Paper ID: 10219
student

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

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USAGE OF NUCLEAR POWER AS A POWERFUL SOURCE FOR SPACE STATIONS AND FOR SPACE DEVELOPMENT MISSIONS

Abstract

With the advent of the space age, the process of creating High Earth Orbit space stations as well as solar system outposts on various planets has become a real possibility in the near future. In this paper, we are trying to address the issue of space stations' power requirements and issues associated with conventional methods. To overcome certain difficulties with power requirements, nuclear power sources will be more advantageous in long term point of view. In space, it is essential to have extensive support to create power for the various requirements such as life support, communications, waste removal, etc. Thus, functional power sources are needed that can function in long term. Due to its basic properties, chemical or thermal means of generating electricity would be quite difficult in microgravity conditions. Moreover, it would create several control and stability issues as well, too. However, with the availability of a nuclear reactor, all of the power requirements in a space based station with microgravity or reduced gravity conditions can be met for several years without any difficulty. Nuclear reactor power systems can support human exploration at surface outposts and space stations. A nuclear reactor on the surface of the Moon or Mars can be a source of reliable power to provide life support, and to supply the large power demands of facilities processing materials. Power levels for surface and space side life support systems are approximately equivalent. This can be achieved with the development of closed-loop Stirling cycle nuclear power systems, which are four times as powerful as the radioisotope thermoelectric generators (RTGs) used on past missions. It will increase the options to improve the conditions for experiments in space and due to which we can install power full systems to study more about space and also we can initiate programs for Moon as well as for Mars. For these kinds of designs, the major issue is designing a controlled fission reaction in the space with microgravity conditions along with radiation shielding. The paper also addresses the issue of future requirements of power in space stations due to attention on space programmes by various nations. Capacity addition to the present designs is also one of the considerations with this work. With proper use of nuclear facilities that are suitable for microgravity and reduced gravity conditions, it can be possible to create enough energy to meet all the needs of space development missions