

## SPACE PROPULSION SYMPOSIUM (C4)

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## NUMERICAL SIMULATION FOR THE SATELLITE PROPULSION SYSTEM

**Abstract**

The purpose of numerical simulation of Liquid rocket engine is to predict the engine's performance under different kinds of complex conditions, and the distributed temperature data, pressure data, flux data are acquired. It has more significance for validation of rocket engine, avoidance of designing bug, and ensure the validity and optimum of engine's performance. Based on the analysis of the physical model, the dynamic models for modularized components were developed. The study investigated the effects of various key design parameters on the transport behavior of the propellant flow for a hydrazine-based satellite propulsion system. Several different kinds of theoretical model were established, and the comparison was studied detailed. The theoretical models were solved numerically to obtain the pressure and propellant mass flow rate histories under various simulated conditions. These conditions considered different total pipeline lengths, and altered duration setting of thruster-valve opening/closing periods in attitude control cycle. The predicted results indicate that the installation of an orifice can rapidly damp out the fluid-hammer induced pressure oscillations compared with the case without an in-line orifice. For different total pipeline lengths , various damp coefficient and different models, the numerical results analysis reveals that different performance of rocket engine was acquired, and all the rules in trend were analyzed. According to a certain system of satellite propulsion system, the numerical simulation has been studied. a simulation method of combination of OOP(Asspect-Oriented Programming) and AOP(Asspect-Oriented Programming) was presented. Take one attitude control engine system for example, these dynamic models and this simulation method were available and accurate.