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RESEARCH OF REUSABLE LOX/RP-1 PROPULSION SYSTEM FIRING TEST

Abstract

Rocket propulsion system firing test usually refers to firing test of the entire vehicle on the test bench. The test examines the working compatibility of the rocket motor and the propellant transmission system. It also helps to verify the comprehensive performance of measurement and control function of the vehicle during propulsion system operation. In order to realize the reusable launch vehicle, the reuse of propulsion system needs to be overcome first. In this paper, two firing-tests of a LOX/RP-1 reusable propulsion system are introduced. At first, the design, manufacture and assembly of a simplified vehicle structure was carried out. Then the entire workflow of test scheme was studied to evaluate the reuse processes of the propulsion system. It was shown that the RP-1 and LOX propellant supplied steadily from the tanks to the motor as designed. The filling, pre-cooling and evaporation of LOX in the tank was also obtained. The start-up and shutdown process of the motor was performed normally. Interfaces with relevant systems of the vehicle and the schedule of launching procedure were also verified to be reasonable. After the first firing test, the vehicle-scale decomposition, post-treatment, reassembling and re-firing test was realized for the first time in China. The tests also made an early exploration of reusable launch vehicle operations in the future.