HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
Joint Session on Human and Robotic Partnerships to Realise Space Exploration Goals (3-B3.6)

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MARS-X: HUMAN EXPLORATION OF MARS FROM MARTIAN ORBIT

Abstract

It is important for the advancement of the human species to leave the cradle of Earth and extend human presence to the rest of the Solar System and beyond. Twenty seven graduate students have come together at the International Space University to research manned exploration of Mars from Martian orbit. The team is highly diverse with students from sixteen countries collaborating in an international, interdisciplinary and intercultural (3i's) way. The Mars-X project identifies the problems associated with sending humans to a Martian moon and returning them safely to Earth. A framework is suggested for addressing these challenges by proposing an alternative to the International Space Exploration Coordination Group's (ISECG) Global Exploration Roadmap. This alternative advises going to Phobos as a preliminary step to explore Mars, instead of missions to the Moon and Near-Earth Asteroids.

The Red Planet is located at an enticing distance from the Earth and possesses characteristics which make it an appealing destination for the advancement of human space exploration. There are many drivers behind this endeavor including: scientific experimentation, technological advancement and in-situ resource utilization. The proposed mission is an intermediate step towards setting foot on Mars' surface to develop and enhance preparations for future missions.

Mars-X focuses on investigating whether all the technologies required for a manned mission to Mars can be tested on a single mission to Phobos. For the mission to achieve two months in orbit around Mars, a three-phase launch architecture is proposed, with the first phase launching in 2025. Mars-X outlines how technologies such as nuclear thermal propulsion, advanced radiation shielding, tele-operation of robotics, and artificial gravity will help achieve the goals of this mission. It also provides initial research into exciting potential future technologies including 3D printing for space missions, and in-situ resource utilization of

Phobos, possibly leading to future applications on Mars. Political, legal, ethical, and economic aspects such as fundraising through Public Private Partnerships are addressed. The potential for involvement of spacefaring nations in this international venture is also discussed. Investigating the Mars-X mission from the 3i's approach is vital for its success. Therefore, Mars-X brings a unique perspective to the challenge of advancing human exploration throughout space.