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REPORT ON TEST FIRING RESULTS OF 6.5 KN PRESSURE-FED HYPERGOLIC STORABLE LIQUID ROCKET ENGINE AND COMPARISON TO THE DESIGN THEORETICAL CALCULATIONS.

Abstract

A test firing campaign of a 6.5 kN pressure-fed storable hypergolic liquid rocket engine is reported together with a description of test stand facility developed in support of the test firing campaign. The 6.5 kN pressure-fed storable hypergolic liquid rocket engine development follows a previous 1 kN liquid rocket engine research and development based on heritage 0.5-2 kN liquid rocket engine used for high speed vehicle flight applications over a multi-year program duration. The test firing campaign covered restarting demonstration with very short ignition/shut-down times as well as 1:5 throttle range variation while using regenerative cooling with ramp-up thrust rates ¿ 6 kN per second. Throughout the test firing campaign the various pressures, thrust, O/F mass flow rates and temperature profiles have shown good agreement (less than 10All theoretical curves have been obtained by implementing both analytical calculations as well as numerical simulations using codes developed in-house in FORTRAN. The codes cover interior ballistic design, thermo-structural design as well as test stand design support. Further potential developments, both in high and low thrust ranges, are discussed together with a potential in-space application with a necessary radiative cooling nozzle skirt adaptation that can be easily fitted on the current engine design.