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ADVANCED TECHNOLOGY AND ON-ORBIT PERFORMANCE OF DALIAN 1-LIANLI SATELLITE

Abstract

Remote sensing satellite is an effective tool for ocean monitoring. Dalian University of Technology independently designed and developed the school's first satellite in order to conduct high-resolution imaging of the ocean around Dalian city and realize the goals of marine ship observation, sea ice monitoring, and marine pollutant monitoring.

Dalian 1-Lianli Satellite is a 17kg, 12U high-resolution remote sensing CubeSat. It mainly verifies a series of innovative technologies, such as sub-meter remote sensing imaging, high-reliability open-source Real-Time Operating System(RTOS), and ultralight satellite deployer, which realizes high integration, low cost, and standardized design. The satellite was launched on May 10, 2023 by the Tianzhou-VI Cargoship. After 253 days of storage in China's Space Station, it was successfully deployed and released into orbit on January 18, 2024. It is the first successful application of the HAN(hydroxylamine nitrate) propulsion system in the orbit control of the CubeSat internationally. It is also the satellite mission with the highest imaging resolution and longest storage time in space among the horizontal satellites.

In view of the technical innovation and application problems in the design of micro-nano satellites, taking Dalian 1-Lianli Satellite as an example, the innovative design involved in the whole process of satellite development, launch, and orbit entry is systematically analyzed. The ground test, simulation results, and the on-orbit measured indicators are given, and the high safety and high reliability of the satellite system design are demonstrated. It mainly includes a series of satellite sensors based on OpenHarmony RTOS, an ultra-light micro/nanosatellite deployer based on metal 3D printing technology, and long-term storage and condition monitoring of satellites in space. Combined with the mission characteristics and engineering feasibility of the satellite, this article provides technical support and reference for the design, manufacture, and launch of other micro/nanosatellites.