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NASA TECH BRIEF

Goddard Space Flight Center

Balloon-Borne Package Temperature Controller

The problem:

High-altitude balloons for weather, astronomy, and other scientific investigations frequently include electronic equipment that must be protected from the extreme variations in temperature which occur in the upper atmosphere. This has long been a significant problem in the technology of high-altitude investigations, as current methods used to control temperature are unreliable or so bulky that they interfere with the purpose of the balloon flight. Moreover, when many balloons are required, the use of even moderately dense materials would constitute a collision hazard to high-speed aircraft.

The solution:

A simple, inexpensive, lightweight enclosure traps the ULWR (upward long wave radiation) of the earth while reflecting the harsh solar radiation in the upper atmosphere. Thus, it warms the enclosed instruments in cold regions (such as the night side of the earth) and protects them from overheating during the day. Nighttime temperatures of the equipment are raised about 20° C above the ambient air temperature, and daytime temperatures usually will be around 30° C, depending on the presence of clouds.

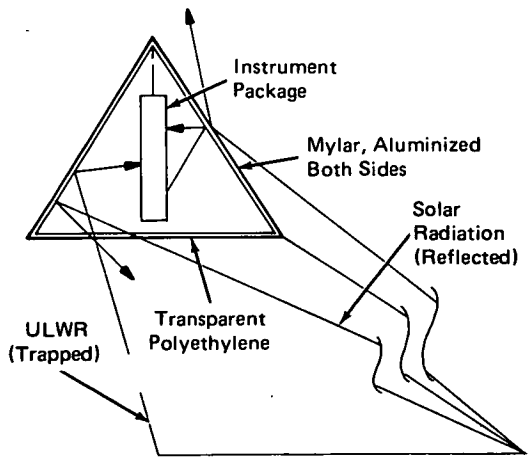

Figure 1. Temperature Control Enclosure

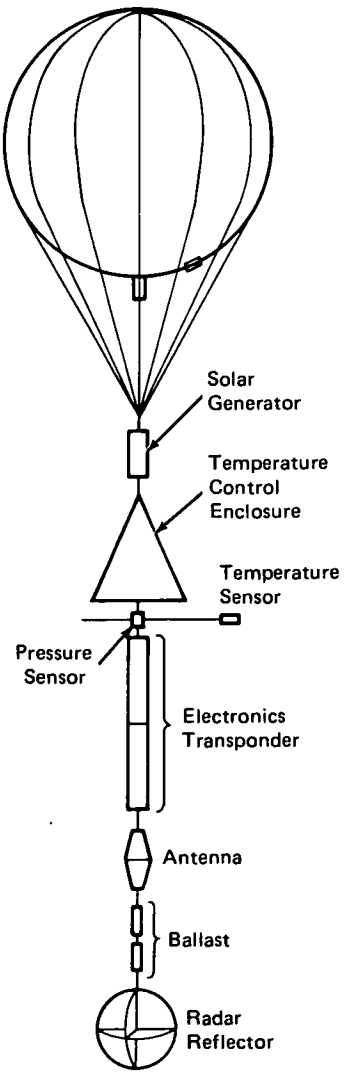

Figure 2. Enclosure Attached to a Balloon Package

(continued overleaf)

How it's done:

The enclosure (see Figure 1) is a cone of Mylar, one to five mils thick, with an aluminized coating on both sides. The bottom is a thin film (one mil) of a transparent plastic material such as polyethylene that allows radiation from the earth's surface to pass through and be trapped in the cone. The internal aluminized surface reflects heat lost by the enclosed instruments, and the external coating reflects solar radiation. The conical shape aids in concentrating trapped radiation on the instrument package.

The device can be attached to a balloon system, as shown in Figure 2, without any changes in the experimental design. It is very lightweight and will provide a suitable temperature without any internal heat source.

Note:

Requests for further information should be directed to:

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Reference: B73-10192

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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