NASA TECH BRIEF

NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Division, NASA, Code UT, Washington, D.C. 20546.

Improved Heat Shield/Radiator

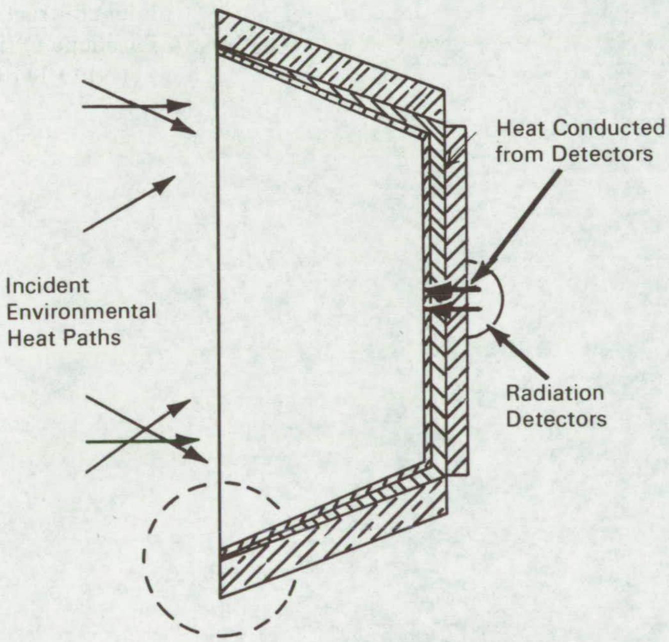

Figure 1a. Cross Section of Heat Shield

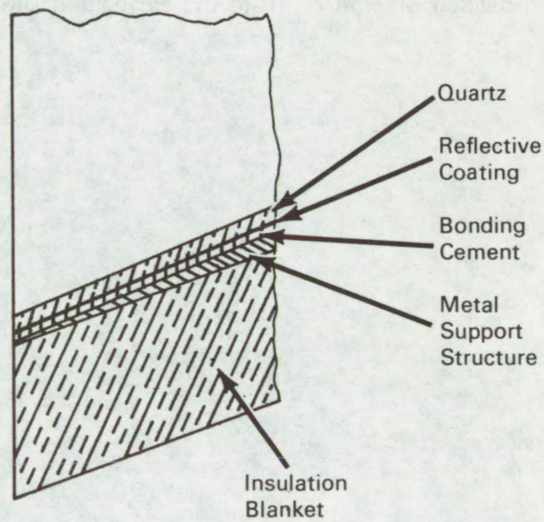

Figure 1b. Detail of Cross Section

The problem:

To remove heat generated internally by an instrument and to reject external heat loads such as direct solar and earth-reflected solar radiation. Conventional blackbody radiators may be used for radiation of internal heat, but they are incapable of reflecting external heat (direct solar or earth-reflected solar radiation).

The solution:

A thermally conductive metal shield in direct thermal contact with the mounting plate for the radiation detectors. The external surfaces of the shield are thermally insulated by an insulation blanket. The internal faces of the shield are covered with a thin layer of quartz, on the hidden faces of which a metallic, thermally conductive coating has been applied.

How it's done:

A cross-sectional view of the composite shield/radiator is presented in the illustration, together with a detail showing its construction. The slope of the side faces is set to achieve optimum outward reflection of direct solar radiation and minimize inward reflection to one of the other faces.

(continued overleaf)

The support structure is made of a metal such as aluminum and should be of integral structure, with all walls joined without seams to eliminate joint thermal resistance. The outer surfaces of the structure are covered with an insulation blanket and the inner surfaces are covered with a quartz sheet. A metal such as silver is vacuum deposited on the outward side of each sheet. This reflective coating is bonded to one of the inner faces of the support structure by a suitable cement, such as a high-thermal-conductivity silicone.

This composite shield-radiator could be used in such meteorological applications as the measurement of the absolute temperature of air masses, since it should largely negate the effects of solar heating. The reflector should reject up to 95% of the direct incident solar radiation and up to 97% of the solar radiation reflected from clouds or air masses. The insulation should isolate the instrument from radiation either reflected or emitted from the earth, and should also reduce convective heating or cooling of the instrument by air currents. The instrument would achieve thermal equilibrium with the air mass above it and would measure the air temperature during the day and the sky temperature at night.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B70-10318

Patent status:

No patent action is contemplated by NASA.

Source: J. W. Smith of
Caltech/JPL
under contract to
NASA Pasadena Office
(NPO-11105)