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UTILIZATION OF GAS CORE NUCLEAR REACTORS FOR INTERSTELLAR PROBES AND FOR INTERSTELLAR MISSIONS

Abstract

"Le reve d'etoiles" or "The Dream of Stars" has been one of the most fundamental driving forces for the mankind. Since mankind was able to gaze into the stars at the dawn of civilization, he has looked for a way to reach those stars. Unfortunately, due to slow technological advancements as well as due to dwindling public support; the prospects for interstellar exploration for the 21st century look grim. There are many exotic types of propulsion methods which have been proposed, but in actuality the only really available and feasible technology that we have currently is nuclear propulsion. While there are several studies going parallel across the world for interstellar travel techniques such as ion propulsion and even warp drive, still nuclear propulsion seems to be most feasible in terms of both technological feasibility and economic feasibility. Also, while fusion as nuclear propulsion seems to be promising, the problems related to fusion shield containment and the control of the fusion reaction at the levels needed is problematic. One alternative is the utilization of nuclear propulsion using a gas core reactor with 10,000K working temperature, which theoretically allows very high specific impulses as well as high acceleration rates. Especially with non-manned missions, it would allow special acceleration rates which could make interstellar missions feasible from time period of view.

This paper will present the method of gas core nuclear propulsion with detailed simulation results of the gas core as well as the exit of the rocket nozzle. Furthermore, specific impulse calculations, as well as a sample calculation for an interstellar mission is included to show its feasibility in terms of energy expenditure. It is interesting to note that this method is certainly within a realm of 2 decades meaning that it can be implemented with a solid 20 year plan with a feasible budget that is doable by today's standards. The paper will discuss this in detail with some possible recommendations for advancement in the future for interstellar travel possibilities. The paper also will establish a baseline for similar proposals to set a precedent for unmanned interstellar missions with today's capability.