



NASA SBIR 2009 Phase I Solicitation

X8.01 Cryogenic Fluid Transfer and Handling

Lead Center: KSC

Participating Center(s): ARC, GRC, GSFC, JSC, MSFC, SSC

This subtopic solicits cryogenic storage and transfer technologies to enable NASA Exploration goals. This includes a wide range of applications, scales, and environments on ground, in orbit, and on the Lunar or Martian surface. Specifically:

- Passive thermal control for ZBO (zero boil-off) storage of cryogens for both long term (>200 days for LOX/LH₂) on the lunar surface and short term (14 days for LH₂, LOX) on orbit. Insulation for both ground and flight.
- Active thermal control for long term ZBO storage for lunar surface and space applications. Technologies include 20 K cryocoolers for Mars missions, cryocooler integration techniques, heat exchangers, distributed cooling, and circulators. Scavenging of residual propellants.
- Zero gravity cryogenic control devices including thermodynamic vent systems, spray bars and mixers, and liquid acquisition devices.
- Advanced spacecraft valve actuators using piezoelectric ceramics. Actuators that can reduce the size and power while minimizing heat leak and increasing reliability.
- Propellant conditioning and densification technologies for Earth based applications, scaled for Altair or EDS tanks. Destratification technologies and recirculation systems for homogeneous tank loads. Reliability and operability upgrades over past densification systems.
- High capacity liquid oxygen pump systems capable of delivering high quality of liquid over a wide flow range between 500 GPM to 2000 GPM are sought. Special emphasis on variable control pumping, parallel pumping, system reliability and robustness, and advanced pump sealing technology is needed.
- Liquefaction of oxygen on the Lunar surface, including passive cooling with radiators, cryocooler liquefaction, or open cycle systems that work with HP electrolysis. Efficiency, mass savings, and reliability upgrades are needed. Heat pumps, switches, and heat pipes to control energy flow at low temperatures. Deployable radiators and radiation shields.

