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# Engineering Design Challenge: Packing Up for the Moon

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Future astronaut crews on long-duration missions will need to learn how to grow safe, edible, and nutritious plants while living and working in space, on the Moon, and on other planets.

The lunar environment is so extreme that astronauts and plants are not able to live on the lunar surface without a protective habitat. Because of the extreme environment, the lunar habitat must provide the plants with light, water, and atmosphere. All the essential supplies and materials needed to survive on the Moon will be stowed on a rocket, shipped to the Moon, and deployed on the surface. There is a limited amount of space available on the rocket for the large amount of lunar cargo needed. The mass and the volume of the stowed cargo must be closely monitored for fuel efficiency and storage limitations.



*Figure 6. Artist's conception of a potential lunar outpost. (NASA)*

## The Challenge

Student teams will design and build a tabletop model of a plant growth chamber that can be folded, stowed, and shipped on a rocket destined for the Moon. When the shipment arrives, the future lunar astronauts will then be able to expand the plant growth chamber and deploy it on the lunar surface. Because this project is in the development stage, the team will only need to design, build, and present a tabletop model of the plant growth chamber rather than a full-size lunar structure designed to grow enough food for the entire lunar crew.

## Criteria and Constraints

The plant growth chamber must meet the following criteria and constraints:

1. On the rocket, the plant growth chamber model must not exceed a mass of 50 g and a stowed volume of 1,000 cm<sup>3</sup>.
2. The deployed plant growth chamber can be any shape; however, the volume cannot exceed 1,000,000 cm<sup>3</sup>.
3. The deployed plant growth chamber may or may not be connected to the lunar habitat, but it must provide a way for astronauts to have access to the chamber.
4. The model plant growth chamber must use a system of expansion from its stowed shipment package on the rocket to its final deployed structure on the Moon.