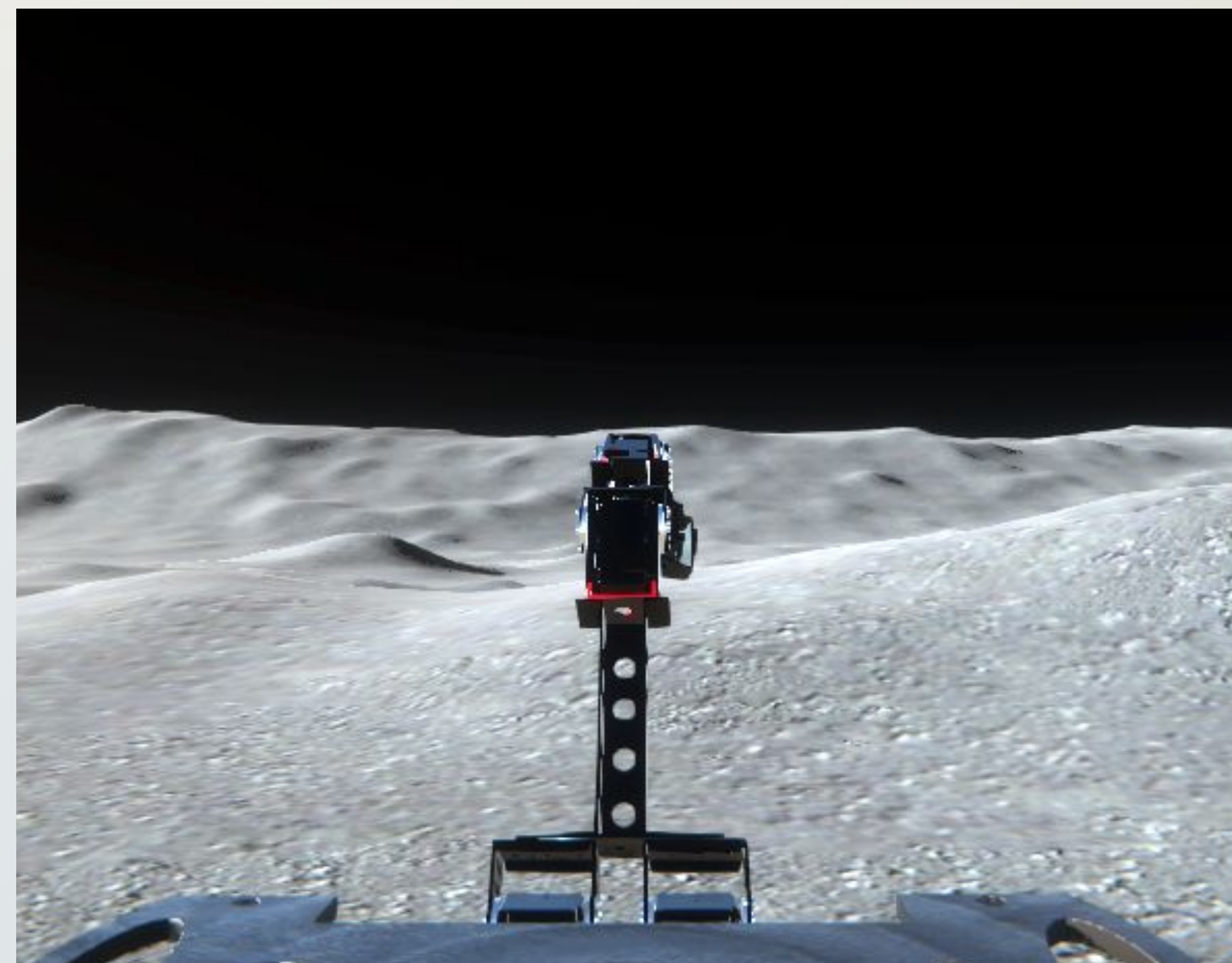
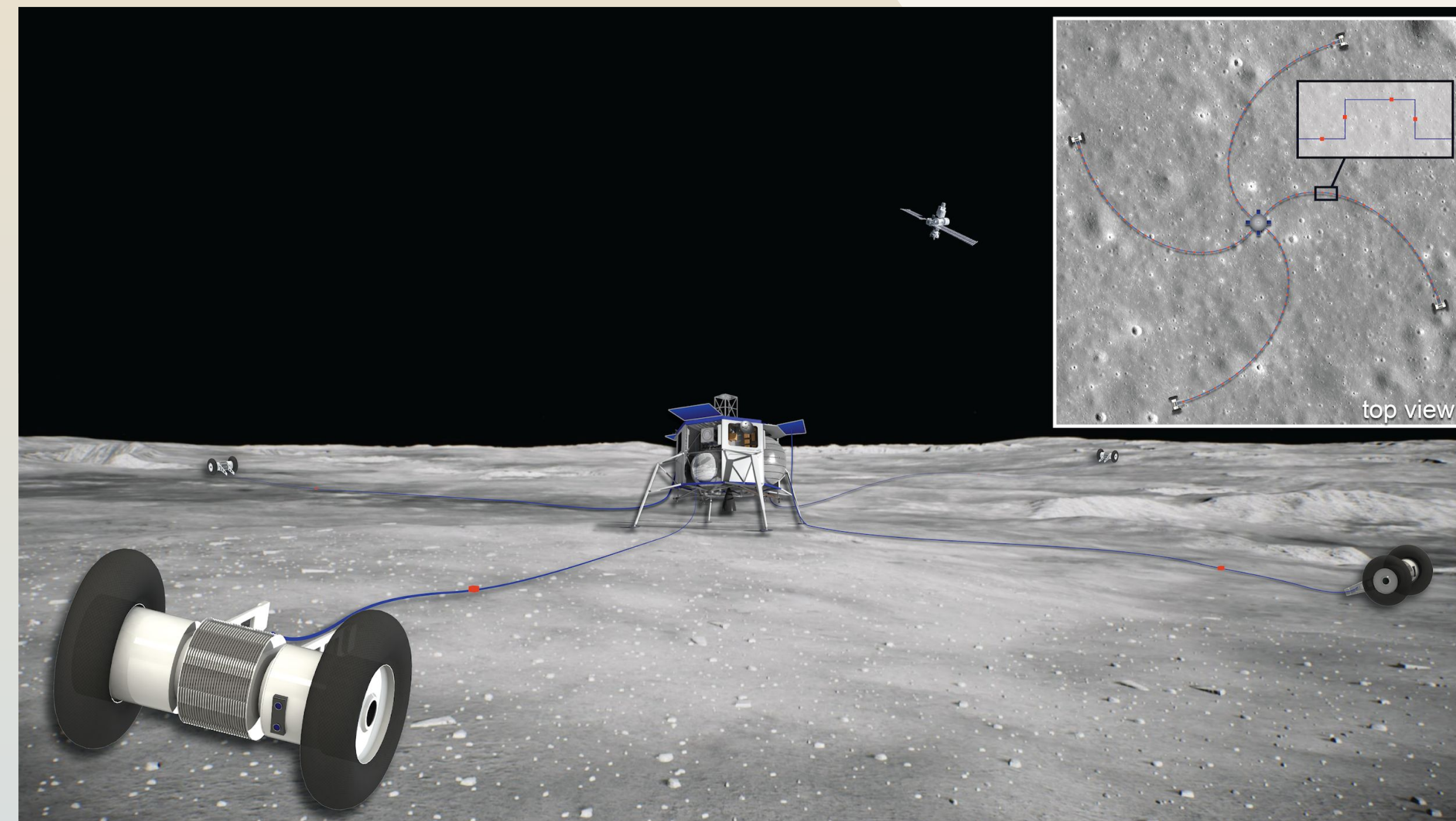
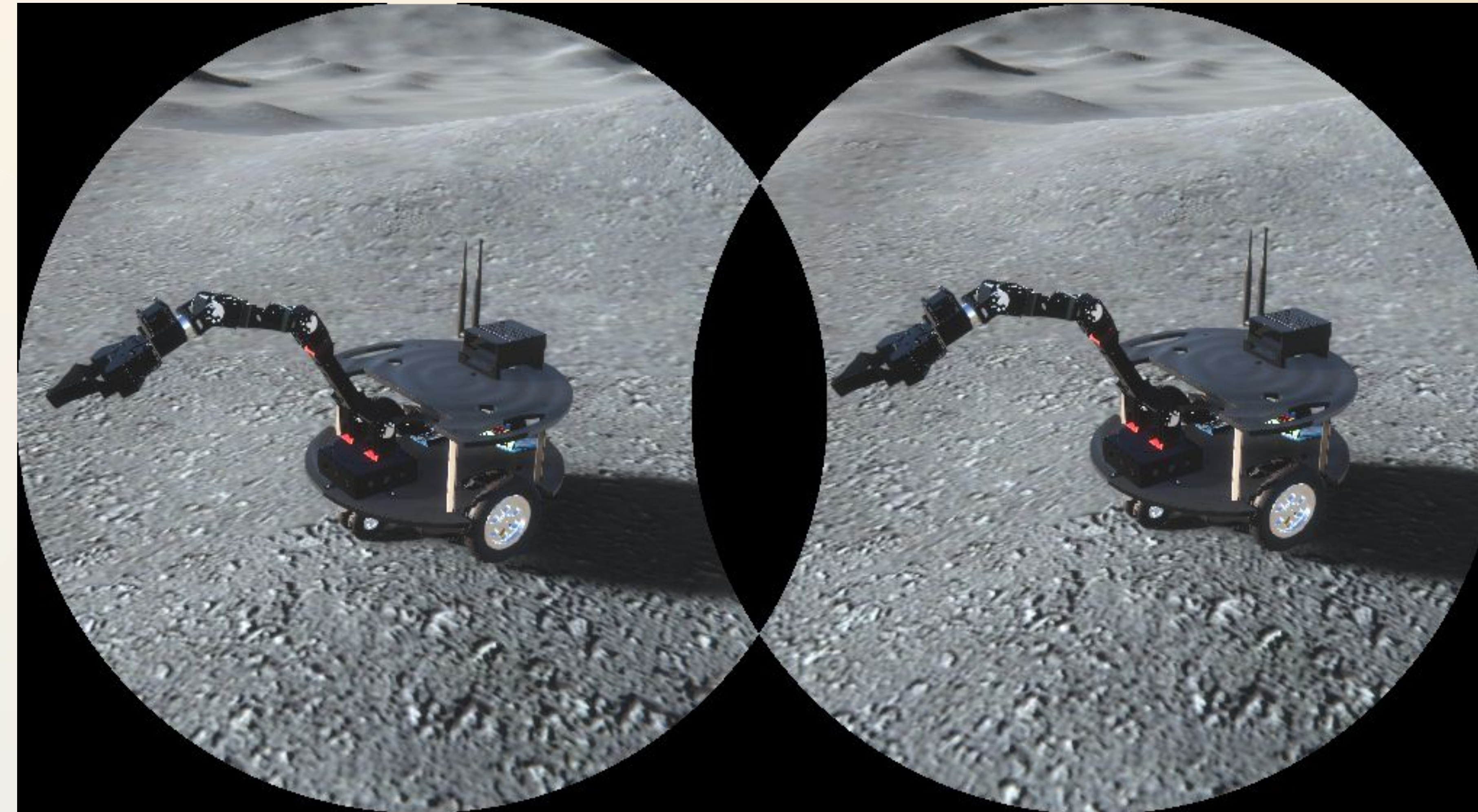


# Telerobotic Deployment Strategies for Lunar Radio Arrays

M. Bell, P. Curlin, J. Burns



University of Colorado  
Boulder

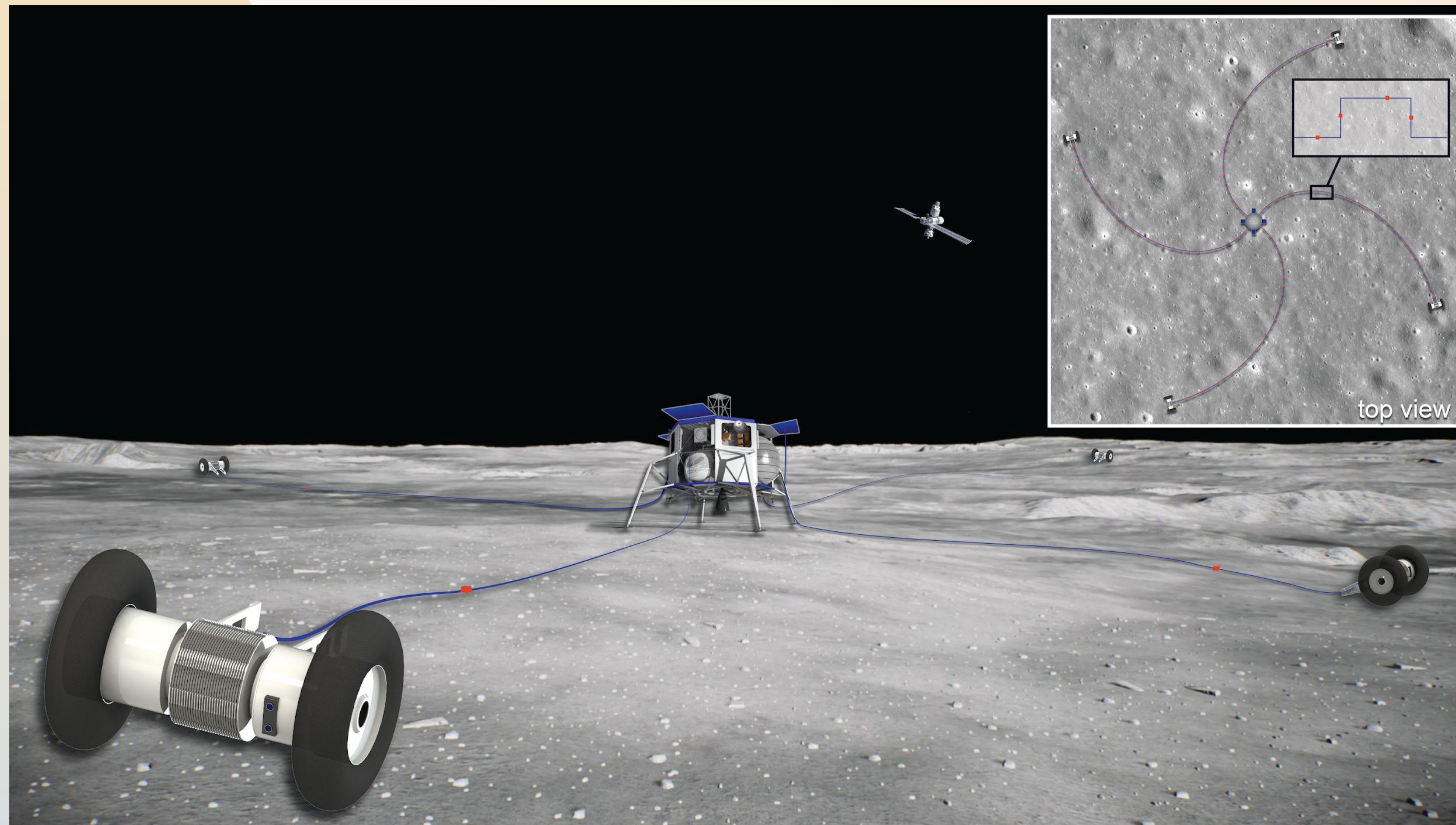


This work is directly supported by the NASA Solar System Exploration Virtual Institute cooperative agreement 80ARC017M0006.

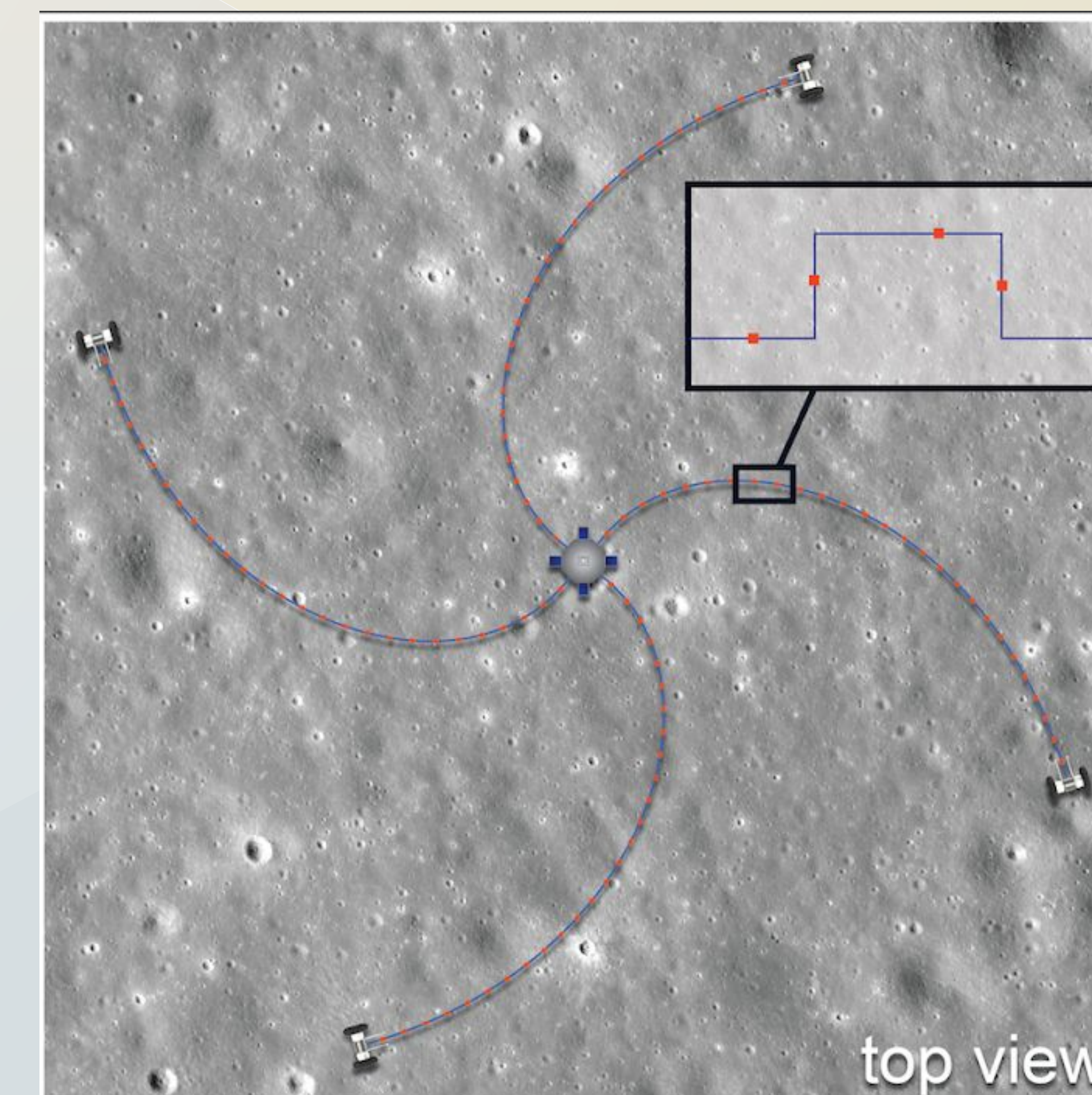


# FARSIDE: Radio Observations from the Moon

## A call for Teleoperation



FARSIDE, a NASA-funded concept that would place a low radio frequency interferometric array on the far side of the Moon. (Burns)



JPL Axel rover depicted laying down polyimide tether. This application aligns with the goals proposed by FARSIDE (Matthews & Nesnas)



# Enhancing Astronaut Teleoperation

## Autonomous Failure Recovery

- Human-Robot collaboration
  - Enhancing operator success at the point of autonomous failure
- Telepresence
  - Depth provides greater situation awareness

ZED-Mini stereo camera  
(Stereo Labs)



Stereo imaging supports the virtual recreation of the robot's environment.

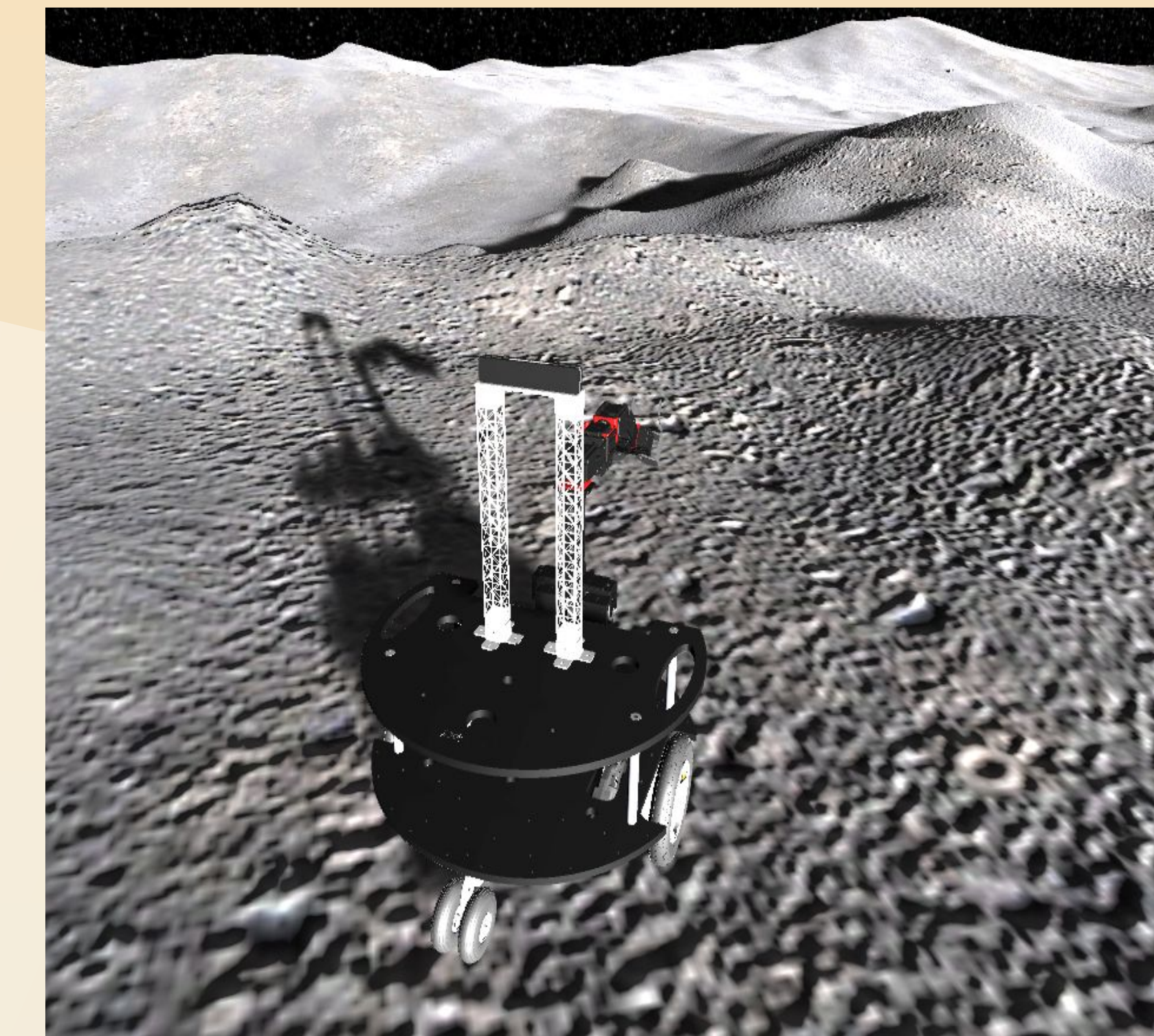
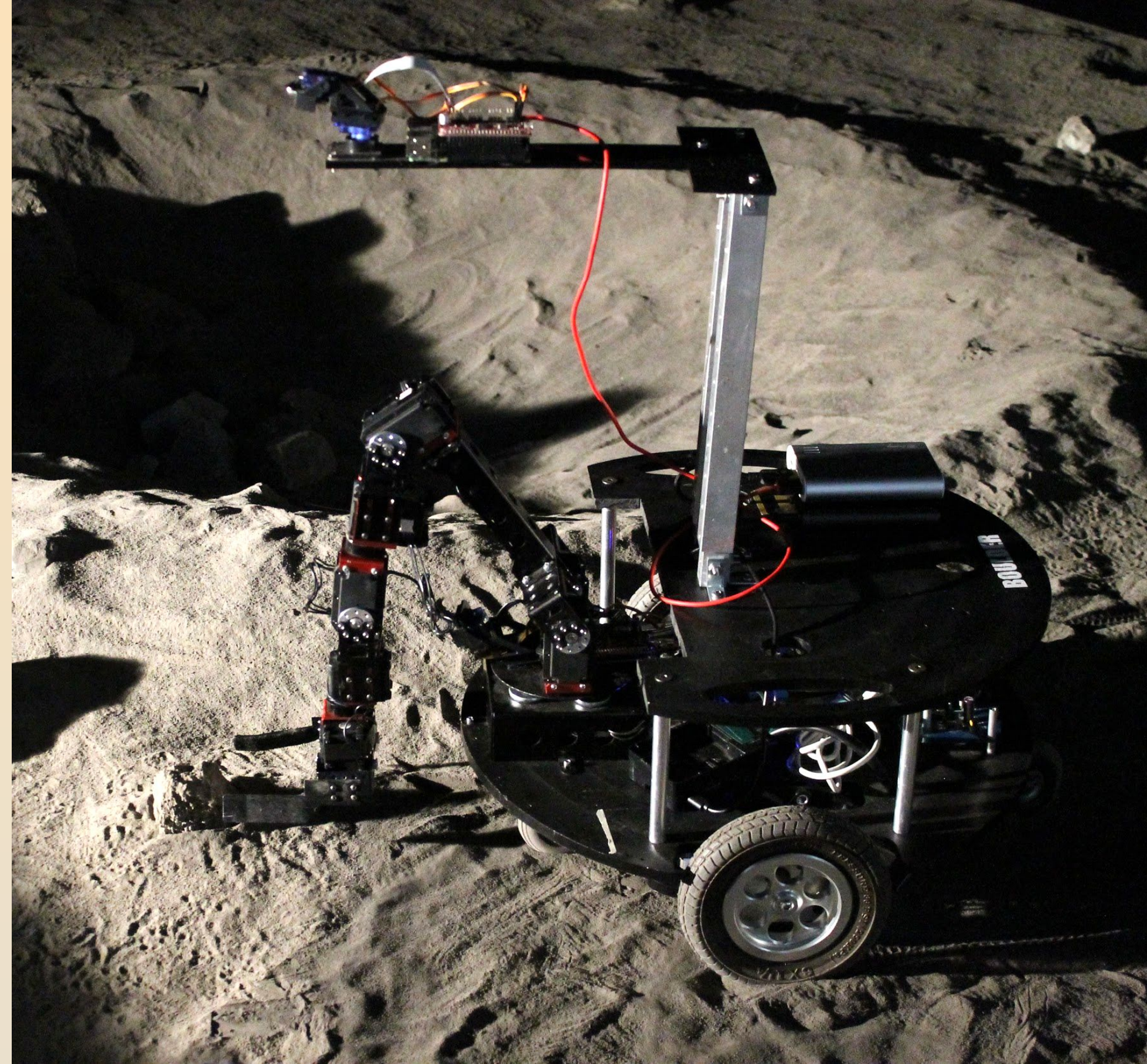


NASA's Mars Yard,  
used for the  
physical replication  
of the Mars Rover's  
state and  
environment





# Our Response - Virtual Recovery Sandbox



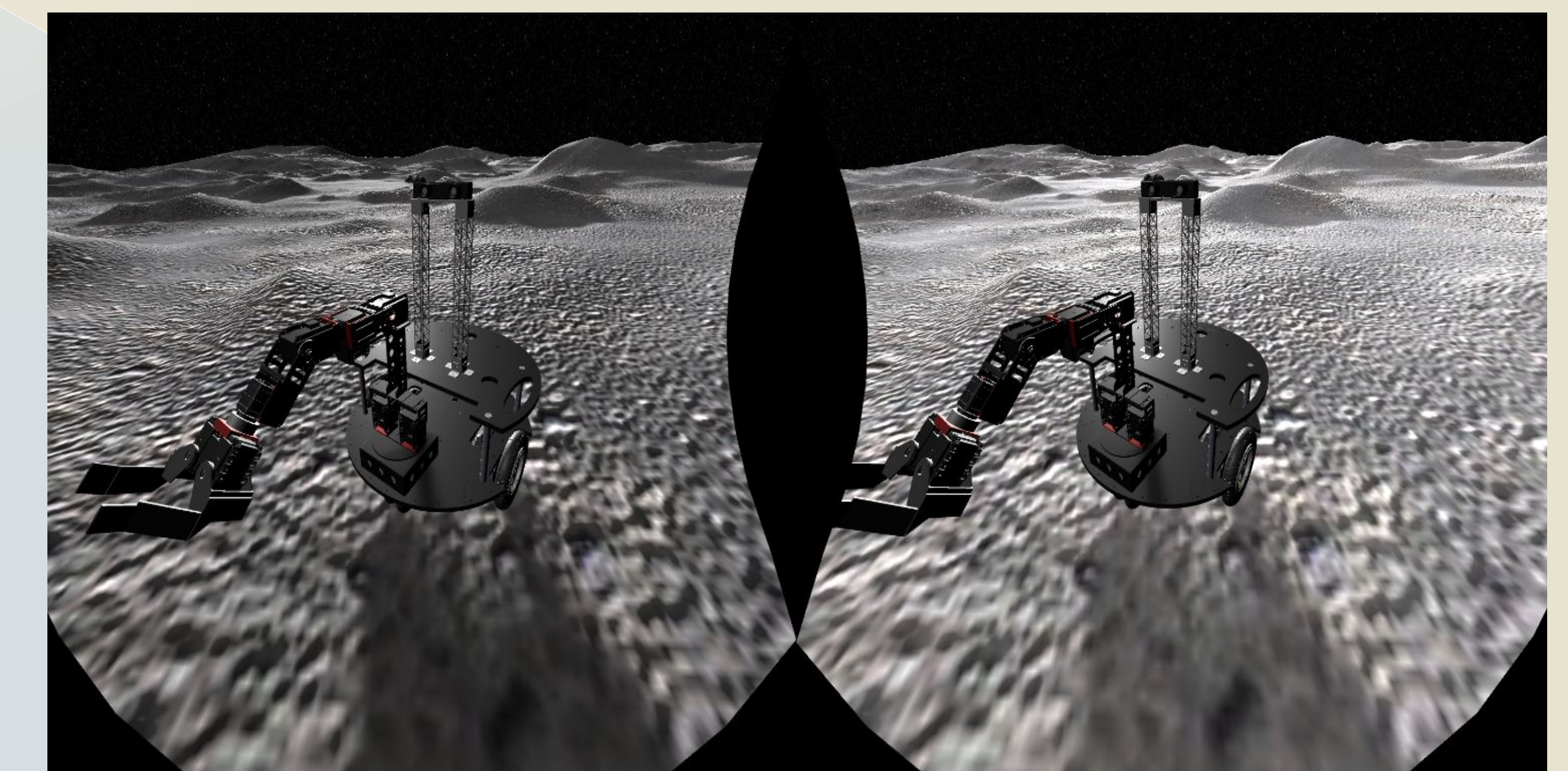
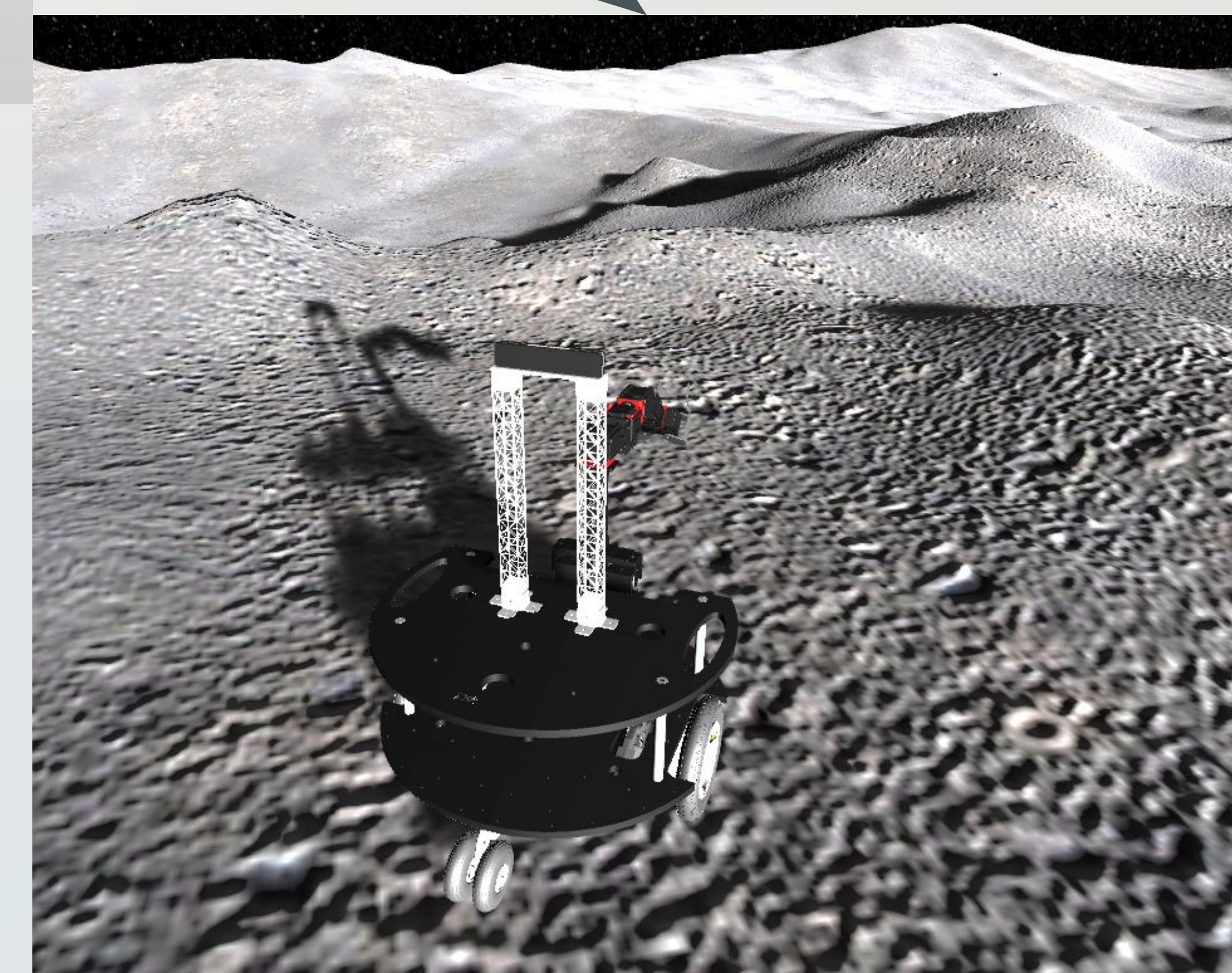
## Exocentric Observation

- Free-Moving 3rd Person Perspective
- Failure Assessment



## Egocentric Control

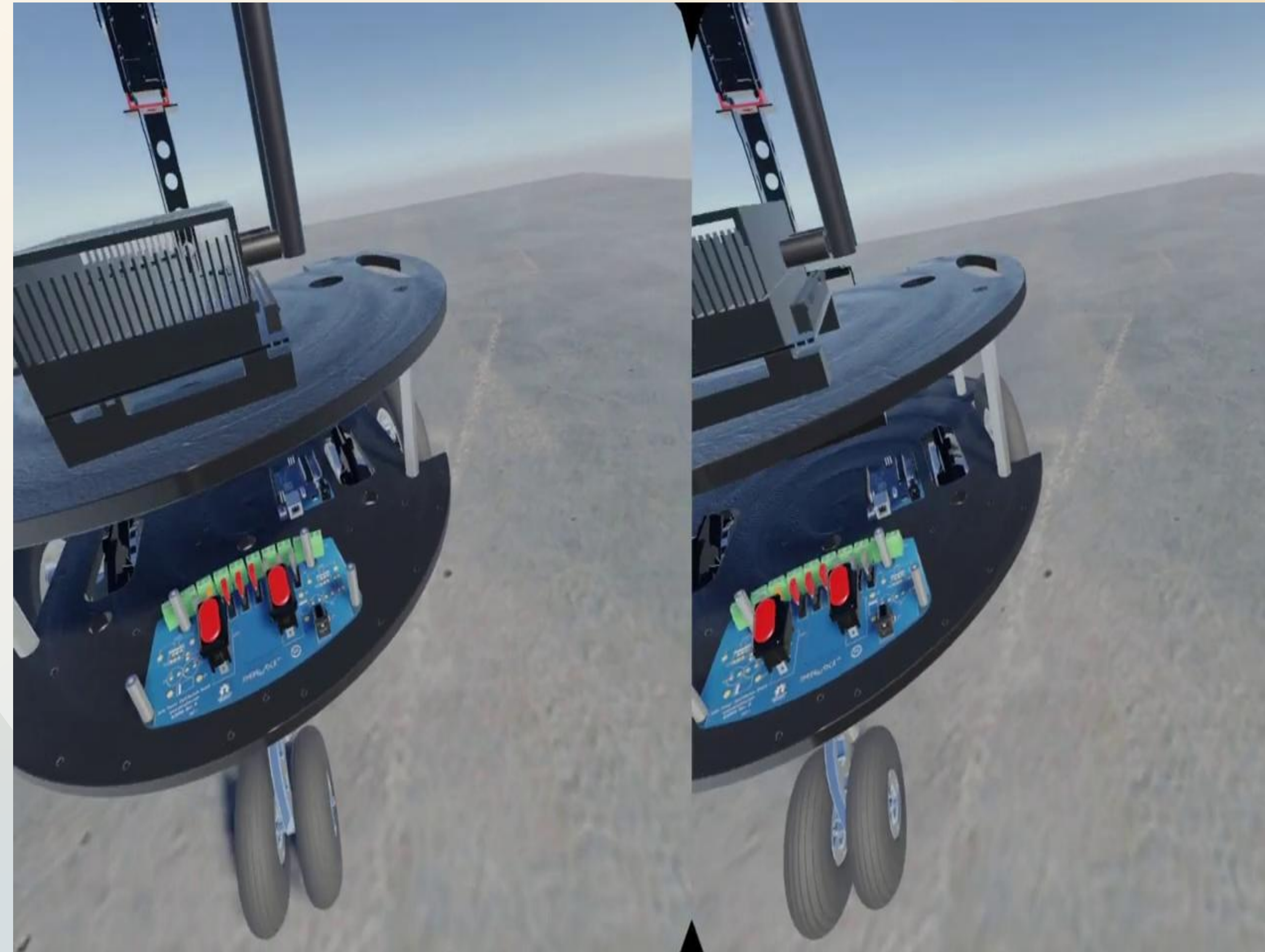
- VR Headset viewing through the “eyes” of the virtual rover
- Solution Development
- Rover Manipulation



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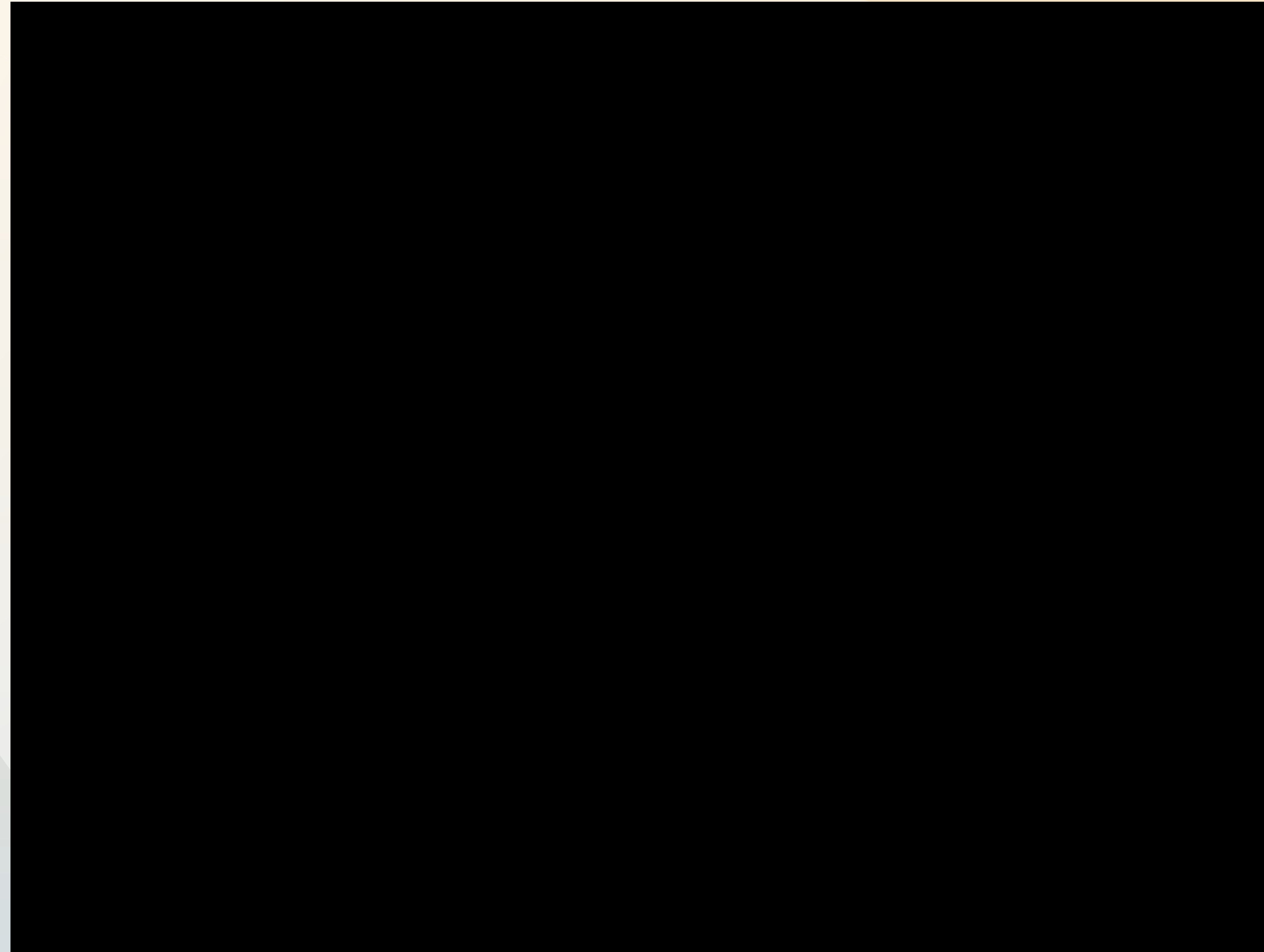


# Demo - Virtual Developments





# Demo - Physical Developments

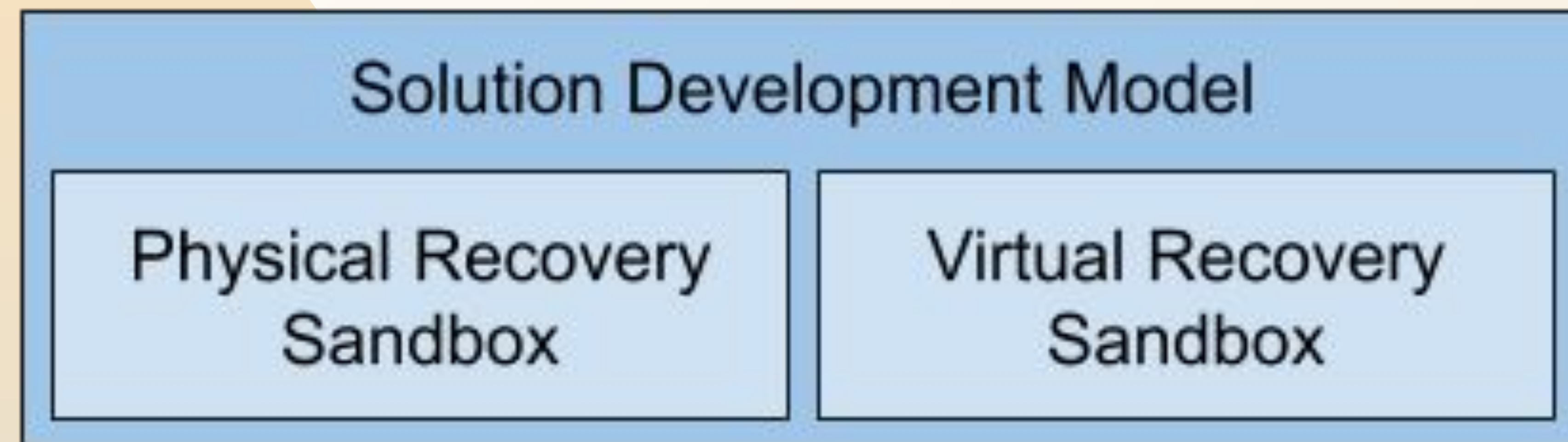


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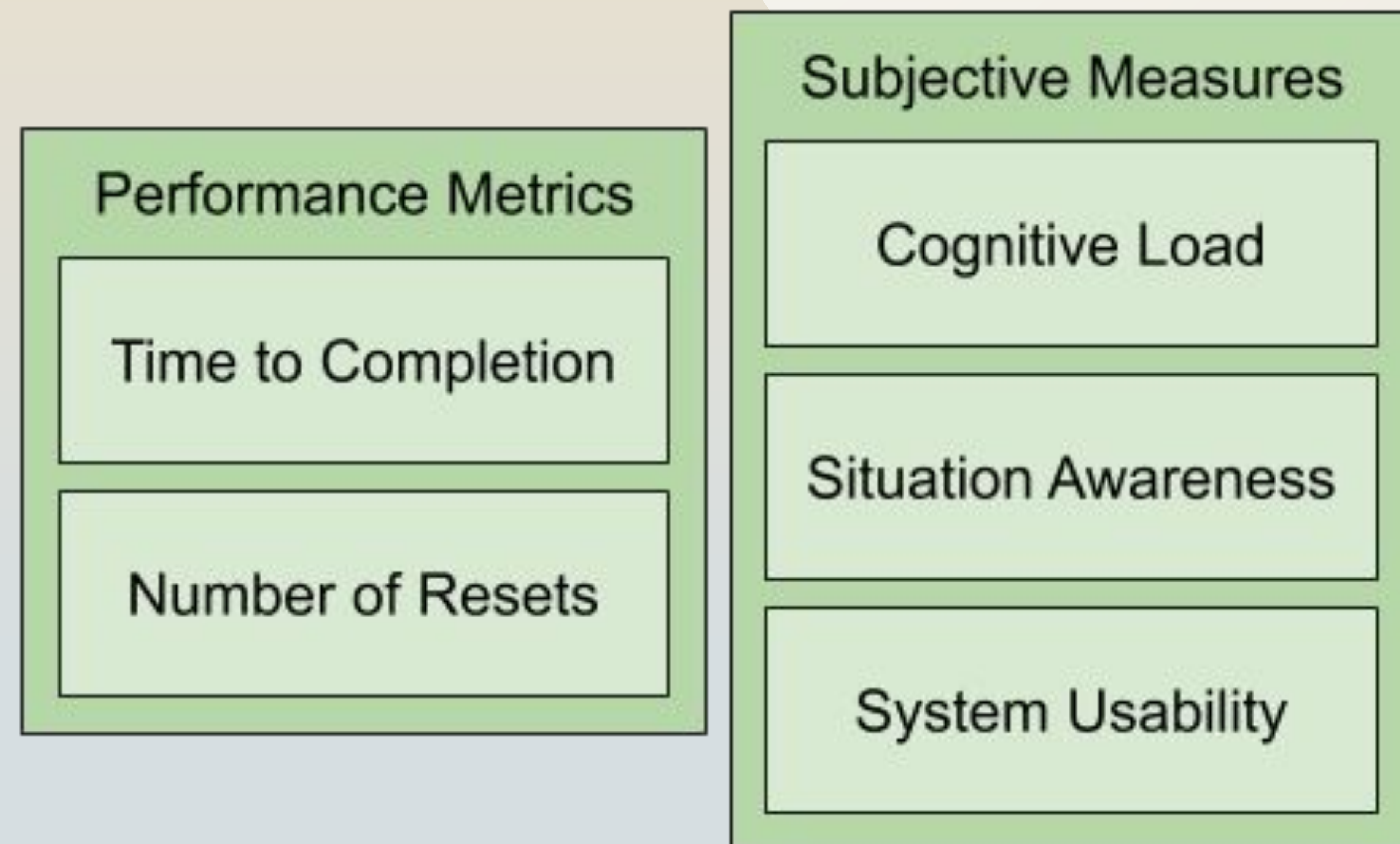


# Our Experiment

## Independent Variables (Factors)



## Dependent Variables (Response Variables)

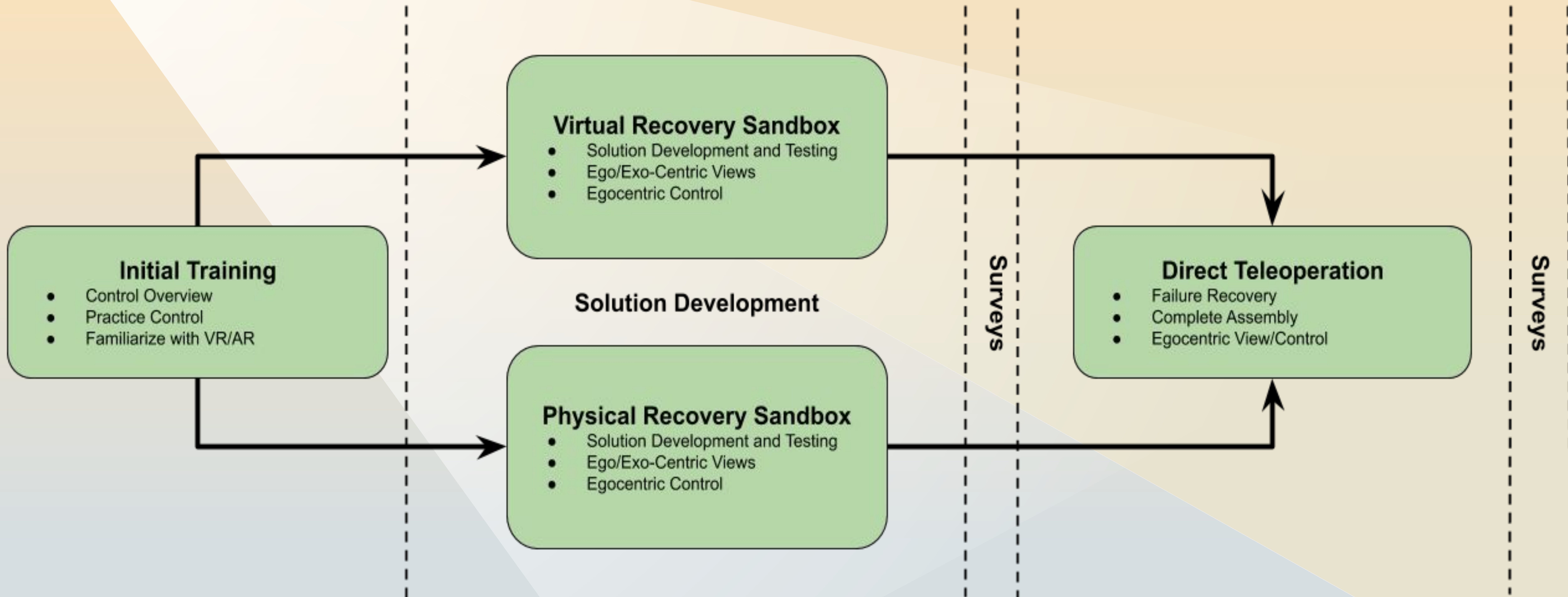


## Experiment Goals

- Provide methods of autonomous failure recovery through collaborative control
- Validate effectiveness of Virtual Recovery Sandbox
- Enhance Operator telepresence
- Enhancing operator success at the point of autonomous failure



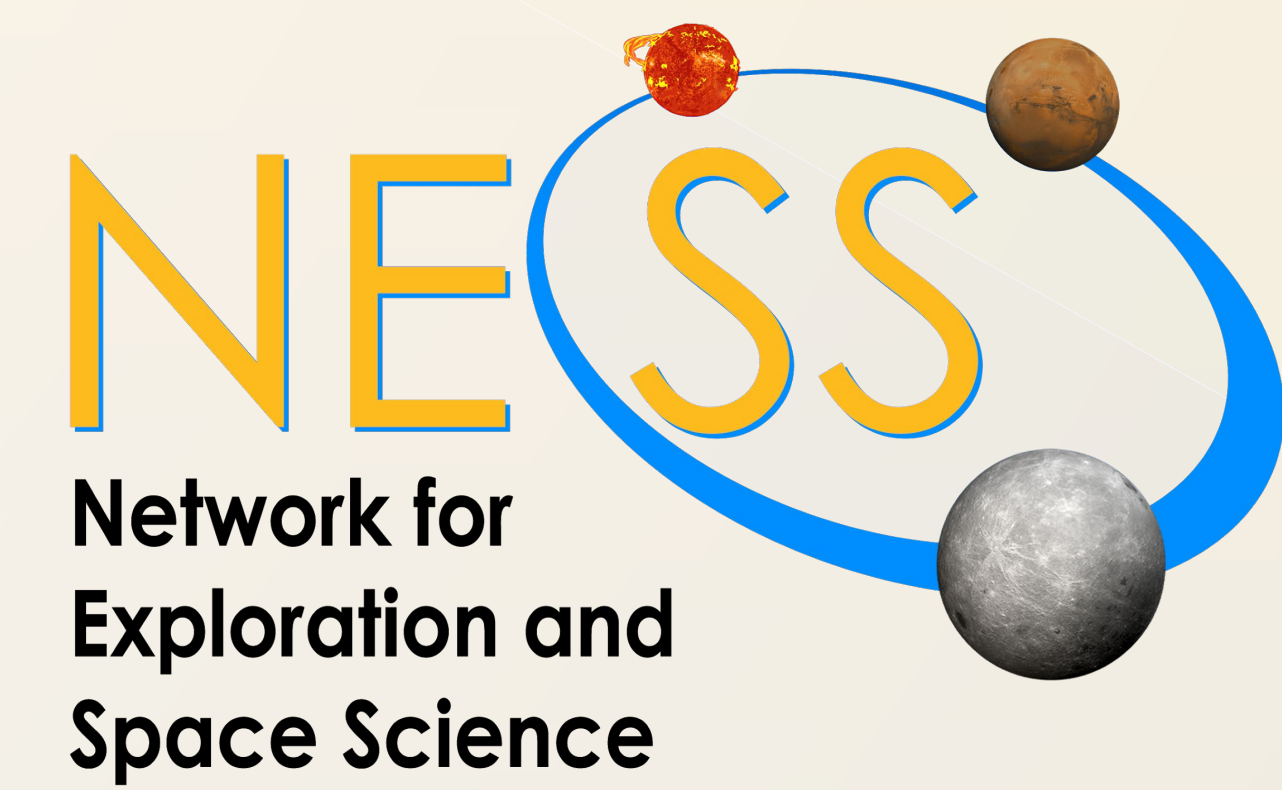
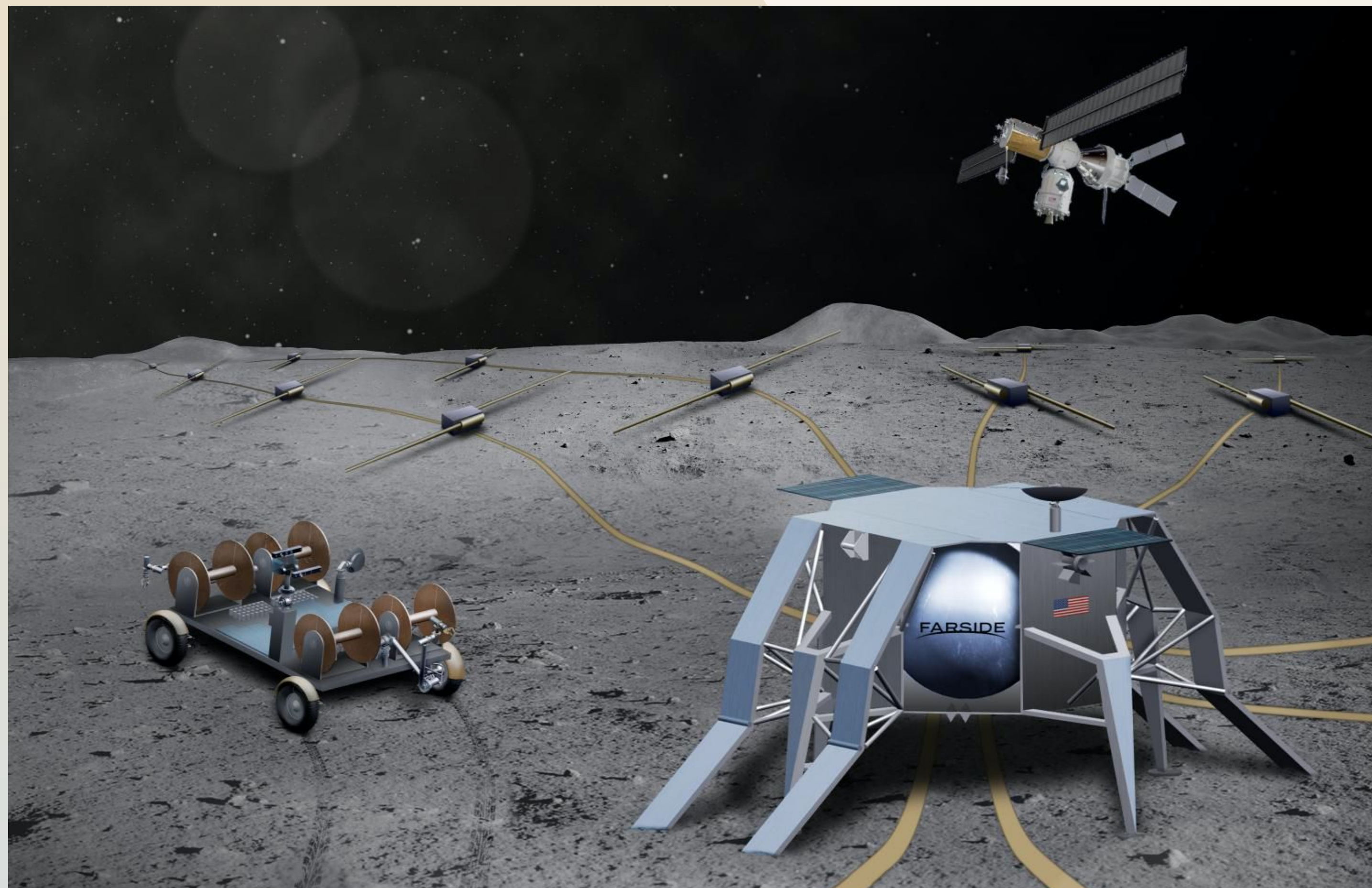
# Our Experiment



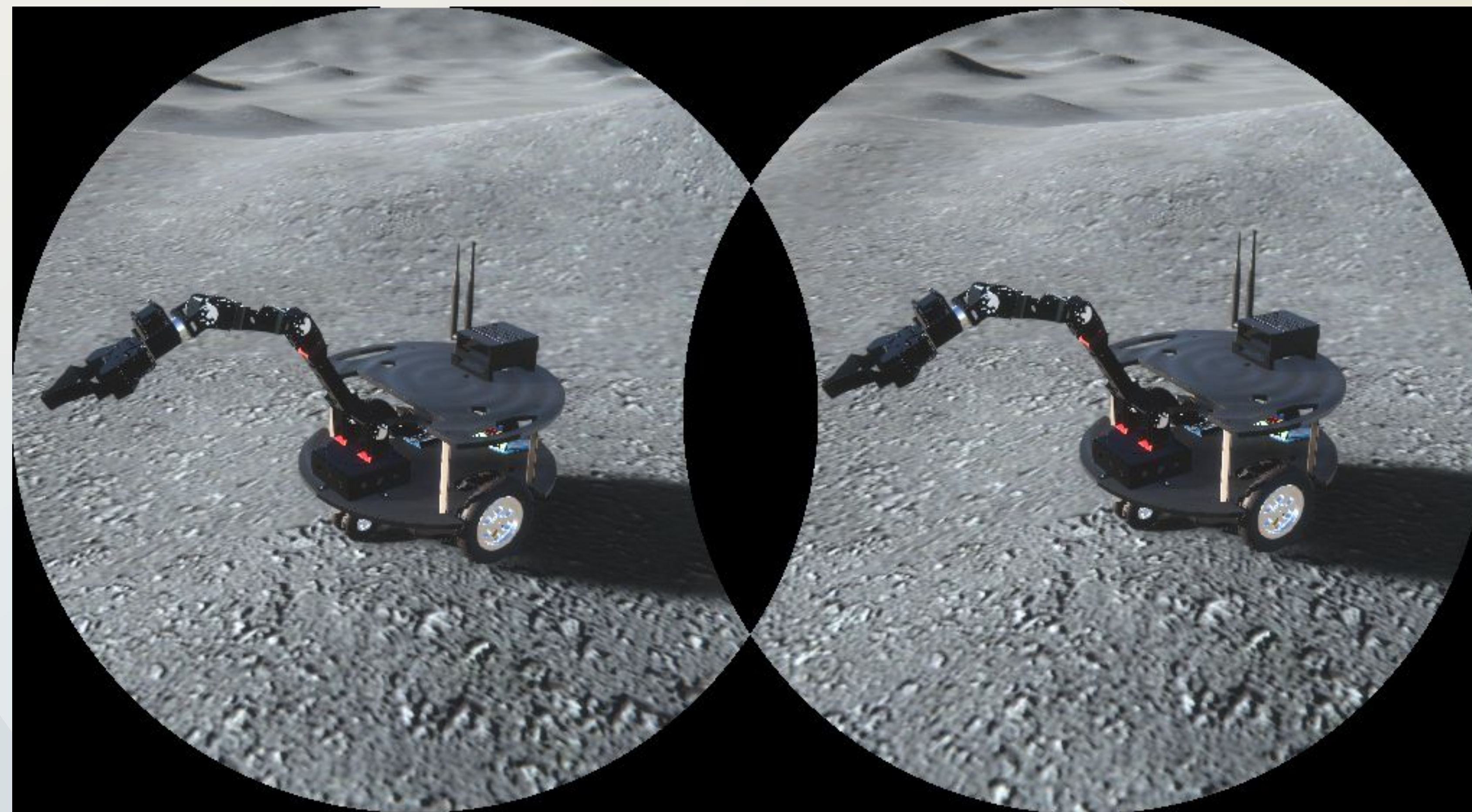


# Thank You!

## Questions?



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