

刘伟凯,何国强,王春光.双脉冲固体火箭发动机压强振荡特性研究[J].航空动力学报,2015,30(10):2553~2560

双脉冲固体火箭发动机压强振荡特性研究

Research on the pressure oscillation characteristics of double pulse solid rocket motor

投稿时间: 2014-04-13

DOI: 10.13224/j.cnki.jasp.2015.10.031

中文关键词: 双脉冲发动机, 隔舱, 压强振荡, 突收突扩, 大涡模拟

英文关键词: double pulse motor, pulse separation device, pressure oscillation, sudden closing and sudden expansion, large eddy simulation

基金项目:

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摘要点击次数: 577

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中文摘要:

为了研究隔舱消融对双脉冲发动机中燃烧室的压强振荡影响规律,选择隔舱消融几个典型时刻进行研究,运用大涡模拟(LES)方法,对II脉冲工作时的发动机流场稳定性进行数值模拟,最后得到了各工况下的压强时间曲线及其快速傅氏变换(FFT)结果,分析表明:由于II脉冲工作初期隔舱暴露在流场中产生额外扰动,以及隔舱级间通道形成狭窄通道的加速作用,是导致边界层分离而引起障碍涡脱落的主要因素,点火初期,双脉冲发动机易发生轻微压强振荡,随隔舱消融,整个流场在发动机工作中、后期逐渐趋于平稳。

英文摘要:

In order to reveal the relationship between the melting of pulse separation device (PSD) and the pressure oscillation, several melting moments were selected for research. Large eddy simulation (LES) was carried out for the numerical simulation of II pulse flow field, and the pressure-time curve and fast Fourier transformation (FFT) results were obtained successfully. The analysis results show that the additional disturbance in the flow field generated by opening PSD when the II pulse is working, and the acceleration of interstage narrow channel, are the main factors to obstacle vortex shedding caused by boundary layer separation. In the early ignition, the double pulse motor (DPM) is prone to slight pressure oscillation. With the PSD melting, the whole flow field becomes more and more stabilized.

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