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UNISAT-7 : A SMALL SATELLITE WITH BIG POTENTIAL

Abstract

More than twenty years have passed since the launch of the first UNISAT, a microsat-class spacecraft designed entirely by students of the GAUSS lab of the Scuola di Ingegneria Aerospaziale in Rome, when Small Satellites were deemed just a toy by the aerospace industry. The latest iteration in this fortunate series is UNISAT-7, a 32kg octagonal-shaped micro-sat, designed and manufactured by GAUSS Srl, scheduled to be launched in Q1 2021 by a Soyuz-Fregat launch vehicle. The four main topics over which UNISAT-7 was built upon, are: Heritage, Technology, Research and Radioamateur. The mission is based on the successful idea of acting both as an in-orbit deployer of third-party satellites and as a flexible in-orbit demonstrator for space technology, while maintaining open access for radioamateurs worldwide. UNISAT-7, developed thanks to the vast experience earned with past missions, continues in the footsteps of its predecessors, UNISAT-5 (2013) and UNISAT-6 (2014), which released a total of 12 nano- and pico-sats, with a turnaround of less than two years. UNISAT-7 will release two CubeSats and three PocketQubes, among which are custom-sized platforms. The satellite, developed using lean-satellite methodologies, integrates payloads and GAUSS-designed subsystems that will be tested in orbit, to boost the capacity of next UNISAT platforms: a fine ADCS system and a low-thrust, electric propulsion system named REGULUS, from Italian Company T4i, which will allow the satellite to modify orbit height, as well as to execute housekeeping maneuvers for drag compensation. This will open endless possibilities for future UNISATs to release satellites based on a desired constellation architecture, enhance life-time expectancy in low-altitude orbits or command an accelerated de-orbit phase. UNISAT-7 will act as in-orbit demonstrator for original GAUSS technology: two Earth Observation payloads, on-board computers, RF transceivers and switches, GNSS navigation, high-power EPS units, sat-to-ground optical links and upgraded electronics for automated in-orbit deployments. GAUSS electronics are manufactured using COTS components, with the aim to lower manufacturing costs while assuring operational reliability. All subsystems were tested for vibration and TVAC, some of them while active. The satellite will also test third-party technology, such as equipment in the framework of NB-IOT research, and it will perform joint operations with GAUSS Observatory for Space Debris “CastelGAUSS” for light-curve detection on

different commanded attitudes. UNISAT-7 spacecraft will be employed to test the space segment of the upgraded GAUSS UNISAT bus, which will pave the way for future UNISAT programs.