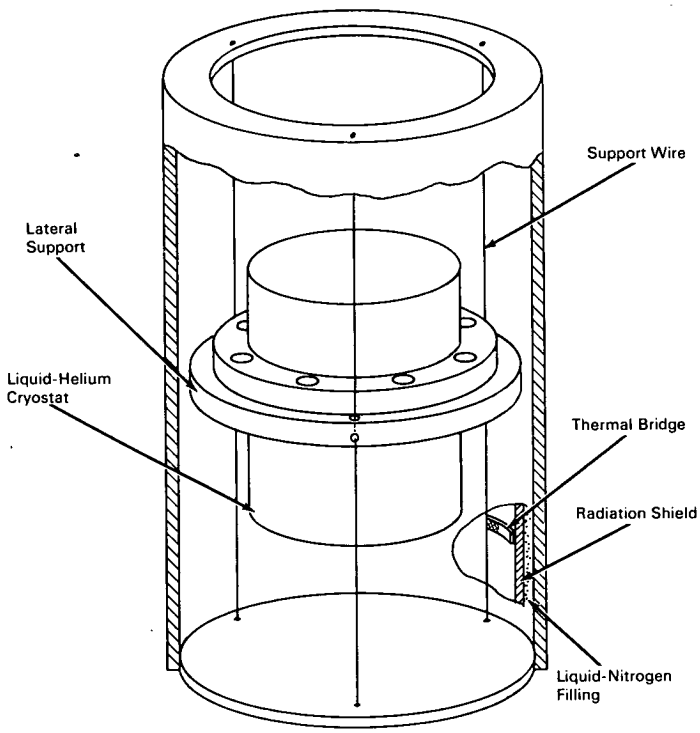
NASA TECH BRIEF

Vacuum Chamber Provides Improved Insulation and Support for Cryostat



The problem: To minimize heat transfer through the walls and junctions (fluid couplings and electrical leads) of a liquid-helium-filled cryostat (Dewar test chamber).

The solution: Suspend the cryostat by means of taut wires in an evacuated cylinder.

How it's done: The evacuated cylinder is constructed with double walls to provide an annular space through which liquid nitrogen (or other cryogenic fluid having a higher boiling point than the liquid helium in the central cryostat) is circulated. Since the inner wall of the evacuated cylinder is maintained at the low temperature of liquid nitrogen, radiation of heat from the outer wall of the cylinder (which is normally exposed to room temperature) to the cryostat is minimized. Rigid positioning of the cryostat in the outer cylinder is obtained by the use of three highly tensioned wires which, due to their orientation, provide both translational and angular rigidity.

The small diameter of the supporting wires ensures very low heat transfer by conduction through contact surfaces. Thermal conductivity (which is a function of

(continued overleaf)

temperature) of the wires is further reduced by heat sinking their lower extremities through a thermal bridge to the liquid-nitrogen-cooled inner wall of the evacuated cylinder. The ends of the support wires are also electrically and thermally insulated from this cylinder by means of ceramic spacers to prevent thermoelectric currents which would produce weak magnetic fields in the cryostat. Such fields would interfere with experiments on superconductor devices under test in the cryostat.

Electrical leads are brought into the liquid-helium-cooled cryostats through a tube which also serves as a vent for evaporating helium gas. This tube also acts as a heat exchanger for countercurrent cooling of the electrical leads.

Note: Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama, 35812
Reference: B65-10368

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: General Electric Company
under contract to
Marshall Space Flight Center
(M-FS-415)