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TRANSIENT SIMULATION OF THE IGNITION OVER-PRESSURE PHENOMENON IN THE
ALTITUDE TEST OF THE STAGED-COMBUSTION-CYCLE ROCKET ENGINE

Abstract

The aim of this paper is to analyze the Ignition Over-Pressure Phenomenon during the altitude test of the staged-combustion-cycle rocket engine. Using the transient CFD method, the start-up of diffuser and evacuation of the vacuum chamber was simulated in 1s after the ignition. The results illustrated how the evolution of shockwave system in the nozzle and the diffusion affects the gas velocity at the vacuum chamber exit, and therefore determines the peak of the over-pressure which is about 130%-140% of the original pressure in the vacuum chamber. Our results also indicated significant pressure impact at the diffuser inlet and throat which can be as high as 0.3MPa. Finally, the effect of geometric dimension on the over-pressure value and start-up time was discussed by comparison of results for three different models.