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Mars Sample Return Utilizing the Capabilities of the Heavy Lift Launch Vehicle

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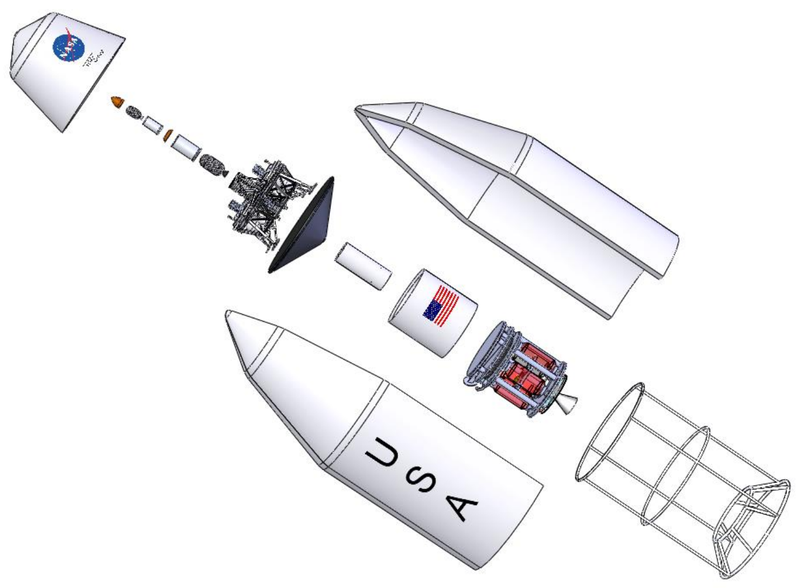
Integrated Product Team

Science Objectives

- Determine the chemical, mineralogical, and isotopic composition of the crustal reservoirs
- Constrain the absolute ages of major Martian crustal geologic processes
- Constrain the mechanism and timing of planetary accretion, differentiation, and evolution
- Determine how the Martian regolith was formed and modified
- Characterize the risks to future human explorers in the area of biohazards, material toxicity, and dust/granular materials
- Interpret the initial composition of the Martian atmosphere
- Determine the age, geochemistry, conditions of formation, and evolution of Martian climate-modulated polar deposits

Mission Overview

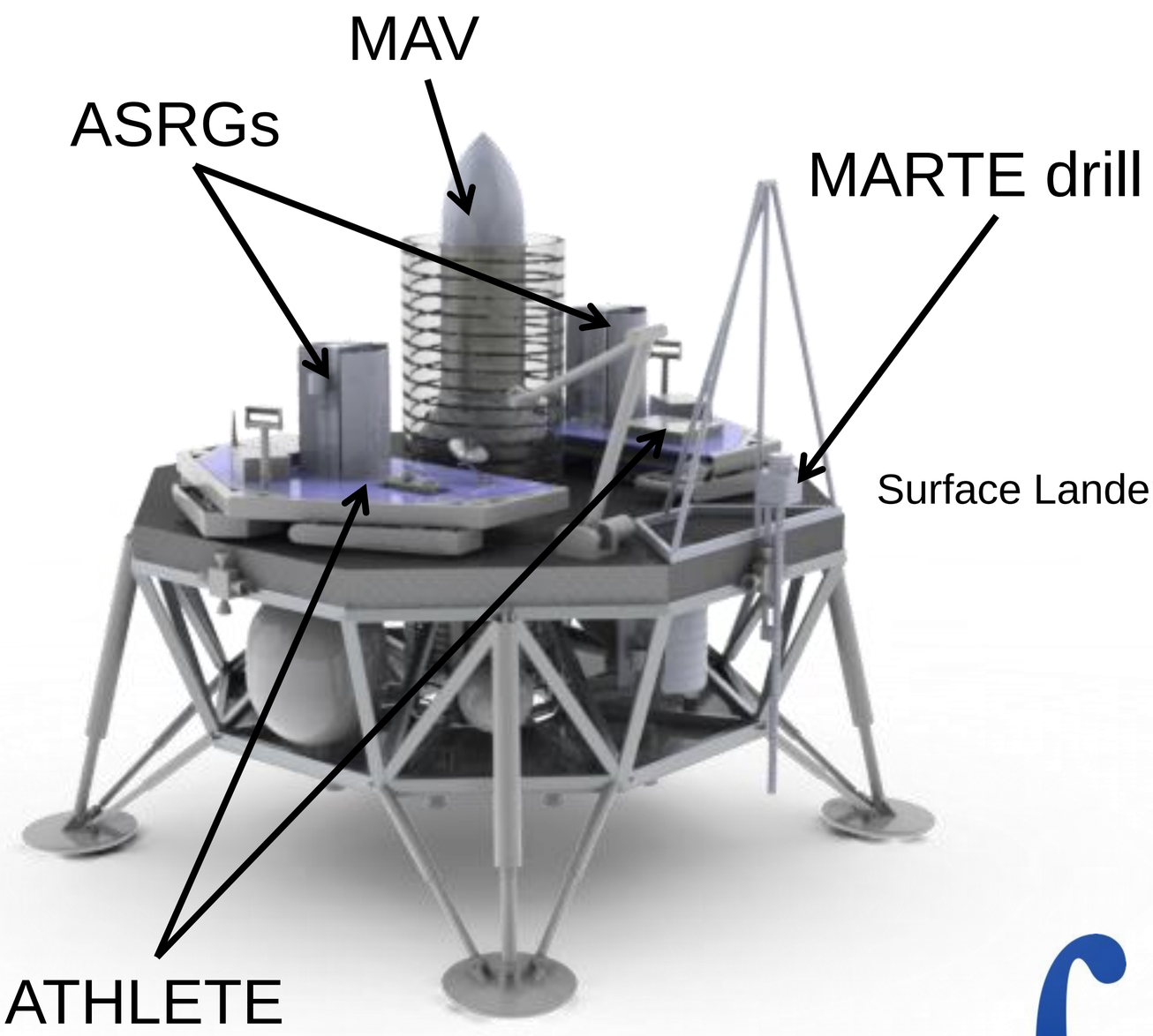
- Leave Earth October 2024 in Heavy Lift Launch Vehicle (HHLV)
- Orbiter takes Surface Function and ERV to Martian orbit
- Surface function lands on Martian surface
- Lander drills core sample, ATHLETE takes sample from Mawrth Vallis
- MAV transports sample to ERV
- ERV returns sample to Earth, July 2027



Entire vehicle in HHLV shroud

Key Spacecraft Characteristics

- Advanced Stirling Radioisotope Generator (ASRG)
- All Terrain Hex-Limbed Extra Terrestrial Explorer (ATHLETE)
- Mars Analog Rio Tinto Experiment (MARTE)
- MARS Ascent Vehicle (MAV)



Science Instruments

Design incorporated as many heritage instruments as possible, including:

- Rock Abrasion Tool (RAT)
- Panoramic Camera (PANCAM)
- Alpha Particle X-Ray Spectrometer (APXS)
- Meteorological Experiment Tower (MET)
- Mossbauer Spectrometer (MB)
- Microscopic Imager (MI)
- Miniature Thermal Emission Spectrometer (Mini-TES)

Acknowledgements