NASA MarsXR Challenge - Virtual Reality EVA Scenarios

Category - Scientific Research

The most important reason why humans are going to Mars is to explore and conduct scientific research.

This category covers all the scientific-related tasks and operations necessary to accomplish the objectives of a mission. This could include all the tasks specific to geological surveys, the search for signs of past life, atmospheric and weather research, or any other research activities that are performed during extravehicular activities (EVAs).

This category does not include any scientific tasks that the crews will perform inside the habitat or spacecraft and only addresses the scientific tasks that the astronauts will perform while wearing an exploration spacesuit.

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 geological tools and equipment from storage, and load them into a tool cart/wagon to prepare for geological research. Control the tool cart for a short distance and unload the tools needed to carry out a rock sample survey.
2. Retrieve the magnetometer from storage and carry it to the research location nearby. Deploy magnetometer as part of geological research test. Record the results and then return all tools and instruments to storage.
3. Retrieve cosmic radiation dosimeters from storage and deploy them nearby. Measure radiation and record the results. Once completed, return the dosimeters to storage.
4. Remove drilling equipment from the storage toolbox. Connect batteries, test, connect drill bit to drill. Extract sedimentary core from drill and package core sample in plastic wrap, for later analysis. Pack all tools and store them. Return the packaged samples to the sample collection box.
5. Pick up cameras from storage. Operate camera to record still and video images of planetary surface/surroundings. Change lenses on cameras and change position frequently to obtain landscape images of the area surrounding the habitat. Once finished, pack all photographic and video equipment, and return to storage.
6. Deploy gravitometer manually to record gravitational data. Record the results and then return all tools and instruments to storage.
7. Retrieve seismic testing equipment from storage. Then pound seismometers into rock, manually using a slide hammer to deploy sensors. Attach wire connectors to seismometer and to receiving terminal, to prepare for recording seismographic data.
8. Deploy temperature sensors (heat-flow probes). Record the results and then return all tools and instruments to storage
9. Inspect geologic samples, visually using a hand-held magnifying tool/microscope, to conduct preliminary analysis. Record the results and then return all tools and instruments to storage.

List of Potential Assets to Be Built By Teams

1. Pipe Drill - for shallow core samples.
2. Alternate lenses for the camera
3. Rotary/Percussion Drill - for deep drilling
4. Thumper
5. Slide hammer
6. Radiation Dosimeters
7. Temperature sensors
8. Tool cart / Wagon
9. Gravitometer
10. Hand-held magnifying tool/microscope
11. Remote rover sample collection by a human operator
12. Soil sample collection (different from hammer & rock chip or core drill sample collection)