Heat Rejection System for Thermal Management in Space Utilizing a Planar Variable-Conductance Heat Pipe

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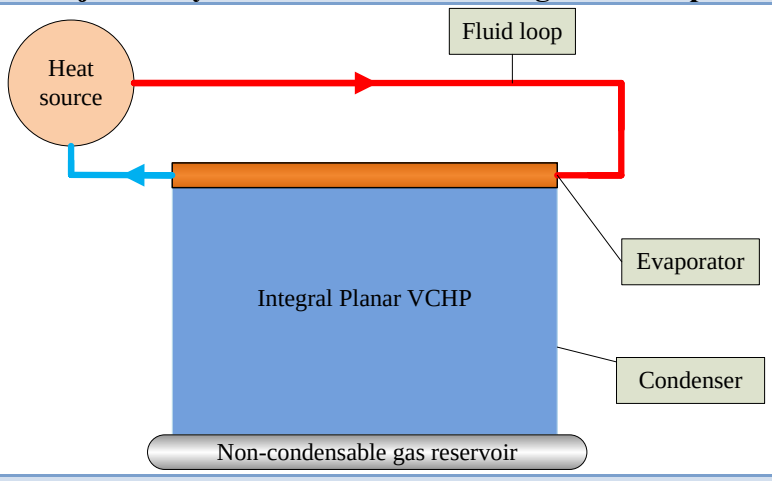
The objective

The objective of proposed research is to design, fabricate, and test an innovative planar heat pipe-based heat rejection system for Thermal Management in space.



Summary

The integral planar variable conductance heat pipe (VCHP) which should operate efficiently and reliably across a wide range of thermal environments is presented. The heat pipe is made from thermally conductive polymers in order to minimize its mass. The non-condensable gas (air) is used to adjust active surface area of heat pipe depending on the heat load. The proposed work includes the design, fabrication, and ground-based testing of a prototype heat rejection system. It is assisted by a modeling work. In the experiment, the heat input to the system is varied and the performance of the heat pipe-radiator will be investigated. The response of the system to a transient heat load change will also be studied.

The potential impact of the research

1. **The research will confirm the efficacy of the integral planar VCHP concept and will provide direction for its future emplacement in spacecraft TCS.**
2. **The research into the thermally conductive polymers and polymer matrix composites will provide knowledge for advanced materials selection in future heat rejection systems.**
3. **The CFD modeling techniques that are developed will permit the design of optimized heat pipe heat rejection systems for future missions. This change in the state of knowledge will enable forthcoming NASA missions by ensuring that the increasingly large required thermal loads of future spacecraft systems can be rejected successfully.**