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应用能量－Casimir方法研究充液卫星系统的运动稳定性

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THE NONLINEAR STABILITY OF THE LIQUID-FILLED SATELLITE WITH FOUR-FLEXIBLE-ATTACHMENTS USING THE ENERGY-CASIMIR METHOD

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摘要 利用能量－Ｃａｓｉｍｉｒ方法研究了带４个挠性梁的充液卫星系统在无外力矩状态下,关于绕铅垂轴稳态转动的非线性稳定性条件,该条件考虑了液体的涡旋、弹性梁的振动、卫星主刚体的旋转以及流－弹－刚之间的耦合,此外还考虑了离心力与Ｃｏｒｉｏｌｉｓ惯性力的影响。推广了Ｒｕｍｊａｎｔｓｅｖ和Ｍａｒｓｄｅｎ的部分结果,为带挠性梁的充液航天器的运动稳定性总体设计提供了可靠的理论依据。

关键词： 充液卫星 柔性附件 能量－Casimir方法

Abstract： Nonlinear self-spinning stability criteria of liquid-filled satellite with fotir-flexible-appendages are investigated with the Energy-Casimir method.The stability condi-tions take into account the vorticity of the liquid,the vibration of the flexible appendages,rota-tions of the rigid satellite,the coupling of liquid-elasticity-rigid,and centrifugal and coriolis forces.These results which are the extension of Rumjantsev's and Marsden's are obtained for the first time.

Keywords： liquid-filled satellite flexible appendages Energy-Casimir method

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