SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic and Combined Cycle Propulsion (9)

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INVESTIGATION OF THE PROPELLANT PROHEATING IN AIR TURBO ROCKET ENGINE

Abstract

In air turbo rocket (ATR) engine, the compressor and turbine are droved by the rocket that works as a gas generator instead of the combustor. Compared with the single model engine, the specific impulse of ATR is much larger than rocket engine but smaller than jet engine. The specific impulse is basically associated with the inlet gas temperature of turbine, the pressure ratio of turbine and the turbine efficiency. All these approaches aim at decreasing the mass flow rate from the gas generator for fixed turbine power. This study investigates a new operating cycle that the propellant including fuel and oxidant are preheated separately or together in combustor before entering the gas generator, which also is consider as a heat protection method. For a fixed inlet gas temperature of turbine, the mixture ratio of oxidant and fuel decreases when the propellant is heated, then the working power is changed with the temperature. The engine performance is analyzed to investigate the specific impulse and total thrust particularly. Based on the simulated results, the specific impulse and total thrust were analyzed. In general, the specific impulse is benefit from the propellant preheating.