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SPACE PROPULSION SYMPOSIUM (C4)
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DEEP SPACE EXPLORATION USING AIRBREATHING ANTIMATTER(POSITRONIC) PROPULSION FOR SINGLE-STAGE-TO ORBIT MISSIONS

Abstract

No engine is likely to generate superluminal speeds;the laws of physics prevent us,but with new propulsion technologies,higher speeds can be attained .Today, it takes nearly a year for an unmanned spacecraft to reach Mars.Approximately 10 grams of antimatter would be enough fuel to send a manned spacecraft to Mars in one month,quicker than any other propulsion engine.The mutual annihilation of matter and antimatter releases all the energy that is stored within the physical structure of material mass and provides the most powerful reaction possible for propulsive thrust. So,matter-antimatter engines have the potential to take us farther and faster with minimal fuel,ideal for deep-space exploration.

It can be a launch vehicle that takes off and lands horizontally on existing runways and no vertical launch-assembly is required.With airbreathing propulsion, it can also reach and return from orbit with a single-propulsive stage.Airbreathing propellers use oxidizer, but the source is the oxygen from the atmosphere rather than stored liquid oxygen.The spacecraft possesses intake vents that "breathe in" oxygen as it flies.This oxygen reacts with the rocket fuel and combustion occurs.Single-propulsive stage increases flight safety and reduces refurbishment and number of propulsive parts.Airbreathing propulsion minimizes oxidizer,fuel,cost and take-off weight and therefore resembles a low-cost cargo jet in operation.

Air-augmented rockets can be used to launch the airbreathing rockets.After the lift-off,the rockets are turned off and the propulsion system is used to support the combustion process.

For improving payload-carrying efficiency, the propulsive power is increased by using matter-antimatter propulsion drive. The three main components of a matter-antimatter engine:

• Magnetic storage rings - Antimatter must be separated from normal matter, so storage rings with magnetic fields can move the antimatter around the ring until it is needed to create energy.

• Feed system - When the spacecraft needs more power, the antimatter will be released to collide with a target of matter, which releases energy.

• Magnetic rocket nozzle thruster - Like a particle collider on Earth, a long magnetic nozzle will move the energy created by the matter-antimatter through a thruster.

Previous antimatter-powered spacecraft designs employed antiprotons, that produce high-energy gamma rays which are harmful.This new design will use positrons,which produce gamma rays of much lesser intensity.

This paper will explore the applicability of such a matter-antimatter annihilation propulsion for future vehicles that could take off and land on existing runways with the help of airbreathing engines with a single-propulsive stage.