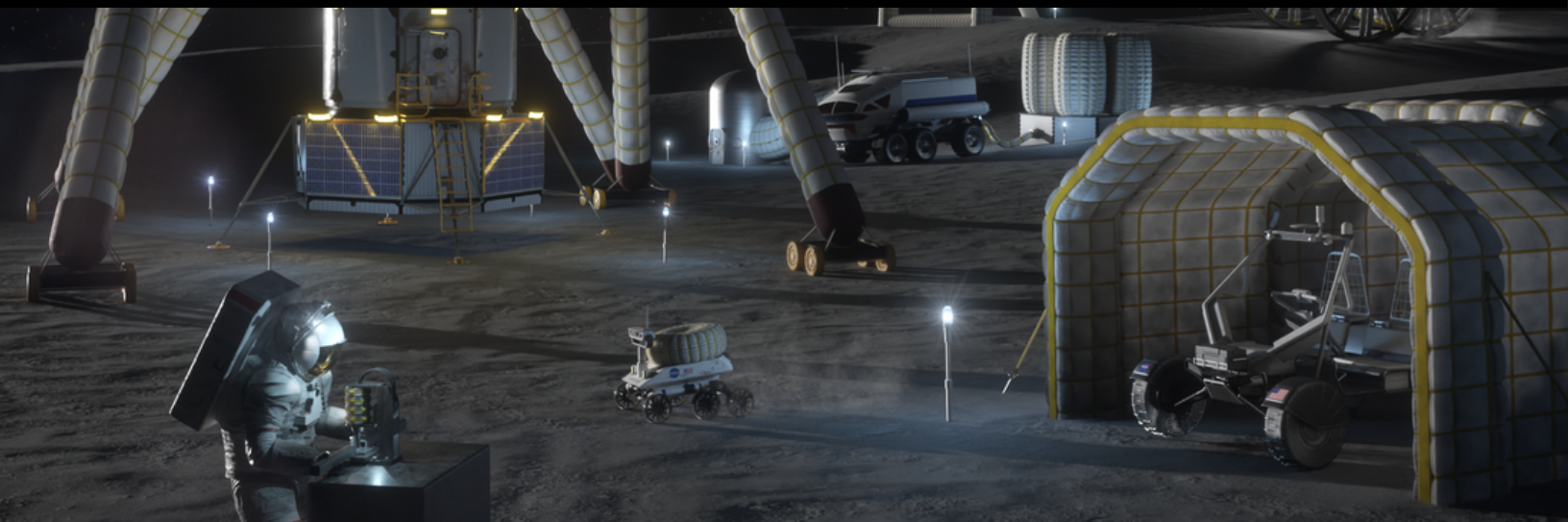




# NASA'S **B**REAKTHROUGH, **I**NNOVATIVE & **G**AME-CHANGING IDEA CHALLENGE



## 2024 Call For proposals: Inflatable Systems for Lunar Operations

In this year's NASA BIG Idea Challenge, [teams of students from Space Grant-affiliated colleges and universities](#) are invited to

submit proposals to design, develop, and demonstrate novel uses of low Size, Weight, and Power (SWaP) inflatable technologies, structures, and systems\* for sustained lunar operations. Selected teams will receive awards ranging between \$50,000 and \$150,000 to bring their ideas to life.

One of the biggest constraints to establishing a sustainable human presence on the Moon is the immense mass and volume of assets needed to support this effort. This is why NASA is looking for novel and cost-effective technologies and applications that utilize inflatable systems that could support [Artemis Missions](#). Together with commercial and international partners, NASA will establish a sustainable presence on the Moon to prepare for missions to Mars.

Proposals must describe the inflatable systems being proposed and potential scenarios and uses for lunar missions and activities. The proposal should identify resources and support systems needed to test and demonstrate the inflatable structure in a relevant environment. The proposal should provide a description of the compelling need, what makes this concept novel and innovative, and potential business cases based on the proposed inflatable concept. The proposal should identify resources and support systems needed to test and demonstrate the inflatable structure in a relevant environment.

This competition is intended to be an open innovation challenge with minimal constraints so that proposing teams can genuinely create and develop out-of-the-box solutions.



**Verification Testing**  
Finalist teams will need to demonstrate a working technology, system, or subsystem prototype.



## GUIDELINES

Low SWaP inflatable technologies, structures, and systems\* can be proposed for a wide variety of lunar applications, including but not limited to:

- deployable towers
- soft robotics
- inflatable actuators and deployment mechanisms
- large antennas and solar reflectors
- emergency shelters for extended EVAs
- internal or external secondary structures on habitats (i.e., floors, walls, support structure for radiators, etc.)
- deployable living volume for long-term rover exploration
- pressurized tunnels and airlocks
- low mass cranes and gantries for offloading and transporting equipment
- deployable debris shields and dust protection systems
- inflatable mandrels for construction
- gas or liquid storage tanks
- "drive-in" volumes/garage for rover repairs

These applications are just a few possible uses for inflatable structures.

\***Exclusion:** The challenge is NOT looking for concepts that focus on the use of inflatables for lunar habitats.

For reference, teams are encouraged to refer to the [NASA's Moon to Mars Strategy and Objectives Development](#) document.

## Required Capabilities

- Maximizes deployed-to-stowed volume and minimizes mass
- Able to operate for long periods in the harsh lunar environment
- Materials and components selected must be able to withstand the stress levels determined for the chosen application
- Minimal barriers to NASA adoption/commercial infusion (e.g., cost-effective, low mass, small size, low power, simplicity, high reliability, etc.)
- Technologies should reach a minimum system-level Readiness Level (TRL) of 4 at the end of the challenge
- Must demonstrate a working system/sub-system
- Reaching a TRL of 5 (testing in a relevant environment) is strongly desired

## Assumptions

Proposing teams should clearly identify their assumptions and provide supporting rationale. Below are some recommended assumptions for missions, but teams can adjust them if a good rationale is provided.

- Solution should be ready for use on the Moon by 2029
- Cost-effective solutions
- Verification that the required key performance parameters are met (Examples of performance parameters might be: Deployed volume-to-mass ratio, deployed to stowed volume ratio, etc.)
- Operational use and simplicity (minimize required crew time for use and maintenance)
- Design for the analog environment (i.e., temperature, vacuum, limited power, limited/restricted communications, abrasive regolith, etc.)
- Energy Efficiency (i.e., power and energy supplies will likely be limited in early Artemis operations)
- Credible fabrication and material selection

## Proposed Solutions Must Consider

- Innovation while being realistic
- The needs of potential stakeholders/funders (i.e., Exploration, Science, Commercial)
- Including a theoretical concept of operations (ConOps) in the design package that clearly describes the use of the inflatable concept in Lunar missions and activities, the supporting systems required, all design assumptions, material being used, key performance parameters (KPP) and deployment operation.

## Important Dates

- Notice of Intent Deadline: October 22, 2023
- Deadline to Submit Advance Q&A: October 29, 2023
- Question & Answer Session: November 7, 2023
- Proposal and Video Deadline: February 1, 2024
- 2024 BIG Idea Forum: Nov. 5-7, 2024 (Tentative)

## Award Funding for Finalist Teams

A wide range of award sizes is expected (in the range of \$50,000 - \$150,000), depending on the scope of the work proposed. Each team will submit a detailed and realistic budget in their proposals, not to exceed \$150K. We anticipate funding several larger-scope awards (typically \$100-\$150K) and several smaller-scope awards (typically \$50K - \$99K). Proposers are encouraged to request what is actually needed to conduct the proposed work. To maximize NASA's Return on Investment (ROI), judges will carefully consider cost as an important factor in determining the overall value of the proposal.

## Eligibility

The 2024 BIG Idea Challenge is open to teams comprised of up to 25 undergraduate and/or graduate students at accredited U.S.-based colleges and universities officially affiliated with their state's Space Grant Consortium. Non-Space Grant affiliated universities may partner with a Space Grant affiliated academic institution who takes a primary role on the project. Foreign universities are not eligible to participate in the BIG Idea Challenge. Please see the BIG Idea website for full eligibility requirements.

**Minority Serving Institutions are encouraged to apply or participate by partnering with a Space Grant affiliated university**

The BIG Idea Challenge is sponsored by NASA through a unique collaboration between the Space Technology Mission Directorate (Game Changing Development Program) and the Office of STEM Engagement (Space Grant Consortium) and is managed by a partnership between the National Institute of Aerospace (NIA) and the Johns Hopkins University Applied Physics Lab (JHU/APL).