DEPARTMENT OF ENERGY FACTS:

Radioisotope Heater Units (RHUs)

NEED FOR RHUs

Most spacecraft can use solar energy to provide heat to keep their structure, systems, and instruments warm enough to operate effectively. However, when solar or other heat source technologies are not feasible, an alternate heat source is required for the spacecraft.

By using Radioisotope Heater Units (RHUs), the spacecraft designer can allocate scarce spacecraft electrical power to operate the spacecraft systems and instruments. RHUs also provide the added benefit of reducing the potential for electromagnetic interference generated by electrical heating systems.

Characteristics of RHUs include:

- Highly reliable, continuous and predictable output of heat
- No moving parts
- Compact structure
- Resistance to radiation and meteorite damage
- Heat produced is independent of distance from the sun.

RHUs provide proven and reliable continuous heat to sensitive spacecraft instruments and scientific experiments enabling their successful operation throughout the mission.

HOW RHUs WORK

RHUs generate heat from the natural radioactive decay of a small pellet of plutonium dioxide (mostly plutonium-238). This heat is transferred to spacecraft structures, systems, and instruments directly without moving parts or intervening electronic components.

RHUs are very compact, 3.2 centimeters (1.3 inches) long and 2.6 centimeters (1 inch) in diameter. The fuel pellet is about the size and shape of a pencil eraser weighing approximately 2.7 grams (0.1 ounces). All together each RHU weighs about 40 grams (1.4 ounces).

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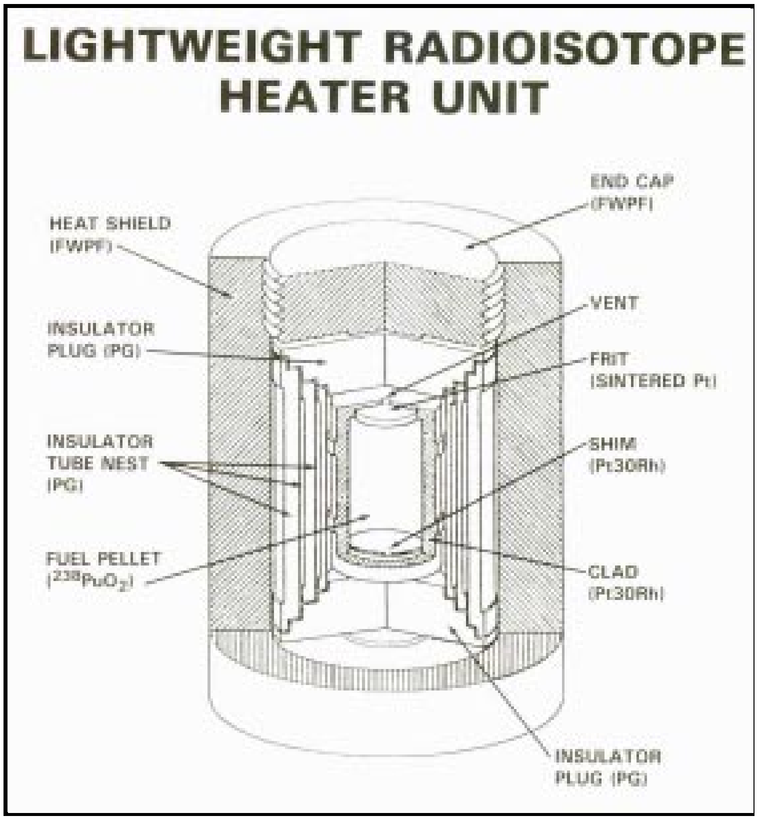
SAFETY DESIGN

RHUs have a very rugged containment system to prevent or minimize the release of plutonium dioxide fuel even when subjected to severe accident conditions. Containment is achieved through multiple layers which are resistant to the heat and impact that might be encountered during a spacecraft accident. An external graphite aeroshell (a reentry shield) and a graphite insulator protect the fuel from impacts, fires and atmospheric reentry conditions. Internally, the fuel is encapsulated in a high-strength, platinum-rhodium metal shell (or "clad") which further contains and protects the fuel during any potential accident.



In addition to this containment, the plutonium dioxide fuel is used in a ceramic form of the material which tends to break into large pieces rather than dispersing as fine particles. This minimizes interaction of the fuel with the environment and the potential for human exposure in the extremely unlikely event the multiple fuel containment barriers are breached. Since each RHU fuel pellet is individually encapsulated in its own aeroshell and fuel clad, the potential for a single event to affect more than one pellet is reduced.

SAFETY TESTING

RHUs have been subjected to a rigorous series of laboratory and field tests. Those test's were more severe than anticipated for credible accident scenarios. No releases occurred for those events which were within the limits of anticipated accident scenarios.

In summary, the RHUs are extremely rugged and reliable devices that have been designed and tested to contain their fuel in a wide range of mission accidents.

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