

IAF SPACE POWER SYMPOSIUM (C3)
Joint Session on Advanced and Nuclear Power and Propulsion Systems (5-C4.7)

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POWERING EXPLORATION OF THE SOLAR SYSTEM – A FIFTY YEAR LEGACY CONTINUES

Abstract

NASA launched its first nuclear powered spacecraft fifty years ago, on April 14, 1969. Since then, NASA has used radioisotope power systems (RPS) to explore the deepest reaches of our Solar System. Using a precept of first conducting reconnaissance *flyby* missions, exploration of the gas giants Jupiter and Saturn was carried out by Pioneer 10 and 11, and again by Voyager 1 and 2; with the ice giants Uranus and Neptune being surveyed subsequently by Voyager 2. The final frontier of planetary reconnaissance was completed in 2015 with the flyby of Pluto by New Horizons.

NASA builds upon the knowledge gained on these survey missions through the capability of *orbiting* spacecraft, which enable a more detailed, global, and extended examination of a planet and its natural satellite system than offered by a single flyby encounter. The Galileo and Cassini spacecraft, with their on-station times of 8 and 13 years, delved deeper into uncovering the secrets of the Jovian and Saturnian systems. Viking's solar-powered orbiters at Mars were similarly utilized and were complemented with two radioisotope powered *landers*, able to further obtain in-situ measurements from the surface of the planet throughout multiple seasons. Mars continued to be explored, using RPS as its power source to *rove* the surface via the Curiosity rover. Even the scientific exploration of the Moon benefitted from the use of RPS with the deployment and multi-year operations of the Apollo Lunar Science Experiments Packages by the crews of Apollo 12, 14, 15, 16, and 17.

These and other missions were conducted using the capabilities uniquely offered through use of radioisotope power. This paper will provide a recap of these power systems, their NASA missions and scientific discoveries enabled by RPS, and a look forward toward the next 20-50 years at the possibilities for further exploration of our Solar System using radioisotope power.