

27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)  
Interactive Presentations - 27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR  
SYSTEM (IP)

Author: Mr. Baladitya Rane  
Vellore Institute of Technology, India

Mr. Jay Singhi  
Sikkim Manipal Institute of Technology, India

Ms. Flora Vyas  
Vellore Institute of Technology, India

SIMULATION-DRIVEN MARS EXPLORATION: ADVANCING MARS COLONIZATION THROUGH  
STRATEGIC PLANNING AND CUTTING-EDGE TECHNOLOGIES

**Abstract**

This paper presents a strategic blueprint for establishing human presence on Mars, employing a meticulously phased approach leveraging cutting-edge technologies and advanced simulations. Initially, a fleet of small-scale satellites and rovers will be deployed to meticulously map potential settlement sites on Mars, considering factors such as resource availability and environmental suitability for space architecture. Subsequently, the mapped area will be replicated within a sophisticated simulation environment, precisely mirroring Martian environmental parameters. Incorporating human-like subjects into this simulation will facilitate the collection of invaluable data regarding astronaut behavior under simulated Martian conditions. Concurrently, the design and testing of Martian architecture capable of withstanding the planet's harsh environment will be undertaken, with prototypes installed within the simulation for rigorous evaluation. Upon successful validation of the simulation setup, human-like test subjects will inhabit the simulated Martian environment, providing invaluable insights into long-term habitation challenges and mitigating potential mission risks. This staged simulation process serves as a crucial preparatory phase, significantly reducing the likelihood of casualties during the actual mission. Ultimately, the success of the simulation will serve as a pivotal milestone, determining the readiness for human deployment to Mars. Should the simulation prove successful, a comparable mission involving the transportation of humans and essential materials to the Martian surface will be executed. Alternatively, any identified deficiencies in structure design or environmental adaptation will be rectified to ensure the viability of human settlement on Mars. This comprehensive approach underscores our commitment to meticulous planning and technological innovation in realizing the monumental endeavor of human exploration and habitation beyond Earth.