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A STUDY ON THE BASE HEATING OF THE FIRST CHINESE LIQUID OXYGEN-METHANE
COMMERCIAL LAUNCH VEHICLE “ZQ-2”

Abstract

ZhuQue-2 (ZQ-2), the first Chinese, or even the first world's commercial liquid Oxygen-Methane (LOX/LCH₄) launch vehicle, and its LOX/LCH₄ liquid rocket engine named “TQ” series, are both developed by LandSpace Technology Corporation Ltd. ZQ-2, aiming to launch low earth orbit satellites, is a two-stage launch vehicle with 4 fins fixed on the rear part of the first stage to improve stability in the transonic Mach regime. The Length of ZQ-2 is nearly 50m and its diameter is 3.35m. The first stage of the rocket is equipped with four LOX/LCH₄ engines. With the increase of flight altitude, the atmospheric pressure of the rocket flight environment gradually decreases, which is lower than the gas pressure emitted by the engine. Meanwhile, the ejected gas is highly expanded and forms complex interference. Under certain conditions, backflow phenomenon is formed at the bottom of the rocket. The bottom of the rocket will be heated by the high temperature gas flow, that is, the base heating. At present, there is no public study on the base heating of LOX/LCH₄ engine and multi-nozzle launcher worldwide. In this paper, the numerical analysis of the first stage base heating is carried out for ZQ-2 commercial liquid launch vehicle.

Key words Commercial Launcher; First Chinese LOX/LCH₄ launcher; Medium liquid launch vehicle; Multi-nozzle layout; Liquid oxygen-methane engine; Base heating