

NASA MarsXR Challenge - Virtual Reality EVA Scenarios

Category - Set Up Camp

Once the astronauts arrive at the Red Planet, they will need to create their planetary settlement.

In order to establish a base on Mars, astronauts will need to perform an array of tasks and set up the infrastructure necessary to support a successful mission. Some of the sample tasks consist of setting up the power infrastructure necessary to operate the base (including the deployment of solar panels and/or RTG equipment), connecting all the necessary fluids connections between the landing spacecraft and modules, erecting all the communications systems such as antennas, burying the cables and equipment necessary to ensure reliable communications with Earth, and more.

Sample tasks also include setting up any in situ resources utilization (ISRU) equipment, making operational the systems to collect, filter, and reuse water, establishing the connections between modules, and any other task essential for creating the basic infrastructure required to live on Mars for the duration of the mission. This category only includes the tasks that the astronauts will perform while wearing an exploration spacesuit and does not include any tasks that crews will perform inside the habitat or spacecraft.

What you can work on:

Below is a list of possible scenarios that teams can explore. This list is not all-inclusive, and you can create other potential scenarios not listed here. The scenarios will need to be realistic and solve an actual task the astronauts will need to perform on Mars to support their scientific tasks.

If you are developing a scenario, please consider that this challenge is about developing tasks for what are called Extravehicular Activities (EVA). EVAs are all activities performed outside the habitat and wearing an exploration spacesuit. We will not focus on any activity inside the habitat or spacecraft for this challenge. Scenarios may start from the moment the crew has exited the Habitat Airlock, or they may start anywhere on the surface of Mars (covered by the NASA XOSS MarsXR Engine). Teams will need to define if the scenarios are single or multiplayer modes. All scenarios should be undertaken with multiple crew members working as a team, and EVAs are never undertaken with a single crew member working by themselves.

If you are developing an asset, each asset developed will need to be used in single and multiplayer modes.

List of Potential Scenarios

1. Deploy the surface pressurized rover and manually/visually inspect the vehicle to prepare for use.
2. Locate the landing area of the robotic surface vehicle. Inspect the robotic surface vehicle to verify functionality. Test drive the robotic vehicle to verify functionality. (Option to include manual radio control via spacesuit)
3. Collect the required tools to install and connect a solar panel array. Setup and secure mechanical interfaces to panels, install cables and connectors according to a checklist. Test functionality of panel array. Once the test is completed, pick up tools and return them to storage.
4. Collect the toolboxes for the installation of fluid connections. Locate rolls of flexible tubing to run fluids from Habitat to the waste station, then connect all systems and perform a leak test. Once the test is completed, pick up tools and return them to storage.
5. Retrieve food/supplies from storage. Complete an inventory check of the supplies and stow them in the surface rover, to replenish consumables for additional operation.
6. To prepare for digging the foundation for storage modules or other types of modules, retrieve the excavation equipment from storage and move it to the appropriate location. Operate the excavation equipment to dig and level a hole one meter deep of the diameter/dimensions of a surface module. Once the task is complete, return the excavation equipment to its proper location.
7. Attach cables to solar panels, transformer, and surface habitat, to enable charging of batteries. Adjust solar-tracking mechanism on solar panel system, to achieve optimal solar cell performance.
8. Pick up cameras from storage. Obtain close-up images of habitat searching for possible issues on the structure of the living quarters. Once finished, pack all photographic and video equipment, and return to storage.
9. Configure and deploy communication antennas at a distance from the habitat. Setup and secure mechanical interfaces to antennas, install cables and connectors according to a checklist. Verify positioning/orientation of antennas and establishment of communications.

List of Potential Assets to Be Built By Teams

1. Tool Box for Electrical Systems with relevant components
2. Tool Box for Fluid Systems with relevant components
3. Trenching tool (electrical or manual)
4. Deployable solar panel arrays
5. Improved surface rover (visuals for inspection, functionality for operations)
6. Transport/cargo vehicles
7. Robotic/mechanical systems requiring human operation (i.e. heavy lift/hazardous operations)