

NASA MarsXR Challenge - Virtual Reality EVA Scenarios

Category - Maintenance

Once the astronauts have successfully set up camp, there will be a number of tasks they need to do to maintain their basecamp. These tasks are critical to crew safety and to keep their base operational for the duration of the mission.

For example, due to the dust storms on Mars, solar panels will need periodic cleaning. Astronauts will need to perform regular inspections of the modules, will need to replace old equipment, manage the waste they will produce on Mars, and do many other tasks which are required on a routine basis.

This category will include all the maintenance tasks astronauts will need to perform while on an EVA in order to keep the Mars Base infrastructure operational. This category does not include any tasks that the crew 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. Retrieve dust removal supplies and tools from the tools stowage box located outside of the habitat. To maintain optimal visibility, manually remove accumulated dust from surface rover windows. Inspect external windows of the habitat and clean where necessary. Once the task is finished, collect all tools and supplies and return them to storage.
2. Conduct troubleshooting of electrical systems due to an interruption of power to the habitat. Using schematics and following proper procedures, visually detect the failure. Then manually repair it using appropriate tools and equipment so that power to the habitat is restored. Once the repair is complete, collect all tools and equipment and return them to storage.
3. Collect all tools and equipment necessary to place a protective cover on top of weather scientific instruments located on the Mars surface. Since wind is moving dust into the instrument and affecting its performance, it is necessary to protect it with a top cover or tarp. Manually pound stakes through protecting cover eyelets, using the sliding hammer, to secure the cover over the instruments. Once the task is complete, collect all tools and equipment and return them to storage.
4. Retrieve tools and equipment for the installation of an antenna system, including all connecting cables. Manually deploy the surface antenna and attach cable connectors to both the antenna and the habitat. Perform systems check and self-orientation of the antenna system. Once the task is complete, collect all tools and equipment and return them to storage.
5. Connect cables/plumbing from a pre-positioned thermal control system to a surface module, to enable heat radiation. Activate controls to initiate the thermal control system.

List of Potential Assets

1. High-vacuum pump
2. Climb ladder or structures
3. Tools to remove simulated Mars regolith from surfaces (spacesuit, rover, solar panels, etc.)
4. Robotic inspection system
5. Enhance the physics different “cables” (movement and interaction)
6. Electrical/fluid connectors
7. Weather scientific instruments
8. Thermal control system
9. Antenna system
10. Protective elements (e.g. Micrometeoroids and Orbital Debris (MMOD) or Dust/Heat shields)