



Challenges

Challenge #1:

Crew Entertainment System

Mental health is important, and there is no exception for astronauts on long-duration space missions. Using the provided guidelines, develop a Crew Entertainment System that will aid in maintaining the psychological health of an eight-person crew during 1-5 year missions in the Common Habitat, a conceptual design being explored for possible missions across the inner solar system in the post-Artemis timeframe.

[Link to Challenge #1 References](#)

Source: Robert Howard, Habitability Domain Lead in the Habitability and Human Factors Branch and Co-Lead of the Center for Design and Space Architecture at NASA Johnson Space Center

Challenge #2:

[Deployable Barricade System for In-Space Repair, Fabrication, and Manufacturing](#)

Astronauts need to be prepared for potential hardware breakdowns in space, and a space “machine shop” called a Repair, Maintenance, and Fabrication Facility (RMAF) is being designed for the Common Habitat to prepare for such failures on the Moon, on Mars, and in deep space. Like in any machine shop, the RMAF will generate substantial quantities of particulates, which are especially hazardous in a spacecraft. Design a deployable barricade system (DBS) that can isolate RMAF particulates when activities are in progress.

[Link to Challenge #2 References](#)

Source: Robert Howard, Habitability Domain Lead in the Habitability and Human Factors Branch and Co-Lead of the Center for Design and Space Architecture at NASA Johnson Space Center

Challenge #3:

[Lander Deployable Heavy Crane](#)

Based on last year’s [winning hackathon project by Team Rocket](#), this is our third challenge dedicated to the Common Habitat. Design a Lander Deployable Heavy Crane (LDHC) system that can extract the Common Habitat from its lander - a modified Starship - rotate it to a horizontal position, and lower it to just above the surface on both the Moon and Mars.

[Link to Challenge #3 References](#)

Source: Robert Howard, Habitability Domain Lead in the Habitability and Human Factors Branch and Co-Lead of the Center for Design and Space Architecture at NASA Johnson Space Center

Challenge #4:

Outfitting a Mars Habitat: A 3D Print Challenge

Imagine you're an astronaut who has just arrived on the Red Planet. Your habitat has been pre-constructed for you, but, other than three 3D printers, it doesn't have most of the things you need to live and work. Your challenge is to design tools, furniture, and other items to assist you on your one-year mission.

Required Deliverables: 3D printed object(s).

Source: SpaceApps 2022

Challenge #5:

The Gateway of Things (GoT)

"Alexa, this is Astronaut Pedro Pascal. Please play The Last of Us on my Gateway TV."

If you have smart devices at home, you are already familiar with the Internet of Things (IoT). Some popular IoT consumer devices include smartphones, smart TVs, smart speakers, connected thermostats, home security systems, domestic robots, smart bulbs, energy monitors, connected appliances, smart door locks, and connected car devices.

How would this technology be incorporated into the [Gateway](#) space vehicle?

Either by hand or software, design an architecture that connects a group of IoT devices (it can be a couple or hundreds of them) into the Gateway network. You are encouraged to research various types of IoT devices, get creative in the way you create your connections, and essentially have fun with this challenge.

Challenge #6:

Lunar Astronaut Protection Program

A human journey to the Moon offers an inexhaustible amount of complexities. To overcome obstacles that lay before such a mission, NASA's [Human Research Program](#) has organized hazards astronauts will encounter into five categories: [Radiation](#), [Isolation](#), [Distance](#), [Gravity Fields](#), and [Hostile/Closed Environments](#).

Some other hazards include solar particle events, crew member leg injuries (ankle sprain, charley horse, torn ligament, etc.), rover mechanical failures, surface habitat ECLSS failures, or even a pressurized rover rollover in a crater.

Come up with a creative solution to protect our astronauts from a hazard of your choosing.

Challenge #7:

We are the Artemis Generation

With [Artemis](#) missions, NASA will land the first woman and first person of color on the Moon, using innovative technologies to explore more of the lunar surface than ever before. We will collaborate with commercial and international partners and establish the first long-term presence on the Moon. Then, we will use what we learn on and around the Moon to take the next giant leap: sending the first astronauts to Mars.

We're going back to the Moon for scientific discovery, economic benefits, and inspiration for a new generation of explorers: **you, the Artemis Generation.**

With this in mind, **choose your own adventure!** Present, design or build a creative way to connect people to human spaceflight.