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IDEASSAT - A 3U CUBESAT FOR IONOSPHERIC SCIENCE AND CAPACITY BUILDING

Abstract

Building on the heritage of in-situ ionospheric sensors developed at National Central University (NCU) in Taiwan, we present the ongoing development of the Ionospheric Dynamics Exploration and Attitude Subsystem Satellite (IDEASSat) - a 3U CubeSat currently in the Phase C Final Design stage, with expected delivery in 2020. IDEASSat is a 3U CubeSat carrying the Compact Ionosphere Probe (CIP) - an all-in-one plasma sensor with flight heritage from the Advanced Ionosphere Probe (AIP) currently functioning aboard FORMOSAT-5. CIP has Planar Langmuir Probe, Ion Trap, Ion Drift Meter, and Retarding Potential Analyzer modes, which will provide in-situ measurements of ionospheric structure, variability, as well as scintillation irregularities from a nominal 500 km Sun-synchronous orbit. The mission is funded by the Taiwan National Space Organization (NSPO), Ministry of Science and Technology, and Ministry of Education. The spacecraft subsystems are a combination of commercial off the shelf (COTS) components, as well as self-developed components designed in collaboration with the University of Colorado and the Indian Institute of Space Science and Technology through the International Satellite Program in Research and Education (INSPIRE), and can be considered the second spacecraft from this consortium. Key challenges include high precision pointing requirements of CIP, as well as the limited power and downlinkable data volume. We present the concept of operations, preliminary design, as well as challenges and lessons learned in the development of IDEASSat. In conjunction with INSPIRESat-1 - a 6U+ CubeSat with the same payload, ionospheric measurements from IDEASSat will extend the coverage of in-situ ionospheric observations from the FORMOSAT-5, and will further enhance our observational coverage of ionospheric variability and irregularities. Development of IDEASSat is also serving to build spacecraft design and operations capacity at NCU, while also providing students with a better appreciation of the relation between space physics and the spacecraft operational environment.