

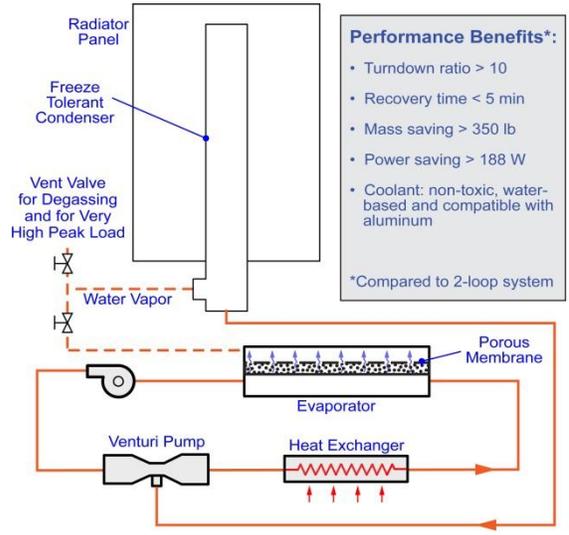
BRIEFING CHART

NASA SBIR/STTR Technologies
 A Multi-Environment Thermal Control System with Freeze-tolerant Radiator
 PI: Weibo Chen/Creare Incorporated, Hanover, NH
 Proposal No.: 11-X3.04-9990

Identification and Significance of Innovation

- A compact, lightweight thermal control system for extreme thermal environments
 - Constant cabin and equipment temperatures
 - Single pumped loop with liquid flow for lightweight and simple integration
 - Suitable for long missions as well as ascent and descent stages
 - Low power consumption
 - No consumables
- A freeze-tolerant radiator with self-regulating thermal conductance to ambient environment
 - No need for active control systems
- Water-based coolant compatible with lightweight aluminum heat exchangers and pipes
- Technology area recommended to NASA Technology Roadmaps

Expected TRL Range at the beginning and end of Contract: 3–5



Single-Loop Thermal Control With a Freeze-Tolerant Radiator

Technical Objectives

- High turndown ratio for thermal conductance
- Quick thermal response
- Freeze-tolerant
- Nontoxic coolant
- Lightweight and low power consumption

Phase I Demonstrated Feasibility

- Demonstrated self-adjusting thermal conductance
- Demonstrated freeze-tolerant characteristics
- Demonstrated rapid recovery after nearly completely frozen
- Reduced corrosion rate by an order of magnitude by developing an effective corrosion inhibitor

Phase II Work Plan

- Demonstrate freeze-tolerant radiator and venturi pump under widely varied heat loads and environmental temperatures
- Develop corrosion inhibitor to reduce long-term corrosion rate for long-duration mission

NASA Applications

- Thermal control systems for future manned spacecraft and habitats for lunar, Mars, and asteroid exploration
- Thermal control systems for satellites and exploration rovers

Non-NASA Applications

- Freeze-tolerant condensers for commercial and military satellites and unmanned aircraft

Contact

Weibo Chen, wbc@creare.com, 603-640-2425

Non-Proprietary Data
 No ITAR Restricted Data