

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

Author: Mr. Weifeng Hu  
China Academy of Launch Vehicle Technology (CALT), China, huweifengtom@tom.com

Mr. Lin Shen  
China Academy of Launch Vehicle Technology (CALT), China, tolinsh@sina.com  
Mr. Wule He  
China Academy of Launch Vehicle Technology (CALT), China, wulehe1971@yahoo.com.cn  
Prof. Yang Jianmin  
China, yangjm158@sina.com

ANALYSIS AND IMPROVED DESIGN OF STRUCTURAL DYNAMICS FOR THE ADVANCED  
UPPER STAGE

**Abstract**

The weight and dimension is large for the advanced upper stage and its payload, so it has lower natural frequencies. The upper stage separation, the shock and dissymmetry of multi-satellite separation, the propellant sloshing, the thrust ripple of engine, the startup of servo system, two-way swing of the engines result in the serious vibrational environment. So the dynamic research of the upper stage is very crucial. In this paper, the dynamic and static behavior is predicted on ANSYS soft system. According to the mode localization and local unreasonable structure, optimize the design of part structure and layout and make the rigidity of the upper stage more reasonable. The longitudinal and transverse first-order natural frequencies and displacement of the advanced upper stage satisfied integrated requirements. Finally, the dynamic characteristics comparison of the advanced upper stage before and after improvement is shown.