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SPACE PROPULSION SYMPOSIUM (C4)
Advanced and Combined Propulsion Systems (8)

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OVERHAUL APPROACH IN SPACE SHUTTLE PROPULSION; THINKING BEYOND CHEMICAL PROPULSION AN EVOLUTIONARY TREND IN AEROSPACE PROPULSION

Abstract

All spacecraft prolusion systems are primarily rooted on Newton's third law of motion. For the past 40 years spaceflight has highly evolved, however little advances have been translated to the propulsion systems. The force and efficiency of a propulsion system can then be quantified by the terms thrust and specific impulse respectively. Thrust is simply a measure of the force exerted on the spacecraft which allows it to fly. Specific impulse is defined as the ratio of the pounds of thrust produced per pound of propellant consumed per second. While different fuels have been used, and current rocket engines are more high-tech than their early predecessors, the basic concepts involved are basically the same. Current space propulsion systems rely on bell-chambered chemical propulsion, and it would still take almost as much time to send a person to the moon as it did in 1969. However with a currently redefined view of space exploration that is accommodating thought of potential asteroid mining, space tourism, and faster space probes, new demands have been placed on the propulsion systems to achieve higher thrust and specific impulse. The innovative solution lies in two major technologies that have rapidly developed in this era of technology; plasma and nuclear propulsion. This paper will give an insight in plasma propulsion in light of Variable Specific Impulse Magnetoplasma Rocket (VASIMR), in which an electric power source is used to ionize fuel into plasma. The paper will also give an focus on dynamics of plasma propulsion and the overall ramifications of plasma propulsion. In nuclear propulsion, there are three kinds of propulsion that have been conceptualized and tested up to today; The designs include nuclear pulse propulsion, thermal nuclear propulsion, and nuclear electric propulsion. Pulse propulsion involves the detonation of fission bombs behind a spacecraft to generate thrust. Thermal nuclear and electric nuclear both utilize fission reactor technology to generate energy. In thermal nuclear systems, the heat energy created by the reactor takes the place of the liquid hydrogen in chemical rockets. Nuclear electric designs use a fission reactor to generate electricity which is then expelled out the back of the spacecraft as ions in order to create propulsion. Each of this kind of engines has its perks, and challenges are to be substantially analyzed in this paper.