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A REVIEW OF CHINA'S LOX/KEROSENE STAGE COMBUSTION CYCLE ROCKET ENGINE

Abstract

The performance of the rocket engine is one of the crucial factors in space exploration. In order to meet the future requirements of non-toxic, high performance, high reliability and low cost of space transportation, high thrust LOX/ Kerosene engines have been developed by Xi'an Aerospace Propulsion Institute for Chinese new generation Launch Vehicles. The rocket engine, which is called YF-100, is a 1200kN LOX/ Kerosene rocket engine. YF-100 is a single chamber rocket engine that utilizes an oxidizer-rich staged combustion cycle. Most of the engine components are required to work at extreme operating conditions, which are high pressure, high temperature, cryogenic propellant temperature, oxygen-rich gas and vibrations etc. Inevitably, a lot of conundrums related with design, manufacturing and test need to be conquered. In this paper, a review of development and associated problems of the Chinese LOX/ Kerosene rocket engine, YF-100, will be given. Firstly, the main features, general configuration and development history of YF-100 are presented. Some of the significant events of development are also mentioned. Next, the main problems of development are introduced, which are as follows: a) start-up process and system simulation technology; b) wide range thrust and mixture ratio regulation; c) oxidizer-rich preburner technology; d) high efficient and stable injector; e) high pressure, reliable, long life thrust chamber thermal protection technology; f) high efficiency and anti-ablation turbine; g) high efficiency axial force balance technology; h) elastic metal seals technology; i) health detection and fault diagnosis; j) new material and advanced manufacturing technology and etc.. Through decades of effort, the key technologies mentioned above have been mastered. Accordingly, the investigation results and primary measures about the technologies are also described in this paper. Finally, the applications of the LOX/Kerosene rocket engine are presented as well. The maiden flight of the new generation launch vehicles powered by the LOX/Kerosene engines will be fulfilled in the near future, the launching capability with greatly increased. Moreover, the performance and the associated key technologies of the LOX/Kerosene rocket engine will be further validated.