

Compact, Lightweight, Non-Venting, Phase-Change Heat Exchanger, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Future exploration spacecraft will need to operate in extreme thermal environments, with highly variable conditions for heat rejection by thermal radiation. Thermal storage is a critical technology for these missions, since it enables the spacecraft's thermal management system to be sized for average conditions instead of the least favorable. We propose a new technology for thermal storage based on an innovative, non-venting phase-change heat exchanger. Create's technology overcomes some of the key limitations of phase-change heat exchanger technology. Our design maximizes the amount of phase-change material, eliminates large thermal resistances due to the poor thermal conductivity of the phase-change material, and accommodates differences in solid vs. liquid volume without a heavy structure. In Phase I we will prove the feasibility of this approach through thermal, fluid, and structural analysis; assessment of critical trade-offs; proof-of-concept demonstrations; and design of a prototype phase-change heat exchanger sized to meet requirements for future space exploration missions. In Phase II we will design, build, and demonstrate operation of the prototype phase-change heat exchanger.

ANTICIPATED BENEFITS

To NASA funded missions:

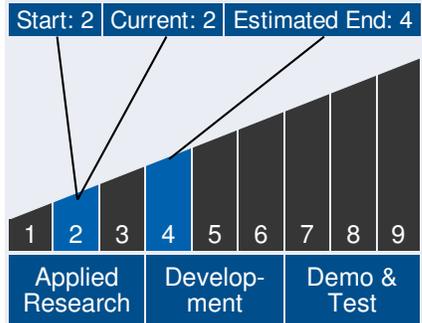
Potential NASA Commercial Applications: Create's technology can replace paraffin or water ice phase-change heat exchangers or water evaporation and venting systems that have been slated for use on future lunar orbiters. These spacecraft face extreme changes in thermal radiation environment each orbit, and Create's technology can significantly reduce the mass needed for thermal storage. The technology could also be useful for rovers or planetary bases in which the thermal control system must be designed for highly variable conditions.



Table of Contents

- Abstract 1
- Anticipated Benefits 1
- Technology Maturity 1
- Management Team 1
- U.S. Work Locations and Key Partners 2
- Technology Areas 2
- Image Gallery 3
- Details for Technology 1 3

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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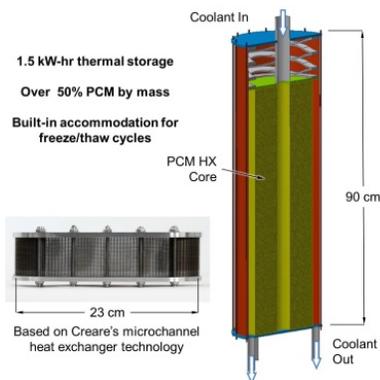


PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23147>)

IMAGE GALLERY



*Compact, Lightweight, Non-Venting,
Phase-Change Heat Exchanger, Phase I*

DETAILS FOR TECHNOLOGY 1

Technology Title

Compact, Lightweight, Non-Venting, Phase-Change Heat Exchanger, Phase I

Potential Applications

Creare's technology can replace paraffin or water ice phase-change heat exchangers or water evaporation and venting systems that have been slated for use on future lunar orbiters. These spacecraft face extreme changes in thermal radiation environment each orbit, and Creare's technology can significantly reduce the mass needed for thermal storage. The technology could also be useful for rovers or planetary bases in which the thermal control system must be designed for highly variable conditions.