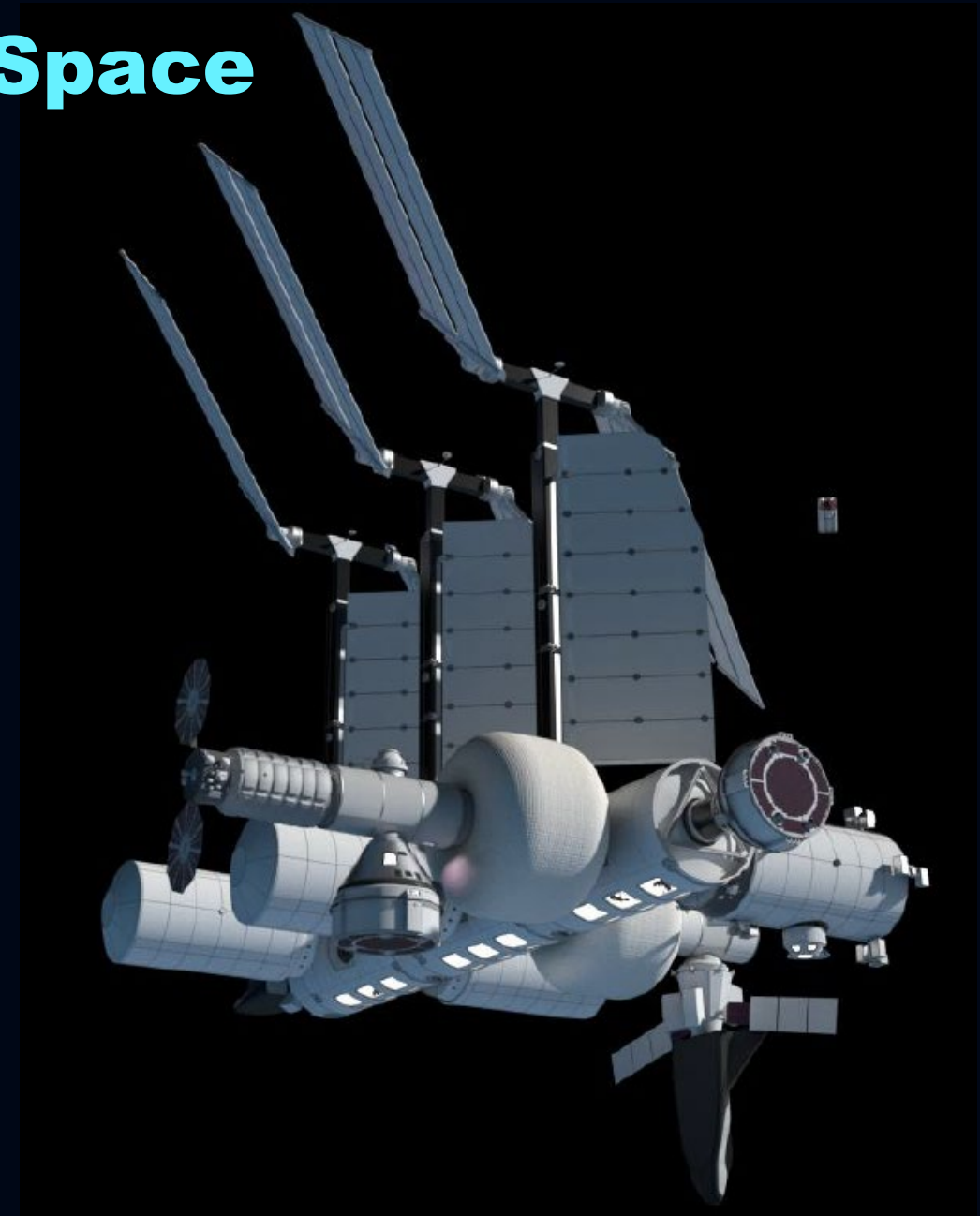
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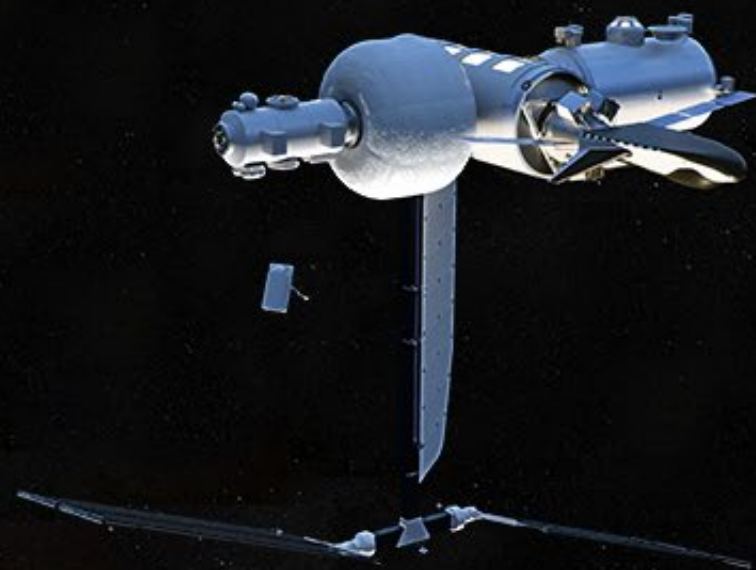
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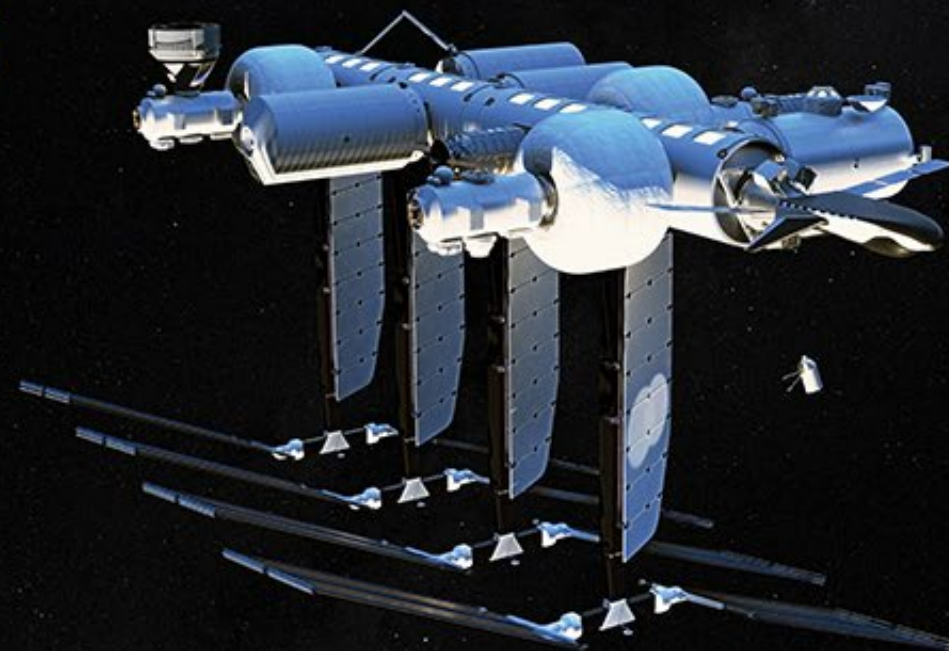
Mixed Use Business Park in Space

- Commercially developed, owned, and operated station in low Earth orbit
- Shared long-term vision of developing and operating infrastructure and systems to enable humans to live and work in space in large numbers
- Modular and expandable architecture grows with market demand
- Focus on commercial efficiency and reimaged logistics reduces capital and operating expenses
- International collaborations to develop and utilize Orbital Reef create a thriving global space economy





BASLINE CONFIGURATION | LATE-2020s



GROWTH CONFIGURATION | MID-2030s

Orbital Reef Team



Utility systems, large-diameter core modules, reusable heavy-lift New Glenn launch system, and space tug vehicle



Expandable LIFE modules with docking nodes, and Dream Chaser reusable spaceplanes for crew and cargo delivery to runways worldwide



Science module, station operations, maintenance engineering, and Starliner crew spacecraft



Microgravity R&D and manufacturing; payload operations and deployable structures; digital engineering



Single Person Spacecraft for routine operations and tourist excursions

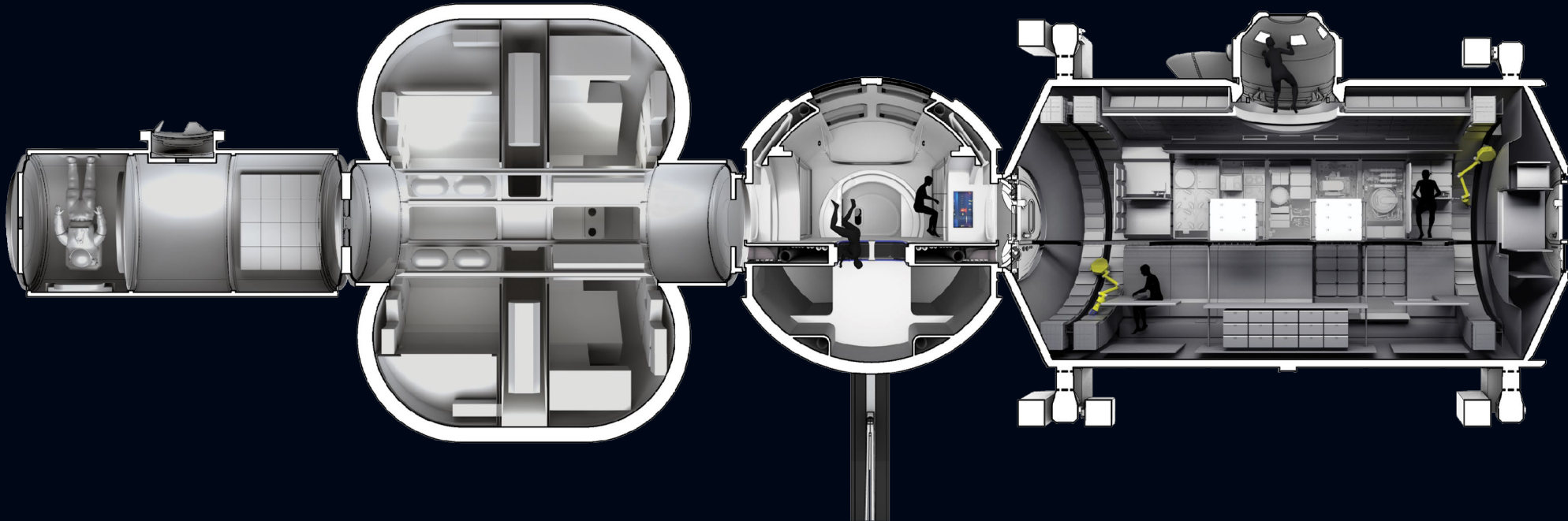


Leads a consortium of global universities providing research advisory services and public outreach



Logistics management system, internal robotics and automation

Baseline Configuration



LIFE + Node (Sierra Space)

- Docking ports
- Airlock for EVA and SPS
- Crew quarters, galley, commodes, exercise equipment
- Science payload support
- ECLSS
- Astro Garden

Core + Mast (Blue Origin)

- Power generation
- ECLSS
- Radiators
- Modular equipment
- Consumables storage
- High-power compute
- Secure communications

Research Module (Boeing)

- Robotically served MLEs
- External payloads
- Science airlock
- Human research / bio lab
- Materials research, quantum physics facility, rodent habitat
- Freezers, gloveboxes

Hub for a Vibrant Emerging Space Economy

National Research

Dedicated or shared facilities

Science, tech development, human research, and other missions post-ISS

Exploration Services

Integration point and base station; platform for astronaut training and exploration systems development

Satellites

In-orbit Support

Production/assembly, delivery, deployment, servicing, and decommission

Commercial Industry

Research & Production

Microgravity to develop and manufacture products for terrestrial applications, and for use in space

Consumer Productions

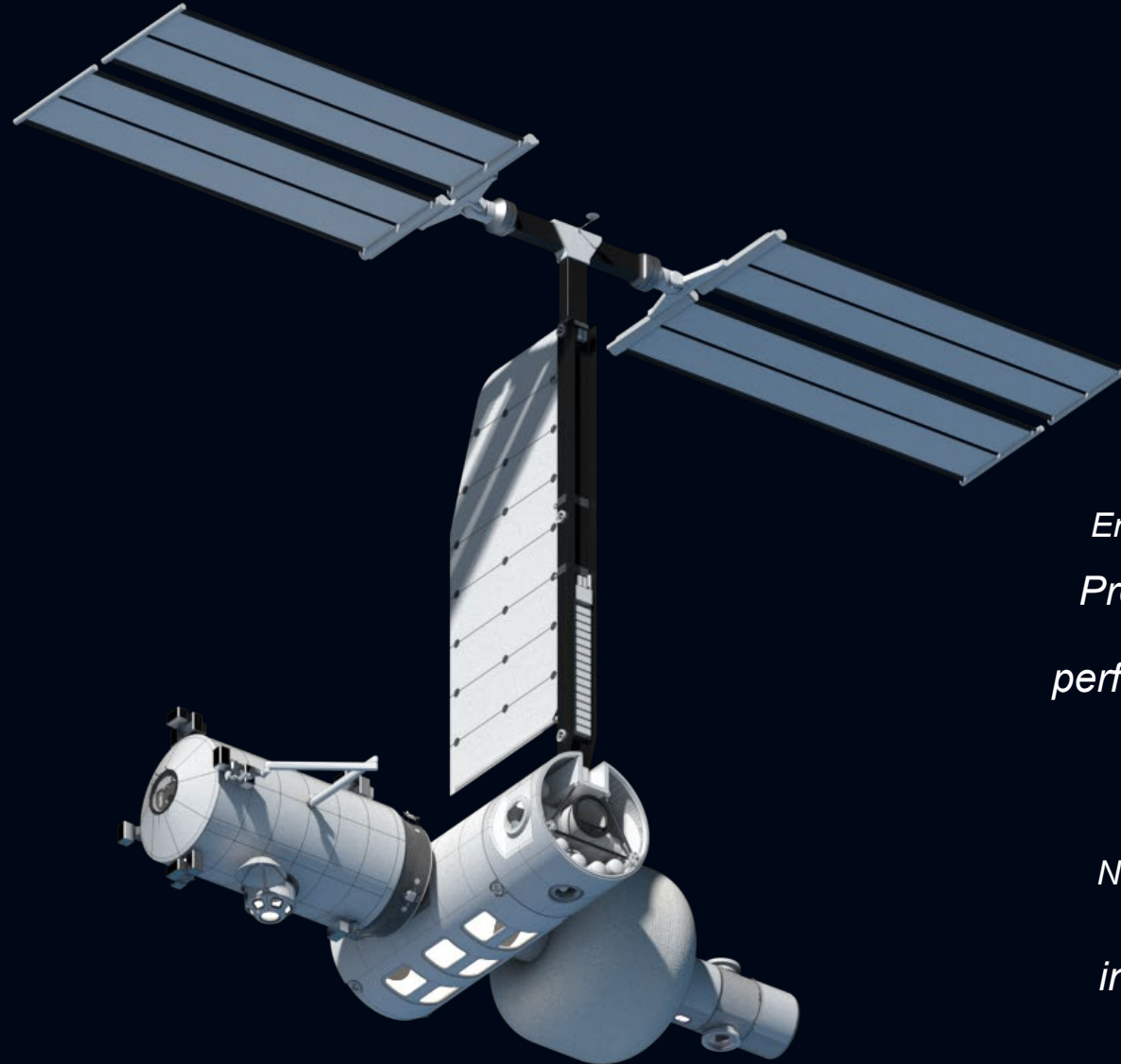
Entertainment, Media, & Advertising

Production of content for mass market audiences, games, performances, and competitions

Travel and Tourism

Noble Causes & Personal Journeys

Demand ramping up from individuals seeking adventure travel and legacy impact





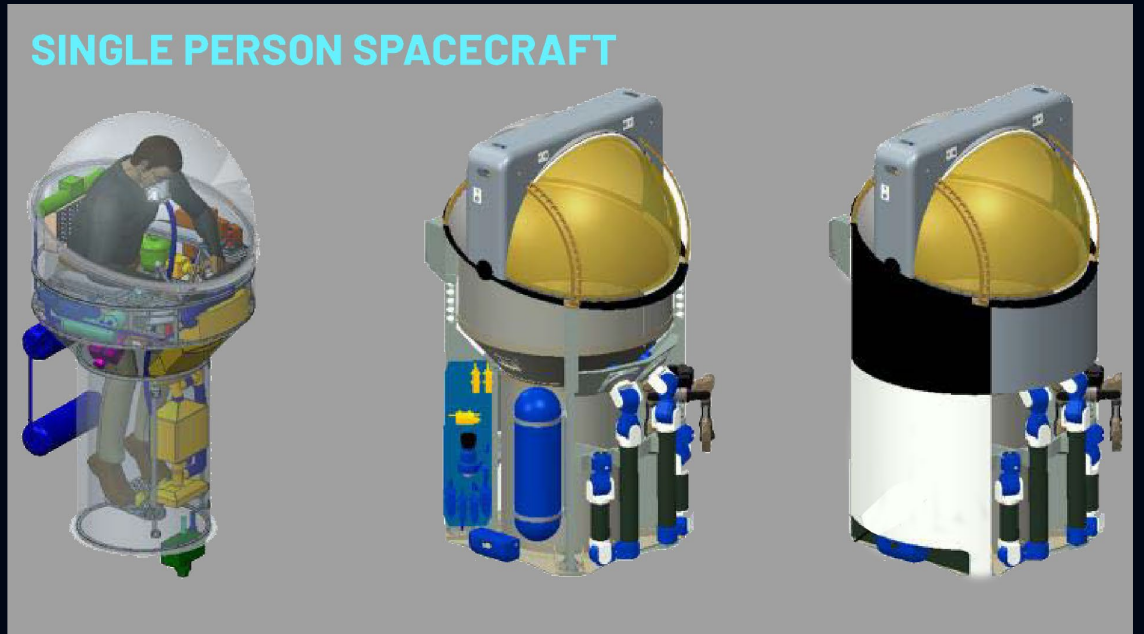
CORE MODULE



LIFE MODULE



RESEARCH MODULE



SINGLE PERSON SPACECRAFT

Orbital Reef Science Vision:

To be the premier Low Earth Orbit science and innovation ecosystem for the benefit of Earth and our future in space. *in space.*

Orbital Reef Science Mission:

To enable a variety of orbital research, development, and applications through best-in-class customer experience from inception to mission success.

Orbital Reef Science Goals...

Science Goal #1

To create a vibrant research ecosystem by **driving bold new R&D pathways** and innovating on the highest potential **legacy spaceflight** results.

- Meet NASA's demands for LEO research
- Capitalize on highest-potential results from ISS to increase use cases and build market demand
- Engage with the greatest minds around the world to



Image credit NASA

Science Goal #2

To develop an orbiting laboratory that researchers trust as an essential element of their transformative research and technology programs.

- Provide researchers novelty, ability to iterate, consistency, and repeatability
- Customer-centric design
- Reimagined logistics for



- Normalize microgravity



Science Goal #3

To leverage the unique suite of Orbital Reef Enterprise capabilities to **advance, de-risk, and mature** our customers' research and technology activities.

- New Shepard
- Dream Chaser
- Reef development programs
- Access to ISS
- Leverage team members' existing and planned ISS



Science Goal #4

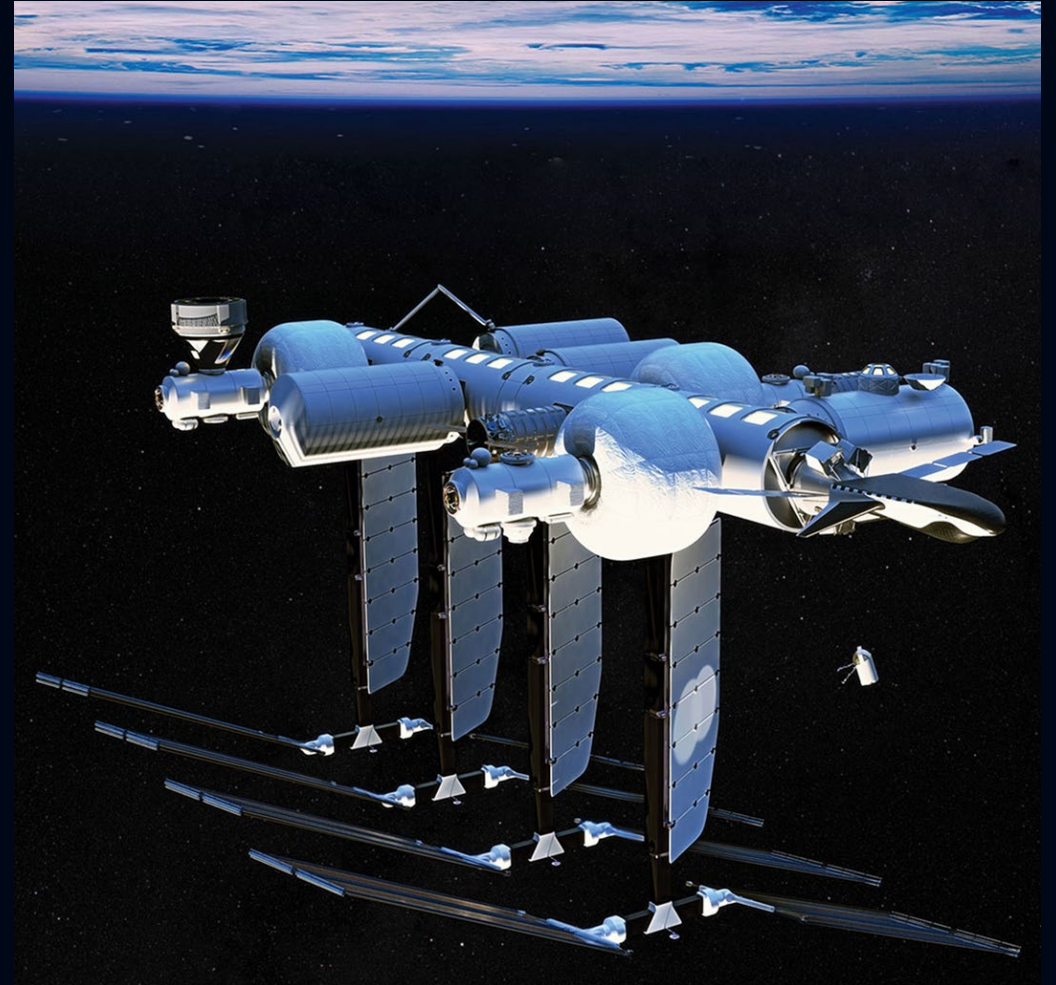
To build an Orbital Reef **science and technology community** that fosters collaboration, sharing of opportunities, diversity of ideas, and inspires the future workforce.

- Known as the premier commercial space station community of professionals
- Collaboration and mentorship will maximize LEO outcomes
- Workshops, summits, and



ORBITAL
REEF

opportunities will invite innovators to Orbital Reef



Decadal Considerations

- NASA research forecasts are two years old, and due for an update so the CLDs can plan and prioritize
- Research Roadmaps are needed to clarify timing, new research questions, and priorities for ISS-to-CLD transitions
- NASA needs to engage soon on defining and funding next gen research hardware/capabilities to be ready for CLDs
- Test campaigns that connect suborbital New Shepard to Orbital Reef can help with CLD planning
- Identification of major LEO research themes will provide input to CLDs (like CAL) or distinguishing CLD capabilities