



NASA SBIR 2014 Phase I Solicitation

H3.01 Thermal Control for Future Human Exploration Vehicles

Lead Center: JSC

Participating Center(s): GRC, GSFC, JPL, KSC, LaRC, MSFC

Future human spacecraft will require more sophisticated thermal control systems that can operate in severe environments ranging from full sun to deep space and can dissipate a wide range of heat loads. The systems must perform their function while using fewer spacecraft resources, including mass, volume and power. Advances are sought for microgravity thermal control in the following areas:

- Heat rejection systems and/or radiators that can operate at low fractions of their design heat load in the cold environments that are required for deep space missions. Systems that can maintain setpoint control and operate stably at 25% of their design heat load in a deep space (0 K) environment are sought. Innovative components, working fluids, and systems may be needed to achieve this goal.
- Lightweight non-venting phase change heat exchangers are sought to ameliorate the environmental transients that would be seen in planetary (or lunar) orbit. Heat exchangers that have minimal structural mass and good thermal performance are sought. The goal is a ratio exceeding 2/3 phase change material mass and 1/3 structural mass.
- Two-phase heat transfer components and system architectures that will allow the acquisition, transport, and rejection of waste heat loads in the range of 100 kW to 10 megawatts are sought.
- Nontoxic working fluids are needed that are compatible with aluminum components and combine low operating temperature limits (<250K) and favorable thermophysical properties - e.g., viscosity and specific heat.

Technologies are expected to be raised from TRL2 to TRL 3/4 during Phase I. Minimum deliverables at the end of Phase I are analysis/test reports, but delivery of development hardware for further testing is desirable. In addition, the necessity and usefulness of a follow-on Phase II should be demonstrated.

Technologies would be expected to be matured from TRL 3/4 to TRL 5 during a potential Phase II effort. Expected deliverables for a Phase II effort are analysis/test reports and prototypic hardware.

For more detailed relevant information:

http://www.nasa.gov/pdf/501320main_TA14-Thermal-DRAFT-Nov2010-A.pdf.