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Hybrid Fission-Assisted Fusion Dense Plasma Focus (DPF) For Space Applications PAUL STOCKETT[1], ROBERT BEAN[2], CHAN CHOI[3], Purdue University — Engineering feasibility for a manned mission to Mars with a dense plasma focus (DPF) had been studied earlier [1]. The current work seeks to investigate the use of a fission-powered magnetic fusion thruster, dense plasma focus device, with the emphasis on creating a very near-term propulsion system, by utilizing present-day technology and adapting methods of nuclear electric and nuclear fusion propulsion. When analyzing a new mission with a critical time of flight for a manned mission, a porkchop plot [2] was created to depict the various delta-V's necessary to complete the mission in a set period of time. The derived delta-V requirements along with the reference thrust-to-weight ratio provided a target performance which was assessed through numerical simulation of the fusion reactions for the fission-assisted fusion propulsion system. The fission-assisted propulsion system for DPF with D-T and D-^{3}He fuels demonstrates near-term solutions with the thrust-to-weight ratio greater than a reference value, 0.2, along with extended specific impulse.
[1]. Choi, C. K., "Engineering Considerations for the Self-Energizing Magnetoplasmadynamic (MPD)-Type Fusion Plasma Thruster," Tech. Rep. PL-TR-91-3087, Purdue Univ., Lafayette, IN. School of Nuclear Engineering, February 1992.
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