



## **NASA SBIR 2009 Phase I Solicitation**

### **X4.03 Low Temperature Mechanisms**

**Lead Center: GSFC**

**Participating Center(s): GRC, JPL, JSC, LaRC**

This subtopic focuses on the development of high power and high specific torque density actuators (e.g., motors and gear boxes) that will operate on the lunar surface exposed to the day/night cycle. They will need to operate over a temperature range of approximately 40 K to 403 K. A five year lifetime is desired. The component technologies developed in this effort will be utilized for rovers, cranes, instruments, drills, crushers, and other such facilities. The nearer term focus for this effort is for lunar missions, but these technologies should ideally be translatable to applications on Mars. These components must operate in a hard vacuum with partial gravity, abrasive dust, and full solar and cosmic radiation exposure. Additional requirements include high reliability, ease of maintenance, low-system volume, low mass, and minimal power requirements. Low out-gassing is desirable, as are modular design characteristics, fail-safe operation, and reliability for handling fluids, slurries, biomass, particulates, and solids. While dust mitigation is not specifically included in this subtopic, proposed concepts should be cognizant of the need for such technologies.

Specific areas of interest include innovative long life, light weight, wide temperature range motors (in the range of one to five kWatts), gear boxes, lubricants, and closely related components that are suitable for the environments discussed above.

Research should be conducted to demonstrate technical feasibility during Phase 1 and show a path toward a Phase 2 hardware demonstration, and when possible, deliver a demonstration unit for functional and environmental testing at the completion of the Phase 2 contract.

