

SPACE DEBRIS SYMPOSIUM (A6)
Mitigation and Standards (4)

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DE-ORBITING AND PASSIVATION OF SINOSAT-3

Abstract

Similar to the radio frequency, GEO station is a limited resource. As a member of the IADC organization, China has carried out researches on the standards and policies to mitigate the space debris as well as de-orbiting methods for GEO satellites. And China has already started on-orbit disposal operations. SINOSAT-3 was a GEO satellite developed by China, launched on June 1st in 2007 and retired in 2014. To eliminate the space debris produced by the retired spacecrafts and reduce the threat of space debris to GEO space systems, China Academy of Space Technology (CAST), according to international practice requirement, performed the de-orbiting and passivation of SINOSAT-3 from November 1st to 5th 2014. In this paper, details on the de-orbiting objectives, the residual propellant required for de-orbiting, the de-orbiting control strategy, the propellant exhausting strategy as well as the method and procedure on passivating the on-board devices are described. These strategies were designed based on the features of SINOSAT-3. The de-orbiting and passivation were performed in two stages. Firstly, before the de-orbiting, the propellant remaining was estimated and then strategy was designed to increase the orbital height based on the residual propellant amount and the on-board devices' health status. Considering the estimation inaccuracy of residual propellant using the PVT method, the orbital maneuver was performed as a group of small Eastward controls to ensure the orbital eccentricity would be sufficiently small after de-orbiting. Secondly, passivation on the propellant, the momentum wheels and the batteries as well as the final setting of the transponders and TM/TC system was performed to reduce the interference with other satellites and eliminate the threat of SINOSAT-3's potential dissolution. Besides, final setting on the propulsion subsystem was also required to ensure no thrust would be generated so that the final orbit after the de-orbiting would be steady. The implementation result of SINOSAT-3's de-orbiting and passivation meets the international practice requirement on discarding GEO satellites. It was proved that the de-orbiting and passivation strategy was correct and reasonable and this success sets a good example for China's following de-orbiting and passivation missions of GEO satellites. So far, China has set up the standards and regulations for retired satellite disposal which will be strictly followed by on-orbit satellite disposal operations in the future.