

Rationale and concepts for robotic and human outposts on Phobos

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Abstract

The surfaces of the Martian moons, Phobos and Deimos, may offer a stable environment for long-term operation of platforms. We present a broad assessment of the potential scientific; strategic and operational opportunities for such platforms.

Objectives include:

- 1) Monitoring and scientific investigations of Mars' surface and atmosphere;
- 2) Scientific investigations of the Martian moons;
- 3) Monitoring and scientific investigations of the space environment;
- 4) Use as data relay for Mars surface assets or interplanetary missions;
- 5) Use in a Mars positioning system;
- 6) Investigations for in-situ resource exploitation and precursor human or robotic based station.

The SPICE software environment (developed by NASA's Navigation and Ancillary Information Facility [NAIF]) allows calculations using orbital elements and incorporates a recently published digital shape model of Phobos, developed from observations by Mars Express' High Resolution Stereo Camera (HRSC). We present results from SPICE calculations performed as a function of location on Phobos, to help answer questions stemming from the above objectives for a study period throughout 2030. By combining and weighting results from these calculations, we present a basic trade study to optimise the location of a platform over Phobos' surface. Future studies that build on these results should incorporate constraints of a platform design, e.g. considering also including thermal environment, power requirements, and link budget constraints.

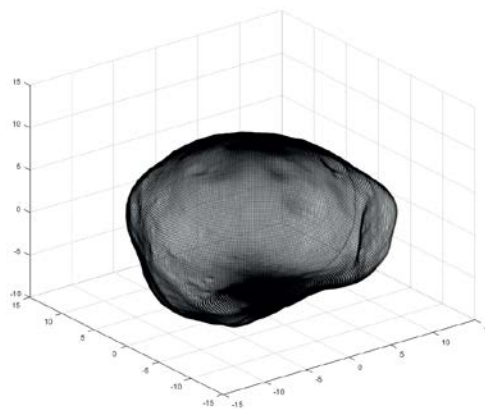


Figure: Digital shape model of Phobos