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EXPERIMENTAL STUDY AND MODELLING OF RISE TIME IN HAN BASED
MONOPROPELLANT THRUSTER AND ITS EFFECT ON CHAMBER PRESSURE OSCILLATIONS

Abstract

Green monopropellant thruster is being considered as replacement for conventional hydrazine thruster. Hydroxylammonium Nitrate (HAN) based monopropellant thruster is one of such type of thrusters. HAN's salient features include non-toxic constituents, ability to store for long duration, high specific gravity, and high combustion enthalpy. Bellatrix Aerospace has developed 1N monopropellant thruster using BHM 01A propellant (HAN based monopropellant). BHM 01A propellant when passed through heated catalyst bed decomposes into multiple constituents resulting in ignition delay which can strongly vary with input parameters and affect the steady state combustion requiring thorough analysis. For CubeSat and small satellites, it is very important to develop thrusters which can operate with quick impulse for precise attitude control and orbit raising. Based on this present work focuses on the response of chamber pressure oscillations to rise time (time taken to reach 90% were also observed during stable combustion operation resulting in different mode of combustion. This analysis approach based on one D modeling and FFT of pressure oscillations was helped to determine optimum combustion and further optimizing design to get higher performance in the system.