

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)  
Small Satellites Potential for Future Integrated Applications and Services (4)

Author: Prof. Byungkyu Kim  
Korea Aerospace University, Korea, Republic of, bkim@kau.ac.kr

Mr. WonJun Tak  
Korea Aerospace University, Korea, Republic of, wjtak@naver.com

PLASTIC DEFORMATION BASED NON-EXPLOSIVE ACTUATOR USING SHAPE MEMORY  
ALLOY

**Abstract**

We propose a plastic deformation based non-explosive mechanism that can be utilized to separate the appendage from the satellite body with spring type SMA(Shape Memory Alloy) actuator. In order to embody the proposed mechanism, based on Finite Element Analysis, we investigate design parameters such as displacement, force and dimension of the Rectangular Plastic Deformation Module. Then, the specification for spring type of SMA actuator is calculated theoretically. Finally, the proposed non-explosive separation device is manufactured by integrating SMA spring actuator in deformation module. In order to prove reliability of the device, some important qualification tests such as the operating time, shock level and quasi-static load test are carried out. The operation time was about 14 sec. It can retain without operation under Max. 43 kgf for 10 sec and induces minor shock of about 20g when it operates under 20 kgf. Therefore, we expect the proposed non-explosive separation device for small satellite can be utilized to replace the typical explosive type separator.