Thermal Control Panels

Thermal Management Technologies

Space Related Technology

Main Features:

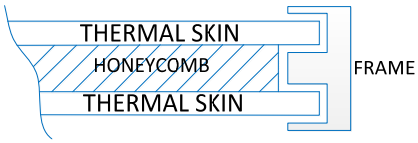
- *Easily integrated*
- *Uniform temperature panel surface*
- *Low mass thermal/ structural solution*
- *Low thermal impedance panel -to- panel connections*
- *Operational temperature: -30 °C to +65 °C*
- *Multi-chambered to eliminate single point failures*

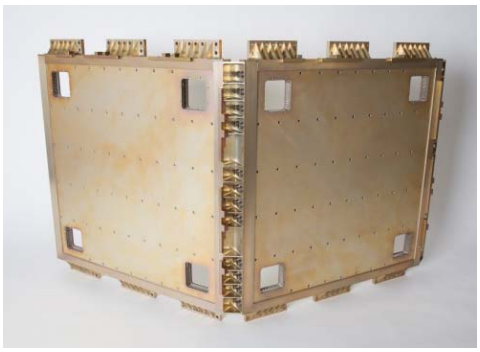
Key Benefits:

- *Produces highly efficient, near isothermal radiators and structures*
- *Enables rapid thermal/ mechanical design*
- *Provides low temperature difference heat spreading*

A straight-forward approach to efficient isothermal spacecraft structures, thermal radiators, and uniform heat spreading

The basis for Thermal Control Panel technology is the heat pipe embedded thermal skin which can be used independently or combined into a honeycomb panel and frame for structural applications.

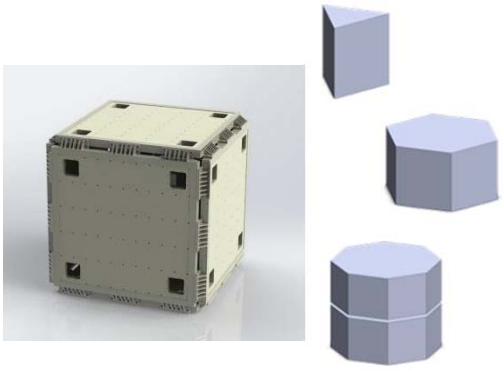




Prototype SBIR spacecraft panels

Isothermal Spacecraft Structures

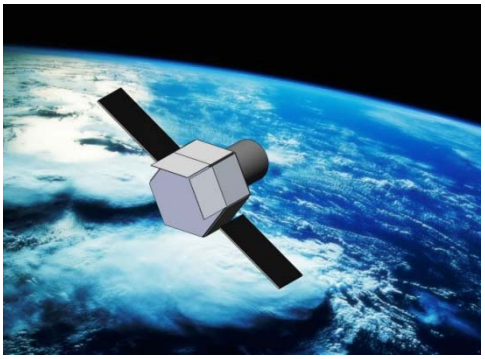
For advanced structures, Thermal Control Panels provide the benefits of distributed heat pipes combined with the strength and stiffness of standard spacecraft panels into one cohesive structural panel. These multi-function panels combine two thermal skins on a honeycomb core surrounded by an interface frame. Developed under SBIR contract to the Air Force, the panels show significant application potential to low temperature difference structures. A built in fastener grid enhances the ease of integration. The panel technology has been space qualification tested.



Structure configurations can be adapted to user requirements

Thermal Radiators

Thermal Control Panels are configured for uniform temperature, light weight radiators using a single thermal skin and an interface flange. These thin panels spread heat to be radiated over the entire surface. The technology is also applicable for backing solar arrays to provide a uniform temperature and heat path to the radiating surfaces.



Spacecraft thermal radiator concept

Uniform Heat Spreading

The technology can also be used to distribute heat from within the bus to external surfaces or to radiators providing more efficient use of bus volume.

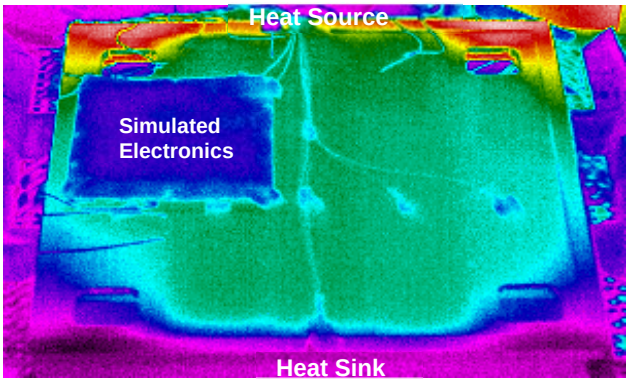
Contact TMT to see how Thermal Control Panels can be implemented into your next design

TMT Thermal Control Panels Can Be Configured for Your Application

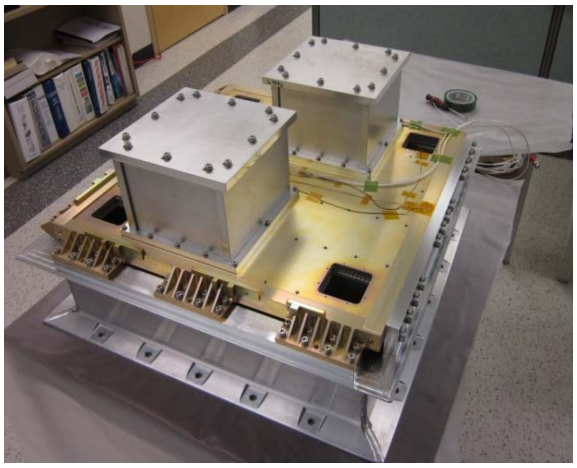
Panel Interfaces

- Component interfaces can be adapted for each application.
    - Typical Component Mounting:

      #8-32 fasteners on a 5 cm x 10 cm grid
- Panel Mounting
    - Low thermal resistance frame designed to meet customer requirements



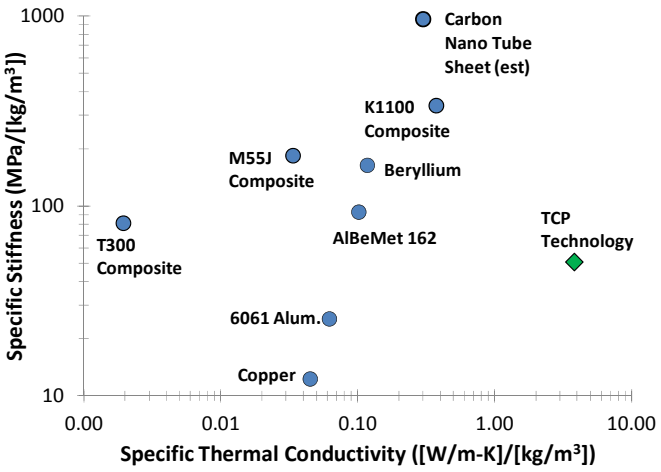
IR picture of typical 56 cm x 56 cm SBIR panel under test (~2C across active panel w/ 56 W input)



Typical small spacecraft application, panel with component simulators

Key Specifications

- Operating temperature: -30 to +65 °C
- Survival temperature -40 to +75 °C
- Typical Uniformity
    - Structure < 0.38 °C/W*m (length)
    - Radiator < 0.1 °C/W*m (length)
- Mass:
    - Typical radiator application: ~8 kg/m^2
    - Typical s/c structure ~25 kg/m^2
- Power limits:
    - 7 W/cm (panel width)
- Panel qualification: (all axes, 25 kg attached mass)
    - 12.5 g
    - Random vibration 8.7 grms
- Typical thickness
    - Radiator: ~0.63 cm
    - Structural panel: ~2.5 cm



Graph illustrates spacecraft material comparison showing significant improvement in thermal performance with Thermal Control Panel active thermal skins

** These values are for reference and should not be used for design*

Product History

This technology was principally developed under SBIR funding managed by the Air Force Research Laboratory, Space Vehicles Directorate under FA9453-10-C-0053

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