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PROJECT ICARUS: ANALYSIS OF PLASMA JET DRIVEN MAGNETO-INERTIAL FUSION AS POTENTIAL PRIMARY PROPULSION DRIVER FOR PROJECT ICARUS

Abstract

Human hopes of reaching stars other than the Sun are currently limited by the maturity of advanced propulsion technologies. One of the few candidate propulsion systems for providing interstellar flight capabilities is nuclear fusion. In the past many fusion propulsion concepts have been proposed and some of them even explored in high detail (Project Daedalus), however, as scientific progress in this field has advanced, new fusion concepts have emerged that merit evaluation as potential drivers for interstellar missions. Plasma jet driven Magneto-Inertial Fusion (PJMIF) is one of those concepts. PJMIF involves a salvo of converging plasma jets that form a uniform liner, which compresses a magnetized target to fusion conditions. It is an Inertial Confinement Fusion (ICF)- Magnetic Confinement Fusion (MCF) hybrid approach that has the potential for many benefits over both ICF and MCF, such as lower system mass and significantly lower cost. This paper concentrates on a thermodynamic assessment of basic performance parameters necessary for utilization of PJMIF as a candidate propulsion system for the Project Icarus mission. These parameters include: specific impulse, thrust, exhaust velocity, mass of the engine system, mass of the fuel required etc. This is a submission of the Project Icarus Study Group.