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A theoretical approach of UNIT* propulsion and its potential for future applications in space exploration

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Space exploration is the present inevitable challenge for researchers. Various theoretical propulsion concepts have been evolved over the past years for space missions. Their potential remains as a key factor for the spacecraft to travel deeper into space in a shorter mission duration. The UNIT thruster follows a principle that the neutrons from the fusion are deliberately allowed to induce fission. It uses National Ignition Facility's laser beam for inertial confinement fusion followed by utilizing the power from tubular solid fuel cell. The net thrust is produced from the expansion of the combined plasma of the nuclear fusion and nuclear fission reactions through the nozzle. This provides high entry, descent and landing (EDL) performance in shortest duration opening new opportunities for space exploration. Restricting the fission processes to sub-critical gives control over the reactions such that the thruster can be either started or shut down simply by inducing fusion. This ensures the reliability of thruster and reduced nuclear radiation emissions. Double layered solid wall of graphite coated with star-lite possess the capability of withstanding the combined heat throughout the thruster operation and reduces the requirement of coolant. Though UNIT thruster is a large setup, it operates at very less fuel quantity, cuts down requirements of external power generator for the vehicle, possess higher specific impulse and highest thrust compared to other propulsion systems. It is designed to be operated in space and hence pre-stabilization of thruster in space is mandatory before operating it. Commercial development of the thruster is possible with support and fundings from the research centers. And the estimated expenditure for this thruster development is around 1.4 million USD.

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