

Exploration of Mars (08)
Mars Sample Return and Human Exploration (2)

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ALTERNATIVE STRATEGIES FOR EXPLORING MARS AND THE MOONS OF MARS

Abstract

The human exploration of Mars represents one of civilizations next major challenges and is an enterprise that would confirm the potential of humans to leave our home planet system and make our way deep outward into the cosmos. As exploration endeavors begin to set sights beyond low-Earth orbit, exploration of the surface of Mars continues to serve as the “horizon destination” to help focus technology development and research efforts. Recent thoughts on exploration follow a “flexible path” approach beginning with missions which do not extend down into planetary gravity wells including surface exploration. Consistent with that flexible path strategy is the notion of exploring the moons of Mars, namely Phobos and Deimos, prior to exploring the surface. The premise behind this thought is that exploring Mars’ moons would be less costly and risky since these missions would avoid the difficulties associated with landing on the surface and subsequent ascent back to orbit. But without a complete strategic assessment this strategy could lead to wrong conclusions.

This paper examines the strategic implications of human exploration of the moons of Mars as a prelude to surface exploration. Various operational concepts for Phobos and Deimos exploration that include the infusion of different propulsion technologies are assessed in terms of mission duration, technologies required, overall risk and difficulty, and operational construct. Finally, the strategic implications of each concept are assessed to determine the overall key challenges and strategic links to other key exploration destinations.