عنوان مقاله:

A Simulation Algorithm for Staged Combustion Cycle Liquid Propellant Rocket Engines

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خلاصه مقاله:

In order to reduce cost and time along with enhancing the safety issues, numerical computer modelling and simulations are widely used for analyzing complex systems such as launch vehicle or spacecraft propulsion system. The objective of this research is to obtain an algorithm for simulation of staged combustion cycle liquid propellant engines. For this purpose the space shuttle main engine (SSME), as one of the world's most complicated engines, is selected as a case study. A total of ۳۴ elements is taken into account and using more than ۱۰۰ linear/non-linear equations, the engine's steady state system model has been established in MATLAB SIMULINK software. The simulation method uses eleven nested loops for iteration. The algorithm is based on the known parameters at the inlet of engine main feed lines namely mass flow rate and pressure, similar to the known conditions during hot test of engine on test stand. The simulation is capable of predicting the engine's operation in wide range of thrust throttling levels from ۶۹ percent to ۱۰۹ percent of the nominal thrust. In order to validate the suggested method, SSME main component parameters, operating at ۱۰۹ percent of rated thrust is presented. Simulation result mean error is less than ۵ percent.

کلمات کلیدی:

Cryogenic Propellant, Liquid Rocket Engines, Mathematical Modeling, Space Shuttle Main Engine

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