

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

Author: Mr. Chenxi Zhang
Northwestern Polytechnical University, NPU, China, airant@mail.nwpu.edu.cn

Dr. YANG LIU
China, liuyang802@nwpu.edu.cn

MIXING ENHANCEMENT USING SECONDARY GAS EJECTION METHOD IN
SUPERSONIC-SUBSONIC SHEAR LAYER

Abstract

Rocket-based Combined Cycle (RBCC) will be one of the most promising propulsion systems for single stage to orbit vehicle, and extensively application foreground in civil range. Ejector jet is the alternative power of RBCC during low-speed operation and the efficiency of ejector will affect the weight and performance of the RBCC system. In this paper, a technique for increasing the growth rate of compressible shear layer is studied, in which the secondary eject method is used in a supersonic-subsonic mixing layer facility. High pressure gas was ejected into the high speed stream and introducing perturbations to the boundary conditions. The introduction of stream wise vorticity into the mixing layer increases the growth rate of the shear layer. Numerical way using Large Eddy Simulation (LES) has been performed to analysis the effect of the secondary ejection. Results (mixing layer thickness, mean velocity, and turbulence parameters) indicate that the total temperature, the total pressure of the ejection and the position of the ejection hole affect the mixing layer growth rates.