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A MICRO-MECHATRONIC SOLAR ARRAY DRIVE ASSEMBLY FOR SMALL/MICRO-SATELLITES

Abstract

Starting from 1990s, the small/micro-satellites around 50 200kg become one of the research focuses of space industry. Different from the mini-satellites developed at the early ages, modern mini/micro-satellites widely incorporate the micro-electronics and micro-mechanisms, emphasizing multi-functionality and system integration. As a result, they have relatively high power/volume ratio. Also, to reduce the fuel consumption, electronic propulsion systems are widely utilized, which pushes the requirement for electronic power even higher.

It is hard for the surface mounted solar cells and stationary solar wings to satisfy these elevating power requirements of modern small/micro-satellites. In response to these requirements, Solar Array Drive Assemblies (SADA) which used to be standard equipments of large spacecrafts have gradually been incorporated in the small/micro-satellites to rotate the solar array for maximum sunlight acquisition.

Lately, a new micro-SADA with integrated mechanisms and electronics has been developed by Beijing Institute of Control Engineering. This SADA features:

–Mechanisms and electronics integrated in one capsule instead of the separate mechanisms and electronic boxes as in large spacecrafts;

–High torque/weight ratio stepper motor;

–High precision mini-transmission;

–Long life high power/weight ratio multi-channel slipring

This SADA has gone through functional testing, mechanical testing (vibration, acceleration, shock, etc.), and thermal-vacuum testings and demonstrated excellent functionality. The whole development and testing process is summarized in this paper.