



# 2024

## Theme Preview\*\*

### Important Dates

**Notice of Intent Deadline** – September 20, 2023  
**Proposal Deadline** – January 23, 2024  
**Selection Notifications** – February 29, 2024  
**Mid-Point Report Deadline** – June 9, 2024  
**Technical Paper Deadline** – October 16, 2024  
**2024 BIG Idea Forum** – November 5-7, 2024

### Eligibility

Participation is open to teams of undergraduate and graduate students at accredited **U.S.-based colleges and universities officially affiliated with their state's Space Grant Consortium**. However, non-Space Grant affiliated colleges/universities may partner with a [Space Grant-affiliated University](#).

**Minority Serving Institutions are encouraged to apply!**

### Awards

A wide range of award sizes is expected (**in the range of \$50,000 - \$180,000 per team**). Proposers are encouraged to request what is actually needed to conduct the proposed work.

### Inflatable Technologies

A great deal of work has been done on inflatables for lunar habitats and entry systems. The 2024 BIG Idea Challenge asks teams to go beyond habitats and entry systems to investigate additional applications such as:

- Deployable towers
- Soft robotics
- Inflatable actuators & deployment mechanisms
- Large antennas and solar reflectors
- Emergency shelters for extended EVAs
- Internal or external secondary structures
- 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

These applications are just a few of the possible uses for inflatable structures – get creative!

**\*\*Full competition details will be available on the [BIG Idea website](#) in early August.**

*Some details may be subject to change.*

## Breakthrough, Innovative & Game-changing (BIG) Idea Challenge

The BIG Idea Challenge is a collegiate-level design competition sponsored by NASA and managed by a partnership between the National Institute of Aerospace (NIA) and the Johns Hopkins University Applied Physics Laboratory (JHU/APL). To participate, **teams of ~5-25 students will submit proposals on concepts for a wide range of solutions for inflatable technologies, structures, and systems for lunar operations**. Selected teams will receive up to \$180,000 to build and test their proposed inflatable solutions, then will present their test results to a panel of NASA and industry subject matter experts (SMEs) at the BIG Idea Forum in November 2024.

### Background

As the first step in the next era of human space exploration, the [Artemis program](#) brings NASA together with commercial, international, and academic partners to establish a sustainable presence on the Moon to prepare for missions to Mars. Large structures are needed for that endeavor, but rigid, prebuilt structures pose volume challenges, and as a result, encounter cost and time limitations. In a stowed launch configuration, a large deployable inflatable structure can fit in a single launch and expand once on the Moon. Inflatable deployable structures can take advantage of using fabric materials and internal pressure to become rigid multi-dimensional pressure vessels when filled with air.

Current efforts in inflatable structure technology have focused on habitats and entry systems. The 2024 BIG Idea Challenge asks collegiate-level teams to go beyond inflatable habitats and entry systems to consider applications for lunar surface infrastructure such as deployable towers, gantries, and antennas. Applications may also include soft robotics, actuators, connectors, deployment mechanisms, airlocks, as well as temporary shields or shelters – among many others.

**To enable sustainable human operation of the Moon in the coming decade, NASA seeks near-term, innovative, and viable inflatable solutions that can pave the way for lowered costs, improved safety, and increased space exploration performance.**

### Basic Challenge

Design, develop, and demonstrate novel uses of inflatables for lunar operations. Proposals must include a specific mission scenario/use case where an inflatable system would be applicable and advantageous. In a systems engineering approach, overview the system, its assumptions, and feasibility. Through testing, show concept credibility and advance concept [technology readiness level \(TRL\)](#).

<https://bigidea.nianet.org>

### Required Capabilities

- Materials must be able to survive the lunar environment and stress levels relevant to selected application.
- Maximize deployed-to-stowed volume; minimize mass.
- Minimal barriers to NASA adoption/commercial infusion.
- Tech should reach a minimum TRL of 4, referring to (1) operation on Earth with analog materials and in relevant environments; and (2) analysis showing the design can operate in targeted environments (environmental testing on critical subsystems is highly encouraged).