

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Systems I (1)

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600KN LOX/METHANE ROCKET ENGINE DEVELOPMENT

Abstract

Liquid oxygen (LOX) /liquid methane (LCH₄) propellants combination has higher performance characteristics, lower cost and well reusability. LOX/methane rocket engine is investigating and developing widely in the world. Research and development of a 600kN class LOX /methane liquid rocket engine was initiated recently in China. For the engine, one of the main aspects will be the development of a thrust chamber technology. A number of experiments at subscale level were conducted to study and evaluate methane/LOX gas-liquid and liquid-liquid injection combustion performance, combustion efficiency and instability, soot formation etc. The cooling characteristics of methane were investigated by a thrust chamber calorimeter with supercritical and subcritical methane flow field in heated rectangular channel with strong wall temperature differences. A methane/oxygen turbine pump together with a LOX/methane gas generator was hot tested to validate their consistency. A LOX/methane thrust chamber, including injector head and combustion chamber, was designed and fabricated. The 600kN LOX /methane rocket engine was based on a LOX/LH₂ rocket engine excepting the newly designed LOX/methane thrust chamber and gas generator. Totally 4 hot firing tests 67 seconds accumulatively, were carried out successfully for the LOX/methane engine in January 2011 with pressure in main combustion chamber range from 10.1 10.5 MPa. Both experimental and theoretical analysis indicates our 600kN LOX/methane rocket engine has good combustion stability and convenient maintenance. Therefore, LOX/methane engine is a good choice for future space transportation.