

Technology Roadmaps for Space Exploration (09)  
Advancing Propulsion Technologies (4)

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DEVELOPMENTS AT THE CENTER FOR SPACE NUCLEAR RESEARCH REGARDING THE  
NUCLEAR THERMAL ROCKET**Abstract**

Nuclear power has been considered for space applications since the 1960s. Between 1955 and 1972 the US built and tested over twenty nuclear reactors/ rocket-engines in the Rover/NERVA programs. However, changes in environmental laws may make the redevelopment of the nuclear rocket more difficult. Recent advances in fuel fabrication and testing options indicate that a nuclear rocket with a fuel form significantly different from NERVA may be needed to ensure public support. The Center for Space Nuclear Research is pursuing development of tungsten based fuels for use in a NTR, for a surface power reactor, and to encapsulate radioisotope power sources. Fabrication of sub-length, tungsten cermet elements reminiscent of NERVA fuel has been completed using depleted uranium oxide. In addition, the CSNR Summer Fellows program has examined several mission scenarios that benefit from the use of the NTR. One Fellows' study defined a Mars Sample Return mission that could return 100 kgs of samples using a single launch of an Atlas V. The potential mission benefits of a nuclear rocket, historical achievements of the previous programs, and recent investigations into alternatives in design and materials for future systems will be discussed.