

IAF SPACE POWER SYMPOSIUM (C3)
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VERIFICATION OF THE 1U STANDARD CUBESAT ELECTRICAL POWER SYSTEM (EPS) FOR
THE INTERNATIONAL SPACE STATION (ISS) SAFETY REQUIREMENTS**Abstract**

The BIRDS-4 satellites are the fourth generation 1U CubeSat developed by Kyushu Institute of Technology (Kyutech), Japan. Kyushu Institute of Technology (Kyutech) Japan deploys constellations of 1U CubeSat annually since 2017. It is called the BIRDS satellites series. So far, up to the third generation, BIRDS-3 has been deployed. BIRDS-4, a constellation of three 1U CubeSats, waits for deployment in early 2021. The electrical power system (EPS) of BIRDS-4 needed to be modified to adopt the safety regulation changes that occurred after BIRDS-4. This paper will explain how the satellites ensure the satellite's safety as required for satellites deployed from the International Space Station (ISS). From BIRDS-4, an additional deployment switch has been added to provide the three inhibits against the new cold launch requirement. This paper focuses on how deployment switches completely regulate the satellites by using inhibiting switches in the EPS circuit. Protection from over-charge, over-discharge, and external short hazards to the satellite's battery has been confirmed. Several ground tests were carried out for the BIRDS-4 Flight Model (FM) satellites, and the results of the verification are presented. Similarly, acceptance and verification tests were carried out for commercial-off-the-shelf (COTS) solar cells and batteries(cells). Inhibit verification test was conducted with the FMs by controlling 3 deployment switches that acted as inhibit function. To check the deployment switches' actual functionality in the FM, inhibit functionality was also checked during the fit check. It was verified that the solar cells could not produce electricity inside the pod. The battery's charging line is completely isolated from the solar source by the electromechanical switches. The satellites will only be turned on 30 minutes after they have been deployed from the ISS. After going through the four generations of ISS deployment, the BIRDS EPS design now can serve as a standard 1U EPS design in compliance with ISS safety requirements. Keywords: Electrical Power System, Safety, Inhibit, Deployment switches.