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# NASA Entrepreneurs Challenge 2023

Venture to the Moon and Beyond with NASA: Launching Lunar Payloads and Unlocking Climate Science!

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# Technology Focus Areas

## Technology Focus Area 1: Lunar Surface Payloads

**NASA is seeking proposals for lunar surface payloads that may attract non-governmental funding for payload flight-readiness development and launch from a commercial provider.** Your proposal should consider technical feasibility as a launchable payload as well as business credibility as a viable venture.

Proposed payloads of interest should include science instruments and technologies that align with NASA's [Moon to Mars Objectives](#) and the [Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032 \(particularly Chapter 22\)](#).

### General Guidance

To increase the likelihood of being manifested by a commercial lander provider, payloads should adhere to the following guidelines for easy accommodation by known commercial landers:

- **Mass:**
  - Under 50 kg, including accommodation hardware. Target 5-10 kg for easy accommodation for launch
- **Standards:**
  - Common and contemporary industry standards (e.g., RS422, Spacewire, etc. data interfaces, 28 VDC)
- **Operational Complexity:**

- Minimize disparate operational modes and transitions to reduce operational complexity
- Lander Resources:
  - Reduce demand, especially during critical times (e.g., power, downlink to Earth)
- Power Consumption:
  - Limit to approximately 150 Watts; lower is easier to accommodate
  - Data Downlink: Less than approximately 300 kilobits per second
- Contamination:
  - Minimize and document requirements and concerns (e.g., offgassing, byproduct venting)
- Risk:
  - Consider and minimize risks to other payloads or the lander
- Mechanical Load Limits:
  - [Meet GSFC-STD-7000 General Environments Verification Standard](#)
- Resource Requirements:
  - Minimize off-nominal peak resource requirements (e.g., instantaneous power peaks, data bursts)
- Avoid [Hazardous Materials](#)

### Topic-Specific Evaluation Criteria

- Technical feasibility of being manifested on a commercial lunar lander

### Example of Suitable Topics for Lunar Surface Payloads

- "Survive the night" technologies:
  - Experiments that can run for consecutive lunar days
- "Operate during the night" technologies:
  - Experiments that can run for consecutive lunar days and nights
- Lunar science instruments:
  - Study dust transport, dust/plasma interactions, local magnetic fields, seismic activity, space weather, etc.
- Lunar engineering experiments:
  - Explore regolith properties, dust mitigation techniques, In-Situ Resource Utilization (ISRU) components, cold-operation bearings/seals/lubricants, radiation-tolerant electronics/computers, etc.

- This list is ***not exhaustive***. Any technology or science payload that aligns with NASA's [Moon to Mars Objectives](#) and the [Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032 \(particularly Chapter 22\)](#) is of interest.

## Technology Focus Area 2: Climate Science

**NASA is seeking solutions to better leverage new and existing climate data to address climate and environmental problems.** Proposals should focus on either developing innovative methods and/or instrumentation to generate high-quality climate science data or new ways to use and commercialize existing Earth Science data. Submissions may address either or both Climate Science Data Generation and Climate/Environment Data Usage objectives (detailed below).

### General Guidance

#### 1. Climate Science Data Generation

- Generate high quality climate science data from low-mass/volume/power instruments that can be or are hosted on commercial spacecraft. Solutions may propose new remote (spacecraft-based) sensors or new ways to physically calibrate/validate existing spacecraft-based sensors.
- Quantitative descriptions of the state-of-the-art in measurement parameters needed for climate science are provided in the climate variability and change panel of Table B.1 "ESAS 2017 Consolidated Science and Applications Traceability Matrix" (pages 596-612) in "[Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space \(2018\)](#)".
- Proposals should address means to increase performance in the state-of-the-art of the geophysical observables listed in this table (e.g., increase spatial or spectral resolution, sampling rates, range...) or propose means to substantially reduce the cost of current state-of-the-art measurements.

## 2. Climate/Environment Data Usage

- Develop new business models for generating revenue from existing Earth Science data to address a climate/environmental problem. For instance, proposers may identify a local environmental problem and propose extracting information with the required resolution and accuracy needed for mitigation actions.
- Data sources can be any governmental or commercial providers and should be used for environmental or climate related solutions.
- Example data sets available from NASA can be found at <https://www.earthdata.nasa.gov/>.

### Topic-Specific Evaluation Criteria

#### 1. Climate Science Data Generation:

- Quality of data needed to address decadal science

#### 2. Climate/Environment Data Usage:

- Appropriateness of the data and data processing to address the proposed climate/environmental problem

### Example Suitable Topics for Climate Science

#### 1. Climate Science Data Generation

- Greenhouse gas concentration/distributions
- Snow water equivalent
- Ice thickness
- Atmospheric aerosols
- This list is ***not exhaustive***.

#### 2. Climate/Environment Data Usage

- Algal blooms
- Local air quality
- Local water quality
- Crop health
- Wildfire effects on local environments
- This list is ***not exhaustive***.



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