NASA SBIR 2015 Phase I Solicitation

H6   Autonomous and Robotic Systems

Lead Center: ARC

NASA invests in the development of autonomous systems, advanced avionics, and robotics technology capabilities for the purpose of enabling complex missions and technology demonstrations supporting the Human Exploration and Operations Mission Directorate (HEOMD). The software, avionics, and robotics elements requested within this topic are critical to enhancing human spaceflight system functionality. These elements increase autonomy and system reliability; reduce system vulnerability to extreme radiation and thermal environments; and support human exploration missions with robotic assistants, precursors and caretaker robots. As key and enabling technology areas, autonomous systems, avionics and robotics are applicable to broad areas of technology use, including heavy lift launch vehicle technologies, robotic precursor platforms, utilization of the International Space Station, and spacecraft technology demonstrations performed to enable complex or long duration space missions. All of these flight applications will require unique advances in autonomy, software, robotic technologies and avionics. The exploration of space requires the best of the nation's technical community to provide the technologies, engineering, and systems to enable human exploration beyond LEO, to visit Asteroids and the Moon, and to extend our reach to Mars. Â

Subtopics

H6.01 Human Robotic Systems - Mobility Subsystem, Manipulation Subsystem, and Human System Interaction

Lead Center: JSC

Participating Center(s): ARC, KSC

The objective of this subtopic is to create human-robotic technologies (hardware and software) to improve the exploration of space.

Robots can perform tasks to assist and off-load work from astronauts. Robots may perform this work before, in support of, or after humans.

Ground controllers and astronauts will remotely operate robots using a range of control modes (tele-operation to supervised autonomy), over multiple spatial ranges (shared-space, line-of-sight, in orbit, and interplanetary), and with a range of time-delay and communications bandwidth.

Proposals are sought that address the following three subtopics:Â

- *Mobility* - Subsystems to improve the transport of crew, instruments, and payloads on planetary surfaces, asteroids, and in-space. This includes hazard detection sensors/perception, active suspension, grappling/anchoring, legged locomotion, robot navigation, and infrastructure-free localization.
- *Manipulation* - Subsystems to improve handling and maintenance of payloads and assets. This includes tactile sensors, human-safe actuation, active structures, dexterous grasping, modular â€œplug and playâ€ mechanisms for deployment and setup, small/lightweight excavation devices, and novel manipulation methods.
- *Human-system interaction (HSI)* - Subsystems that enable crew and ground controllers to better operate, monitor and supervise robots. This includes robot user interfaces, automated performance monitoring, tactical planning software, ground data system tools, command planning and sequencing, real-time visualization/notification, and software for situational awareness.