Starlab Space Station

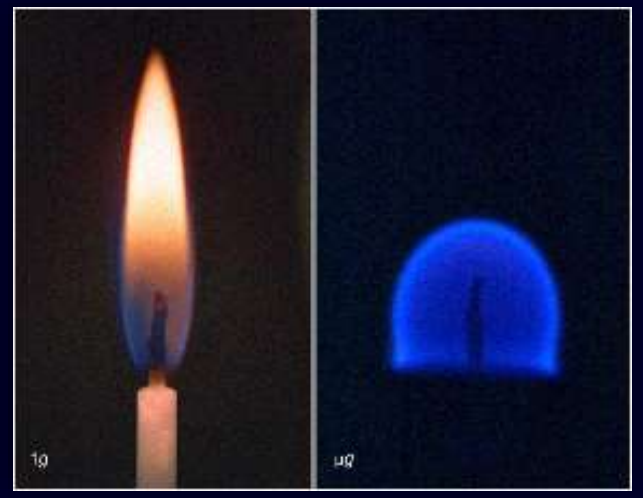
Enabling Next Generation Materials Research and Manufacturing in Space

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Why Research in Low Earth Orbit (LEO)?

UTILIZE UNIQUE FEATURES OF THE ENVIRONMENT THAT CAN'T BE FOUND ON EARTH



- Microgravity
  - Suppression of gravitational forces including convection, buoyancy, and sedimentation
  - Allows for non-gravitational forces to dominate such as diffusion, conduction, and surface tension
  - These non-gravitational forces can greatly impact numerous biological, physical, and chemical processes terrestrially, but the forces can't be isolated on earth to examine their true impact, hence the need for microgravity
- Extreme Environment
  - Provides simultaneously: hard vacuum, rapid thermal cycling, atomic oxygen, high UV radiation
  - All of these features are not present simultaneously on Earth for testing or demonstration



What Topics and Industries are Relevant in LEO?

A wide variety of research topics are of interest in many major industries

Research Topics

- Materials Science
- Fluid Physics
- Transport Phenomena
- Soft Matter
- Reaction Chemistry
- Combustion Science
- Biophysics
- Plant Biology
- Microbiology
- Cell and Molecular Biology



Industries

- Semiconductors
- Industrial Materials
- Construction
- Pharmaceuticals
- Aerospace
- AgTech
- Household Products
- Food & Beverage
- Biotech
- Medical Devices

Commercial industries invest significant R&D dollars into these science topics!

Why do Manufacturing in Space?

RESEARCH CAN TRANSLATE TO SPACE-BASED MANUFACTURING FOR BOTH EARTH & SPACE BENEFIT

- Material defects in the manufacturing process ultimately impact a product's performance
- These defects are often driven by gravitational forces impacting the manufacturing process
- Defects can also be caused by impurities in the manufacturing environment
- Space provides the environment for both microgravity and vacuum conditions to mitigate these defects
- Certain steps of the manufacturing process which are the most impacted by defects can be done in space, while other remaining steps can be done on ground to maximize the business case
- With the growth of space infrastructure in LEO and beyond, there will be a need to have on-demand manufacturing in space for military, commercial, and civil applications
- In-Space manufacturing can also lead to IP generation by the manufacturer



Characteristics of In-Space Manufactured Materials:

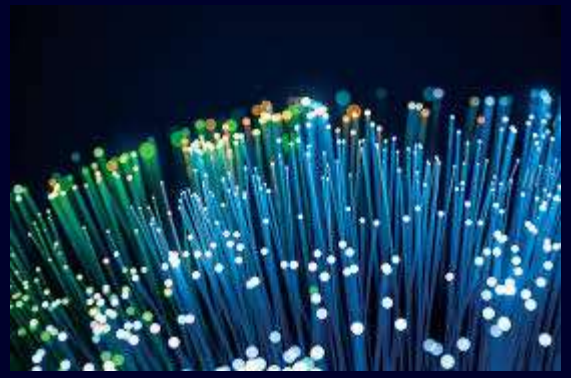
✓ Low Mass
✓ Low Volume
✓ High Value
✓ Defect Driven

Ceramic & Glass Demonstrations - Examples

ISS DEMONSTRATIONS FOR RESEARCH, TESTING, AND MANUFACTURING

- **Turbine Ceramic Manufacturing Module (Redwire)**
  - Investigates the capability to produce ceramic single-piece turbine blisks in microgravity for commercial use on Earth
- **MISSE Experiments (Series)**
  - Various ceramic and glass materials tested to determine the degradation effects of Low Earth Orbit
- **Flawless Space Fibers (Flawless Photonics)**
  - Microgravity allows for the production of more homogenous ZBLAN optical fibers (10 km in total, >1.1 km in single test)
- **Fiber Optic Production (Mercury Systems, Physical Optics Corporation)**
  - Multiple studies of ZBLAN fiber manufacturing in microgravity
- **Glass Formation Mechanism of Densely Packed Functional Borate Glasses (Kyoto Univ)**
  - Studies a new type of borate glass that forms without the connected atomic network normally required for glass, measure specific thermophysical properties more effectively in a microgravity environment





Microgravity Enabling Commercial Innovation

IMPACTS IN VARIOUS HIGH VALUE TERRESTRIAL MARKETS

Pharmaceuticals

Total Market - $1156B



Example: Merck

- Studied in microgravity the crystallization process of formulating the drug Keytruda, used in treatment of various types of cancers
- Significantly reduced sedimentation and convection currents produced more uniform crystalline suspensions of the drug in space
- This could lead to the manufacturing of seed crystals of Keytruda (and other drugs) in space, and continuing the rest of the formulation process on earth to produce more effective treatments

Medical Devices

Total Market - $595B



Example: LambdaVision

- Developing a multi-layered retinal implant used to cure macular degeneration and retinitis pigmentosa
- Gravity prevents these multiple-layered proteins from being arranged uniformly which is needed for the retinal implant to function properly
- The size and value of these devices, along with the need for microgravity for manufacturing, provides a viable model for production in space

Household Products

Total Market - $331B

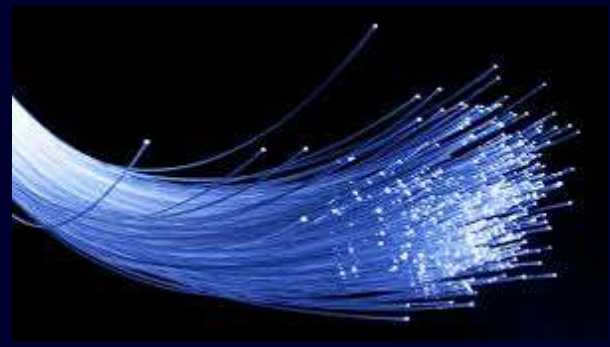


Example: P&G

- Performed a series of experiments in microgravity to increase shelf life of their various lines of consumer products
- Sedimentation of the components in the product play a role in shelf-life, but other factors contribute as well
- These factors can't be determined when sedimentation occurs, hence the need to study in microgravity
- Obtained multiple patents from their microgravity research

Advanced Glass

Total Market - $616B



Example: Flawless Photonics

- Demonstrated manufacturing of ZBLAN Fiber in Microgravity
- Microgravity enables pulling of longer fibers with fewer defects, which can greatly reduce signal attenuation
- In a total of 16 draws, 11.9 km (7.4 mi) of fiber were produced, 3 were over 1 km each
- 9 of the 16 draws exceeded the longest ZBLAN fiber ever drawn terrestrially
- Quality currently being validated by 5 labs around the world



Research onboard the International Space Station has benefitted life on Earth and laid the groundwork for future deep-space missions.

Post-ISS Problem: Once deorbited, research and commercial product and services markets have no destination for valuable microgravity projects.

National space agencies and businesses need full capability and continuity of space capabilities.

25
YEARS

270+
ASTRONAUTS

4,000+
INVESTIGATIONS



Station Specification Overview

LAUNCH CONFIGURATION

- Altitude: 500 km
- Inclination: 45° circular orbit

DEPLOYED

- 12 kW average payload power, internal and external
- 3 standard IDSS docking ports
- >2.5 Gbps communication to ground at Final Orbital Capability

OPERATIONAL

- Science airlock
- 2 external payload platforms for 18 external payloads
- External robotics to service external payloads
- 4 crew continuous presence and 8 crew during turnover

Competitive **Advantage**

JV PARTNERSHIP

- Experienced industry leaders reduce execution, technology and funding risks
- Cost transparency driven by commercial cost matching
- Each global partner represents a large, existing space station user and opens opportunities for international demand and funding

TECHNOLOGY

- Modern design leverages advanced technologies, energy efficiency and AI-enabled science and manufacturing
- Palantir's software and AI optimize operations and reduce maintenance costs

SINGLE LAUNCH

- Starlab is the only station that requires only one launch to be fully operational
- Single-launch solution lowers costs, enables competitive pricing and eliminates complex in-space assembly



VOYAGER

Payloads and hardware

Largest commercial user on ISS

Owns and operates the only private infrastructure on ISS

AIRBUS

Human space infrastructure

Technical design and engineering services

Engineering and Station Design Lead

Mitsubishi Corporation

Hardware and supply chains

Accelerating terrestrial product development with space research

iPark owner

MDA SPACE

Space robotics

External robotics, robotics interface and robotic mission operations

Palantir

AI and software

Enterprise-wide software data management to enhance operations

AI/ML payload integration

spaceapplications SERVICES

Payloads and Operations

Payload avionics, operations software, and microgravity payloads

Providing mission control software suite

VISTA – Voyager Institute for Space, Technology & Advancement

A unique “sum is greater than the parts” approach.

Phase I: Dedicated Facility #1 2027 (artist rendering of full park circa 2030).

Current facility is open now.



NASA InSpa SBIR/STTR Phase I Funding Opportunity

- https://www.nasa.gov/sbir_sttr/

Opportunity	Open Date	Close Date	Selection Announcement
Post Phase II | Phase II-E Submissions	—	7/21/25	Aug. 2025
SBIR Ignite | 2025 NASA SBIR Ignite Phase I Solicitation	6/2/25	7/22/25	April 2026
Phase II | 2024 NASA STTR Phase II Solicitation	7/25/25	9/8/25	April 2026
Phase II | 2025 NASA SBIR Phase II Solicitation	4/15/26	5/15/26	Aug. 2026
Phase I | 2026-2027 BAA Appendix 26A-I SBIR	4/21/26	5/21/26	Aug. 2026
Phase I | 2026-2027 BAA Appendix 26B-I SBIR	4/21/26	5/21/26	Aug. 2026
Phase I | 2026-2027 BAA Appendix 26B-I STTR	4/21/26	5/21/26	Aug. 2026

See You in Orbit!

starlab-space.com

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