



Power Generation and Storage

Single Material Heat Rejection System

Offers reduced mass and increased thermal efficiency

Researchers at NASA's Glenn Research Center are developing a next-generation low-cost, efficient, lightweight, single-material heat rejection system with application to many industries. Heat rejection systems, particularly for aerospace, use multiple materials with various coefficients of thermal expansion resulting in significant thermal losses and complicated designs. The thermal efficiency of these heat rejection systems, balanced with structural requirements, directly affect the total mass of the system. NASA Glenn's innovation uses a single material as both the heat pipe and structure, increasing thermal efficiency and design integrity.

BENEFITS

- Low cost: Enables a simpler design and fabrication
- High efficiency: Minimizes thermal resistance losses
- Lightweight: Combines the heat pipe and radiator into one using an innovative structural support system

technology solution



NASA Technology Transfer Program

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THE TECHNOLOGY

NASA Glenn's novel heat rejection system incorporates multiple rectangular heat pipe channels, and an enclosed pressure boundary fabricated from the same material. Each channel can be shared with neighboring channels to create a multi-channel heat pipe. Tubular heat pipes connected to flat fins, typically made of different materials, have traditionally been used to reduce heat rejection system mass. Dissimilar materials inherently have coefficient of thermal expansion mismatches, leading to complex designs and additional mass.

Combining structural and thermal components of a heat-pipe radiator into a unique design produces advantages to both heat transfer characteristics and structural integrity. NASA Glenn's concept is the first of its kind to combine, radiator, heat pipes, and structural components into one system using a single material. This design allows the internal sandwich core structure to double as the heat pipe vapor space, providing rigidity and reduction in mass over current technologies.

This is an early-stage technology requiring additional development. Glenn welcomes co-development opportunities.



NASA Glenn's novel heat rejection system may have application in thermal control of buildings

APPLICATIONS

The technology has several potential applications:

- ➔ Aerospace
- ➔ Construction
- ➔ Automotive
- ➔ Manufacturing
- ➔ Electronics
- ➔ Energy

PUBLICATIONS

Patent Pending

National Aeronautics and Space Administration

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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