AstroVerse

[Active Dust Response VR Simulation]

Storyboard Description

Dust storms on Mars can be incredibly dangerous for any potential human mission to the planet. The dust can cause damage to equipment and can also accumulate on the surface of spacecraft and rovers, reducing their efficiency and potentially causing them to malfunction.

If humans are to reach Mars, it would need to be during the perihelion orbit period when Mars is closest to the sun and the Earth. However, this poses a significant problem as Mars receives up to 40% more solar energy during this period, increasing the frequency and intensity of these storms, which are caused by the amount of solar energy absorbed and released by the planet.

This goal of this storyboard is to train astronauts in preventing and resolving potential hazards caused by dust storms and dust devils on Mars. The simulation will analyze the judgment of the astronaut and the capability to adapt to intense situations. The astronaut will be required to predict such storms using available data from Martian satellites, take preventative measures, prioritize the safety of research specimens, communicate efficiently to the crew, and finally service machines in high dust concentration environments.

The simulation will also analyze the astronaut's creativity and capability to introduce redundancy by simulating unforeseen circumstances like power outages and communication disruptions.

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Assets Available in this Storyboard

Raw Assets:

1. Data from Optical Depth Columns
2. Extendable pressurized air and water jets
3. Particulate dust with a diameter of 3 micrometers (*μM)*
4. Microfiber film protective covering
5. Mobile Communication Device
6. Cryo-coolers and Mars Sample Return Canisters
7. Laser Range Finder (Type: Time Pulsed)
8. (Mars-Adjusted) Microstrands Dust Brush
9. Silicon Based Photovoltaic (Solar) Cells
10. Martian Payloads and Deployable instruments

Physics & Environment:

1. Miro-Pressure simulation through skeletal constraints.
2. Dusty ambient atmosphere of marsh limiting vision, dust storms and dust devils.
3. Martian wind speeds of 60 miles/hour
4. MRO, MCS, THEMIS data and camera views.
5. Multiplayer capability with communication interpreters.
6. Different geospatial anomalities and locations: impact craters, valleys, dunes, and polar ice caps.

Actions Executable in this Storyboard

1. Check data of dust optical depth columns from the satellite instruments like the MCS (Mars Climate Sounder), MRO (Mars reconnaissance orbiter), and THEMIS (thermal emission spectrometer) through a mobile communication device to successfully predict impending dust storms and dust devils.
2. In case of a predicted danger, begin the preventative procedures: Sand bathing of solar panels, adding of a thin layer of microfiber protective film over sensitive machinery, securing EVA vehicles, checking for external hull breaches, and temporarily disengaging most critical equipment.
3. Safely secure critical research specimens in appropriate storage units like vacuum-sealed cryo-coolers or Mars Sample Return (MSR) canisters for prevention against breach of microparticles.
4. Commence post-storm recovery scenario, inspection of all mechanical instruments and analyzing potential breaches. Conduct tests to check efficiency. Wash instruments through pressurized water and air dual jets to clear residue dust particles.
5. Redeploy additional systems and machinery, service and repair compromised instruments delicately and void any fine dust particles.

Frame Descriptions

1. Astronaut monitoring satellite data on a mobile communication device to predict dust storms.
   Potential Failure Point: Mobile communication device might fail to establish a reliable connection with the satellite instrument
2. Astronaut taking preventative measures by covering the solar panels with protective film.
   Potential Failure Point: The astronaut might fail to initiate preventative procedures promptly after predicting a danger, resulting in severe damage to sensitive machinery or equipment.
3. Astronaut securing the research specimens inside cryo-coolers and MRS Canisters
   Potential Failure Point: Astronaut might mishandle the specimens during the storage process leading to damage or loss of the specimens.
4. Astronaut conducting the post-storm recovery tasks, by vacuum cleaning the dust residue from the EVA vehicle.
   Potential Failure Point: The pressurized water and air dual jets might fail to clear all residue dust particles, leading to further contamination or malfunction of instruments or equipment.
5. Astronaut servicing compromised machines carefully of disruptive dust particles.
   Potential Failure Point: If the astronauts are not careful in servicing and repairing compromised instruments, they may inadvertently introduce fine dust particles or cause further damage, rendering the instruments unusable.