



NASA SBIR 2015 Phase I Solicitation

S4.02 Robotic Mobility, Manipulation and Sampling

Lead Center: JPL

Participating Center(s): ARC, GSFC, JSC

Technologies for robotic mobility, manipulation, and sampling are needed to enable access to sites of interest and acquisition and handling of samples for in-situ analysis or return to Earth from planetary and solar system small bodies including Mars, Venus, comets, asteroids, and planetary moons.

Mobility technologies are needed to enable access to steep and rough terrain for planetary bodies where gravity dominates, such as the Moon and Mars. Tethered systems, non-wheeled systems, and marsupial systems are examples of mobility technologies that are of interest. Technologies to enable mobility on small bodies in micro-gravity environments and access to liquid bodies below the surface such as in conduits and deep oceans are needed. Manipulation technologies are needed to enable deployment of sampling tools and handling of samples. Small-body mission manipulation technologies are needed to deploy sampling tools to the surface and transfer samples to in-situ instruments and sample storage containers, as well as hermetic sealing of sample chambers. On-orbit manipulation of a Mars sample cache canister is needed from capture to transfer into an Earth Entry Vehicle. Sample acquisition tools are needed to acquire samples on planetary and small bodies through soft and hard material. A drill is needed to enable sample acquisition from the subsurface including rock cores to 3m depth and icy samples from deeper locations. Minimization of mass and ability to work reliably in the harsh mission environment are important characteristics for the tools.

Component technologies for low-mass and low-power systems tolerant to the in-situ environment are of particular interest. Technical feasibility should be demonstrated during Phase I and a full capability unit of at least TRL 4 should be delivered in Phase II. Proposals should show an understanding of relevant science needs and engineering constraints and present a feasible plan to fully develop a technology and infuse it into a NASA program. Specific areas of interest include the following:

- Tethers and tether play-out and retrieval systems.
- Small body anchoring systems.
- Subsurface sampling systems.
- Low mass/power vision systems and processing capabilities to enable fast surface traverse.
- Abrading bit providing smooth surface preparation.
- Sample handling technologies that minimize cross contamination and preserve mechanical integrity of samples.