

of diverse applications to improve technological, scientific, and industrial endeavors, which include improving the length and quality of life through improved diagnosis and treatment of the human ills.

APPLICATIONS

Radioisotope Power for Space and Terrestrial Systems

In June, 1990 Ulysses was launched on its way to the poles of the Sun to observe the solar wind, magnetic field, solar corona, sun spots, solar flares, solar x-rays, and other physical phenomena.³ It was the 17th NASA launch using isotopic power (Table 1). Radioisotope power systems have been the only alternative in outer planetary, lunar, and solar exploration with trajectories out of the ecliptic plane. About this time last year the Galileo spacecraft began its eight-year mission to explore Jupiter, with about twice the amount of isotopic power generation capacity as Ulysses. Galileo also was equipped with 120 radioisotope heaters on the orbiter and entry probe each of which produce one thermal Watt to heat instruments.⁴

Table 1. NASA Missions Utilizing Isotopic Power

<u>Mission</u>	<u>Year</u>	<u>To</u>	<u>Radioisotope Systems</u>
Ulysses	1990	Sun	power
Galileo	1989	Jupiter	power, heaters
Voyager 1	1977	Outer Planets	power, heaters
Voyager 2	1977	Outer Planets	power, heaters
Viking 1	1975	Mars Surface	power
Viking 2	1975	Mars Surface	power
Pioneer 11	1973	Outer Planets	power, heaters
Pioneer 10	1972	Outer Planets	power, heaters
Apollo 17	1972	Moon	power
Apollo 16	1972	Moon	power
Apollo 15	1971	Moon	power
Apollo 14	1971	Moon	power
Apollo 13	1970	Moon	power*
Apollo 12	1969	Moon	power
Apollo 11	1968	Moon	heaters
NIMBUS III	1969	Earth Orbit	power
NIMBUS-B-1	1968	Earth Orbit	power**

* Aborted Mission, intact heat source disposed of in Tonga⁵ Trench.

** Aborted Mission, intact heat sources recovered from Santa⁵ Barbara Channel.

Since 1968, when NASA lost NIMBUS-B-1, its first nuclear-powered spacecraft, and safely recovered its isotopic heat sources intact,⁵ NASA has used isotopic power. Another isotope powered NIMBUS weather satellite was successfully launched in 1969. Between 1969 and 1972 NASA used one isotopic heater on the first lunar landing and six power sources on subsequent Apollo Lunar Surface Experiment Packages; one on the aborted Apollo 13 mission was safely deposited in the Tonga Trench.⁵ In 1972 and 1973 isotopic power and heater sources were launched on