Paper ID: 9455
oral

SPACE PROPULSION SYMPOSIUM (C4)
Joint Session on Nuclear Propulsion and Power (7.-C3.5)

Author: Dr. George Schmidt
National Aeronautics and Space Administration (NASA), United States, george.schmidt@nasa.gov

NUCLEAR SYSTEMS FOR SPACE POWER AND PROPULSION

Abstract

Nuclear power systems were first used in space by the U.S. in 1961, and have been vital to space exploration ever since. Using energy released from the decay of radioactive isotopes, these devices have enabled some of the most challenging and exciting space missions in history, including the Pioneer and Voyager probes to the outer solar system; the Viking Mars landers; the Galileo mission to Jupiter; and the Cassini mission orbiting Saturn. Advanced systems currently under development could lead to entirely new types of capabilities, such as application of long-lived rovers on rugged planetary terrain and use of high-performance electric propulsion in the outer solar system. Moreover though application of fission and other energetic reactions, nuclear systems are poised to make even more dramatic contributions to space exploration in the 21st century and beyond. Nuclear Thermal Propulsion (NTP), a technology evaluated from the late-1950s to early-1970s, could offer faster and more effective space transportation to Mars and other destinations within the inner solar system. Furthermore, new reactor power systems could serve as a backbone for human planetary surface exploration and use of high-power plasma propulsion for cargo and possibly crew transportation. Finally in the far term, fusion, antimatter and hybrid fission-based propulsion systems could extend human presence across the solar system and propel our first probes to other star systems. This paper outlines the key features, challenges and capabilities of these various technologies, and discusses their relative importance for the future.