

SPACE PROPULSION SYMPOSIUM (C4)

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ANALYSIS OF A COMBINED MULTI-MODE DETONATION WAVE ENGINE FOR AEROSPACE CRAFT

Abstract

A novel combined multi-mode detonation propulsion system is discussed for potential application for aerospace craft. The working process includes four modes. The first mode is turbo-pulse detonation process for taking off to moderate Ma3. The second is pulsed normal detonation wave mode for flight Mach number from approximately 3 to 7, which corresponds to combustion chamber Mach numbers less than the Chapman-Jouguet Mach number. An oblique detonation mode works at flight Mach number above 7 which result that the mach number in detonation chamber is greater than the Chapman-Jouguet Mach number. Pure pulse detonation rocket mode is applied for extra-atmospheric flight. Theoretical performance analysis model for the different modes is established, and the influence of the flight regime change on the performance of detonation engine is studied. The effect of detonation characteristics is also considered in the model which is useful to design the combined multi-mode detonation wave engine.