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INVESTIGATION OF FLOW INDUCED PRESSURE DIFFERENCE DURING HIGH ALTITUDE
SIMULATION

Abstract

Abstract: High altitude simulation on a ground testing facility is carried out to create a real low pressure value correspond to the flight environment. It can be used to study the flow pattern in a large expansion ratio nozzle, thermal characteristics of the nozzle/thrust chamber and the thrust variation of a rocket engine. Passive ejection method is widely adopted in high altitude simulation test facility to realize the full thrust of the engine for its low cost. However, due to the flow-induced pressure difference between the inner wall and external wall during the starting phase, the nozzle should have sufficient intrinsic structure stress to overcome it. If not, the nozzle will be unstable and even distort. In order to reduce the pressure difference during the starting phase, to create a real low pressure value outside the nozzle before ignition has been deemed as an effective method. Therefore, in the current study, the influence of low pressure value outside the nozzle on flow-induced pressure difference has been investigated through experimental and numerical analysis. As a validation, comparison of static pressure variation on the nozzle wall between the experimental measure date and the simulated result will be first made. For more details, the flow field evolution inside the nozzle will be simulated and discussed, which will help us understand the relationship between the pressure difference and its flow structure.