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NUMERICAL AND EXPERIMENT RESEARCH OF NONSYMMETRIC CAVITATION FLOW IN
INDUCER DURING HEAD DROP

Abstract

In the development of large thrust advanced liquid rocket engine, cavitation as well as flow insatiability phenomenon often occurs in the turbo-pump inducer of the propellant supply system. The flow oscillation and mechanical vibration caused by cavitation influenced the characteristics and reliability of the rocket engine seriously. Nonsymmetric cavitation was known as a sophisticated kind of flow instability. The characteristic of nonsymmetric cavitation flow in inducer during head drop has been studied deeply in this paper. During the period of head curve, the outside head begin to drop and various kinds of cavitation flow instability occur. A visualization experiment facility for inducer cavitation research has been completed recently. During the experiment, a type of nonsymmetric cavitation patten has been found. This cavitation pattern is called 'uneven attached cavitation'. Numerical research for nonsymmetric cavitation has been carried out synchronously. The calculation results of nonsymmetric cavity flows in inducer are compared with those in experiment. It is found that local head decrease of an inducer might be caused by the nonsymmetric cavity patterns. The predicted regions of a steady nonsysmmetric cavity flow correlate with the region of cavitation instability observed both in numerical and experiment results. Key words: liquid rocket engine inducer, nonsymmetric cavitation, flow instability, visualization experiment, numerical research