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THE DEVELOPMENT OF SURYA SATELLITE-1: PIONEERING INDONESIA NANOSATELLITE

Abstract

Surya Satellite-1 (SS-1) is the awardee of the 3rd Round KiboCUBE Program, a collaboration program between the United Nations Office of Outer Space Affairs (UNOOSA) and Japan Aerospace Exploration Agency (JAXA) to grant a launch slot to a 1U CubeSat program. This CubeSat is the first Indonesian student CubeSat that reaches Earth orbit. SS-1 brings an amateur radio Automatic Packet Reporting System (APRS) payload with an independently developed CubeSat bus and structure. The project's mission is APRS beaconing, APRS digipeating, and capacity building for Indonesian students. Manufacturing most subsystems modules and structures in-house makes this project challenging in parts procurement and the Assembly, Integration, and Test (AIT) process. The Flight Model (FM) of SS-1 has qualified through the Japanese Experiment Module (JEM) - Small Satellite Orbital Deployer (J-SSOD) Interface Control Document (ICD) requirements and verifications of JAXA. Moreover, SS-1 underwent the vacuum chamber, thermal cycle, and vibration test to ensure survivability in the launch and space environment.

During its progression, SS-1 received manufacturing, test facilities, and ground system development support from government research institutions, satellite operators, and the amateur satellite community. As a result, SS-1 is a benchmark model on how academics, industry, and government can cooperate and create a breakthrough in national satellite projects at the most affordable scale. SS-1 launched and docked at International Space Station (ISS) on November 26th, 2022, and became the first Indonesian satellite deployed from the ISS on January 6th, 2023. SS-1 is presently orbiting at around 400 km altitude and 51.4° inclination. The Author(s) will describe some of the team's experiences, particularly in the space systems engineering approach, in ensuring a space-qualified design is developed for the successful launch and operation of SS-1.