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POGO CHARACTERISTICS AND EXPERIMENTAL ANALYSIS OF THE FIRST CHINESE LIQUID
OXYGEN-METHANE LAUNCHER “ZQ-2”**Abstract**

ZQ-2 launch vehicle, the first Chinese even the first world's commercial launcher model that adopts liquid oxygen and liquid methane (LOX/LCH₄) propellants, configured with four 80-ton thrust-level LOX/LCH₄ engines. In order to suppress POGO vibration and improve flight reliability, each engine in the first stage of the launch vehicle adopts two diaphragm box accumulators. Based on the transfer function method, the POGO safety frequency window and stability analysis of ZQ-2 launch vehicle has been carried out considering the deviation of design parameters (such as rocket structure frequency, cavitation compliance of pump, etc.). On the other hand, the first-stage ground hot-firing test for ZQ-2 has been completed successfully. The comparative analysis shows that the design of accumulator is reasonable, and the frequency of POGO test is consistent with the analysis result, indicating that the POGO analysis model is reasonable. Finally, based on the analysis of the model, it is further shown that ZQ-2 launcher still has good POGO stability in the case of single-failure of the diaphragm box accumulator. Therefore, the POGO design system of ZQ-2 launcher has good reliability and ensures the safety of flight.

Key words: ZQ-2 launch vehicle; the first Chinese LOX/LCH₄ Launcher; commercial launcher; POGO; accumulator; dynamic model