INNOVATION CHALLENGE

Presented by:

KEYSTONE SPACE COLLABORATIVE

Powered by:

innovation works®

Funded by:

pennsylvania
DEPARTMENT OF COMMUNITY & ECONOMIC DEVELOPMENT

Special thanks to the

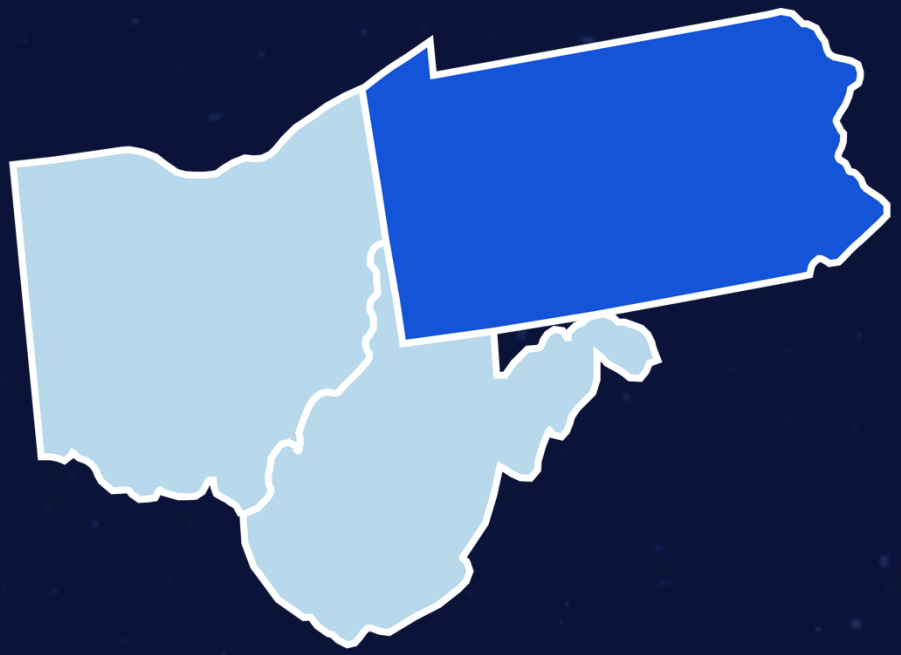
PA Department of Community and Economic Development and Ben Franklin Technology Development Authority

pennsylvania
DEPARTMENT OF COMMUNITY
& ECONOMIC DEVELOPMENT

Thank you to our partners at

What is the Keystone Space Innovation Challenge?

The Keystone Space Innovation Challenge**, launching in Pennsylvania**, is a new initiative created in collaboration with **Innovation Works and key industry partners, and funded by the PA Department of Community and Economic Development.**



The challenge is designed to foster innovation in space technology and commercial research and development **by catalyzing groundbreaking ideas** within the space industry and the utilization of space by terrestrial industries.

By applying, you'll get...

- The chance to secure up to **$50,000** for business growth
- Impactful industry exposure
- An opportunity to connect with key industry stakeholders

...and benefit from...

- Expert business coaching
- Access to industry investors and startups

All of which can open doors to collaboration and funding opportunities.

Participants can submit business plans in two categories:

1. Commercial Space Technology Concepts:

This category encompasses visionary ideas related to commercial space technology, spanning various domains.

Example Aerospace Technology Areas

- Propulsion Systems
- Flight Computing and Avionics
- Aerospace Power and Energy Storage
- Robotic Systems
- Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
- Human Health, Life Support, and Habitation Systems
- Exploration Destination Systems
- Sensors and Instruments
- Entry, Descent, and Landing
- Autonomous Systems
- Software, Modeling, Simulation, and Information Processing
- Ground, Test, and Surface Systems
- Thermal Management Systems
- Flight Vehicle Systems
- Traffic Management and Range Tracking Systems
- Guidance, Navigation, and Control

Participants can submit business plans in two categories:

2. In-Space R&D Commercial Concepts

This category encompasses groundbreaking in-space research and development concepts. This category is not confined to space-specific fields; it includes work pertaining to fields not directly related to space such as life sciences, material and physical sciences, advanced manufacturing, and agriculture. These ventures should hinge on utilizing the unique environment of space (especially microgravity) for R&D demonstration, commercialization, and application.

Why Research in 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

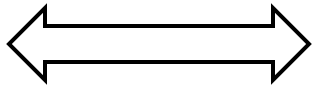
- Provides simultaneously: hard vacuum, rapid thermal cycling, atomic oxygen, high UV radiation
- All of these features are not present simultaneously on Earth for testing or demonstration

Why Research in LEO?

A Wide Variety of Research Topics Are of Interest in Many Major Terrestrial Industries

Space Research Topics

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



Terrestrial Industries

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

Many benefits to products and services come from research in these topics.
Space can unlock revolutionary breakthroughs

Why Manufacture in Space?

Research Can Translate to Space-Based Manufacturing for Both Earth and 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
- 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

Terrestrial Industry Benefits From Space

Terrestrial Industry	Life Sciences 	Advanced Materials and Composites 	Agriculture and Food 
Primary Applications Benefited by Space	• Drug Development • New Organ and Tissue Production • Stem Cell Therapies • Monoclonal Antibody Production • Vaccine Production • Medical Device Implants • Retinal Implants	• Semiconductors (e.g., gallium nitride) • Metals & Alloys • Glasses & Alloys (e.g., ZBLAN Fibers) • Composites • Minerals (e.g., diamonds, zeolites)	• Seeds • Plant Nutrition and Health • Crop Management and Monitoring • Indoor Agriculture / Vertical Farming • Cultured Meats / Plant Based Meats • Manufacturing and Formulation
Outcomes on Earth	• More targeted therapies • Reduce "empty wells" and increase time to market • Reduce cost of drug discovery • Improve Drug Formulations • Improve Drug Delivery Pathways • Improved quality of layered materials like retinal implants	• Advanced Materials with lower defects and higher performance • Materials with better thermal qualities • Improved Wide Band Gap and Ultra Wide Band Gap Semiconductor material • Ability to layer (deposit) diamond on silicon to create superior wafer	• More tolerant plants to climate change • Higher crop yields • Soil with more nutrients • Green Pesticides • Farming that needs less water and space • Plant based meats that have the texture of animal-based meat

Terrestrial Industry Benefits From Space

Terrestrial Industry	Marine /Aquaculture 	Outdoor Recreation 	Sustainability 

Primary Applications Benefited by Space	• Remote Sensing Applications
	  • Visible/Hyperspectral
	  • IR
	  • Radar
	  • Fluorescence
	• Microgravity
	  • Membrane technologies
	  • Novel plastics
	• Accelerated Degradation
		• Microgravity materials R&D
		• Thin layer deposition
		• Material combustion
			• Remote Sensing
			  • Weather and wind patterns
			  • Agriculture monitoring
			  • Disaster prediction and response
			• Microgravity
			• Accelerated Degradation

Outcomes on Earth	• Ocean Temperature Stability • Improve pH of the Ocean • Improve Coral Health • Improve Fish Populations • Decrease Illegal Fisheries • Decreased Plastics in the Oceans	• Novel materials • Recyclable Materials • Energy Efficient Materials	• Lower Carbon Emissions • Novel CO2 Sequestration • Climate Conservation • Water Conservation • Energy Conservation • Creation of Green Metals • Sustainable buildings • Smart Cities

SCM
UNEARTH THE POSSIBILITIES

Lots of Commercial Space Activity

6+ projects focused on Drug Discovery, Crystallization, Bone Loss, Drug Formulation and Manufacturing Efficiencies

4+ projects focused on barley seed germination and more efficient crop production

Colloidal Chemistry Project Focused on Extending the Shelf Life of Consumer Goods Products

Recurring Protein Crystallization Projects focused on Merck's blockbuster oncology drug Keytruda

AI and Machine Learning

2 projects focused on Vaccine Development

Protein Crystallization project focused on Parkinson's Disease

Sponsorship of a Cotton Sustainability Challenge resulting in 3 projects focused on plants structures and remote sensing solutions

Water Droplet Formation Project focused more efficient shower facilities

Looking for Unique Silica Morphologies for their tires

Cement Mixing Study in coordination with Penn State

Biofilm Project focused on Oil and Gas Pipeline Corrosion

Monoclonal Antibodies for Drug Development

Space Hardened Computer System

Crystallization Project Focused on Crop Science

Remote Sensing Focused on Cyclones

Algorithms

Google Earth

Remote Sensing for Oil and Gas Lines

SCM
UNEARTH THE POSSIBILITIES

In addition to ISS, we are seeing new space stations, terrestrially-friendly facilities, labs and space factories.

VAST

SPACE FORGE

AXIOM SPACE

starlab

Commercial Service Providers

SPACE PHARMA
BioServe
ICECUBES
AXIOM SPACE
AEGIS
REDWIRE
SIERRA SPACE
Bartolomeo
SPACE TANGO
YURI
KAYSER ITALIA
Rhodium
Nanoracks
TELEDYNE BROWN ENGINEERING
ZIN TECHNOLOGIES

Facilities & Capabilities:

- Cell Culture
- 3D Bioprinting
- Plant Growth
- Microorganisms
- Rodent Research
- Macromolecular Crystallization
- Formulations
- Fluid Dynamics
- Thermal Transport/Heat Pipes
- Furnace Crystallization
- 3D Printing
- Deposition
- Spraying & Coating
- Combustion
- External Materials Testing
- Small Satellite Deployment

SCM
UNEARTH THE POSSIBILITIES

Challenge Details

Who is eligible?

Registered Businesses: Must be formally registered within Pennsylvania.

Student Groups: At least one member must be enrolled in a higher-education institution in Pennsylvania.

Unaffiliated Teams: At least one member must be a full-time resident of Pennsylvania.

Award recipients must commit to establishing and operating their businesses within Pennsylvania.

Additional Eligibility Requirements

- All applicants and team members must be 18 years of age or older.
- All applicants and team members must be U.S. citizens or lawful permanent residents.
- Applicants must ensure that their participation does not violate their employer's policies or procedures or any other third-party rights or obligations (e.g. non-competition agreements).
- The applicant company leaders or individual and their immediate family members must not be employed by or affiliated with Keystone Space, BNY Mellon, Innovation Works, or any of their/our parent and affiliate companies.
- Applicants must not have received funding of $50,000 or more in previous Challenge cycles.

How does the Challenge work?

The Process:

- Submit business plan by **January 17, 2025.**
- Finalists will be invited to submit a pitch deck to present at a **Pitch Day Competition** on **February 19 and 20, 2025.**
- **Six winners will be announced.** The top two will each secure a **$50,000 award**. Four other standout concepts will be granted **$25,000 awards**.

In addition to the financial awards, all winners will receive a one-year membership to the Keystone Space Collaborative.

Challenge Schedule

Challenge Kick-Off Webinar *(Virtual)*	Wednesday, December 4, 2024 @ 1:00 p.m.
Applicant Office Hours	Office hours begin Monday, December 9, 2024
Business Plan Submission Deadline	**Friday, January 17, 2025 @ 11:59 p.m.**
Finalists Announcement	Thursday, January 30, 2025
Finalist Office Hours	Finalist office hours begin, Friday, January 31, 2025
Pitch Deck Submission Deadline	**Tuesday, February 18, 2025 @ 11:59 p.m.**
Pitch Days *(Virtual)*	Wednesday, February 19 – Thursday, February 20, 2025
Awardees Announcement	Monday, February 24, 2025
Awardees Presentations & Investor's Day *(In Person)*	**TBD – Mid-March**

Resources

Business Plan Template

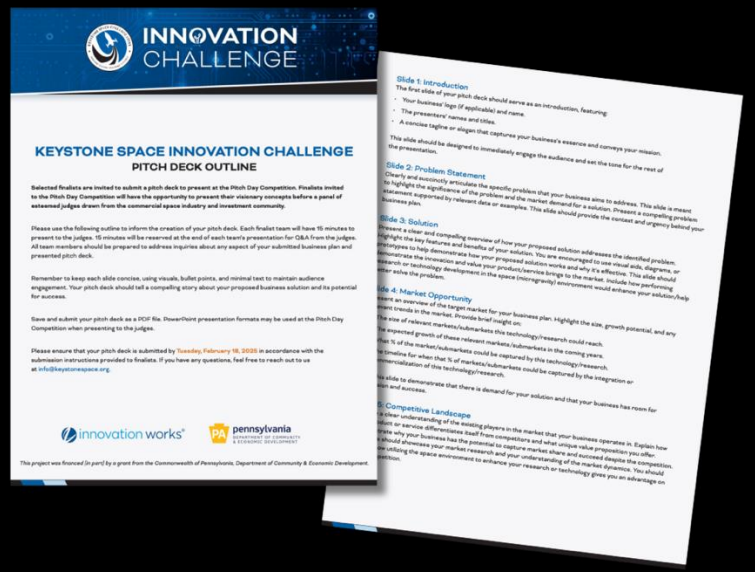
To apply for the Keystone Space Innovation Challenge, applicants must first submit a business plan using the provided template.

Download

Pitch Deck Template

Selected finalists will be invited to submit a pitch deck and present at our Pitch Day Competition to showcase their concepts before a panel of esteemed coaches from the commercial space industry and investment community.

Download



Judging Criteria

- **Evaluation Beyond Traditional Metrics**: Companies will **not** be evaluated based on business maturity, including factors like how much money has been raised, revenue generated or number of employees.
- **Relevance**: How does this capability (product, service, technology, etc.) benefit the space industry in Pennsylvania?
- **Value Proposition**: What value does this capability offer to potential customers?
- **Commercialization Potential:** How do you plan to commercialize this capability?
- **Feasibility:** What is the plan for scaling this capability? How will this capability sustain itself?
- **Market Differentiation:** How is this capability different from other products/solutions on the market?
- **Customer Acquisition:** How will the capability reach more customers/clients?
- **Financial Support:** How does the team intend to raise the capital needed to roll out this capability?
- **Team And Leadership:** Team can articulate impact cases for their capability and the team can execute on the business plan.

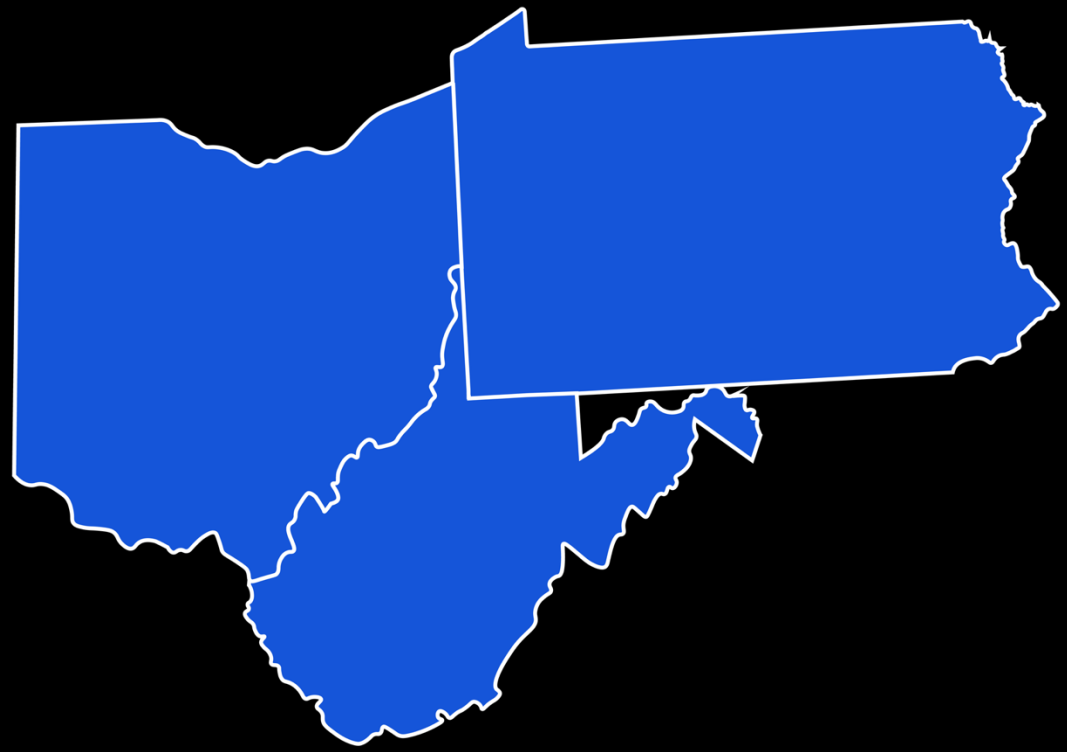
Connect With a Mentor

See the Challenge mentors on Keystone Space website and click the scheduling link to find time to meet with them.

View Mentor Information Here

Looking Toward the Future

Though the Keystone Space Innovation Challenge can only support Pennsylvania participants this initial pilot year, it plans to **expand its impact to include Ohio and West Virginia (in addition to Pennsylvania) in the future,** pending multi-state funding.



KEYSTONE SPACE COLLABORATIVE

BUILDING BRIDGES. BREAKING BARRIERS

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Questions?

You can also find more information at
KeystoneSpace.org/Innovation-Challenge
or scan the QR code.