

Positron Propelled and Powered Space Transport Vehicle for Planetary Missions

Dr. Gerald A. Smith, Principal Investigator
Positronics Research LLC
Santa Fe, New Mexico

ABSTRACT - Positronics Research LLC (PRLC) proposes a revolutionary space transportation vehicle for planetary missions incorporating propulsion and power systems that utilize positron-electron annihilation. This concept is different than previously proposed antimatter-based systems because it uses positrons, not antiprotons, and is a viable alternative to nuclear fission systems. There are distinct advantages in using antimatter, and specifically positron, annihilation. First, the energy density of antimatter is ten orders of magnitude greater than chemical and three orders of magnitude greater than nuclear fission or fusion energy. Second, the annihilation of a positron and an electron results in the creation of two soft 511 keV gamma rays. These gamma rays can be easily absorbed to heat a working fluid in a closed, high-efficiency thermodynamic power system, or directly into a propellant. Third, unlike nuclear fission or antiproton systems, no residual radioactivity is created. Fourth, unlike nuclear fission or antiproton systems, the presence of soft gamma-rays and lack of residual radiation will result in a mass effective, compact system that does not require heavy radiation shields or large separation between the power source and the payload. Positron-powered systems are inherently safer, more reliable and offer fewer operational concerns than their nuclear fission and antiproton based counterparts. Finally, positron production technology is a mature science, with worldwide facilities in operation in government, university and commercial laboratories. PRLC is currently engaged in creating an intense source of low energy positrons, and has successfully developed traps to store positrons in large numbers and high density. Expected near-term positron production rates indicate that testing of prototype rocket and power system concepts is plausible in the next few years.