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EOL OPERATIONS OF THE D-SAT SATELLITE: AN IN-ORBIT DEMONSTRATION OF SATELLITE CONTROLLED RE-ENTRY

Abstract

D-SAT is the first satellite ever designed to be removed from orbit, at the end of its mission, in a controlled way, by means of a dedicated and independent propulsive decommissioning device. D-SAT will be launched in April 2017 on-board of a PSLV Rocket, will be operated by D-Orbit for 2 months in orbit, carrying out three different independent experiments. At the end of the two months, D-SAT will perform its decommissioning maneuver. In this paper, results and lessons learnt from the mission and the EOL operations will be collected and explained, allowing the scientific and industrial audience discussing on a mission unique of its kind. D-SAT, designed and assembled in-house by D-Orbit, is a nanosatellite designed on the 3U+ CubeSat standard, with a mass of about 4.5 kg. The decommissioning device embarked on D-SAT, based on solid rocket propulsion, has been conceived since the first conceptual idealization to maximize the reliability and consequently the mission success. Therefore, a unique feature of D-SAT is that the main functions of the decommissioning system are single point of failure free. Thanks to this valuable characteristic, D-SAT differs from the majority of current CubeSats and it may represent an innovative design model in the nanosatellite development. Large satellites, usually over 1.5/2 tons, that do not comply with the maximum casualty risk threshold imposed by international Space Debris Mitigation guidelines and regulation, are mandated to perform a controlled re-entry at end-of-mission. D-SAT will provide useful inputs for this re-entry scenario, and will set an important milestone towards the development of autonomous satellite decommissioning systems based on solid propellant technology. In addition, D-SAT will constitute a case study for effectively disposing of satellite small satellites, since the decommissioning system installed on-board is able to remove small satellites up to about 50 kg. The

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