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## DESIGN AND DEVELOPMENT OF THE DEORBIT SYSTEM FOR MICROSATELLITES.

**Abstract**

PW-Sat2 is the second polish student satellite. First – PW-Sat – was launched in 2012 and its main mission was to test passive deorbit system, consisting of a deployable tail (1m long). The goal was to increase the satellite drag area to accelerate the deorbit process. PW-Sat2 project continues the idea of designing an effective, compact and light deorbit system which can be used in future small satellites missions on LEO orbits. This system only needs to burn a Dyneema wire, holding the folded springs, for the structure deployment, without need to use any kind of motors. It makes the system reliable, sturdy and its power consumption is very low.

In this project the primary objective is to test the designed system and verify its effectiveness. PW-Sat2 deorbit system will be a square sail of 2m side. The material of the sail is stretched on four flat springs and wrapped around specially shaped roller. This construction will be deployed 20cm above the satellite. On one side of the satellite a small camera will be mounted to observe the opening process of the sail so the team will be able to analyse it for future improvements and development. The lifetime of PW-Sat2 on orbit will be compared to the other satellites on similar orbits.

The team performed simulations with GMAT (General Mission Analysis Tool, NASA) software. Simulation parameters were carefully chosen and validated for similar satellites which had already deorbited. For CubeSat 2U (PW-Sat2) with 4m<sup>2</sup> deorbit sail and 2,66 kg mass, on 700km SSO orbit, satellite deorbited in simulations after less than 2 years contrary to 40 years without a sail.

The deorbit system is designed to be easily integrated with other small satellites, not only CubeSats, in future. This kind of subsystems can help to reduce the amount of new space debris. As of the date of this publication the ongoing work focus on minimization of the system's mass and volume which are now 0.8dm<sup>3</sup> and 0.5kg. PW-Sat2 launch is planned for 2016.