

## **PW-Sat – the first Polish Satellite and the Technology Demonstrator for a new De-orbiting Concept**

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PW-Sat is the first Polish satellite designed and built by students at the Warsaw University of Technology (WUT), in association with the Students' Space Association (SSA) and the Student Space Engineering Scientific Group (SSESG), and in cooperation with the Space Research Centre of the Polish Academy of Sciences. The project was started in 2005 at the Faculty of Power and Aeronautical Engineering of WUT by members of the SSA. The main assumption was to design and develop a 1U CubeSat and to demonstrate a new concept of de-orbiting technology. The launch is planned for 9th of February 2012 on board the Vega Maiden Flight into an orbit with 300 km perigee and 1450 km apogee (inclination 69.5°).

As educational project, the PW-Sat is supposed to help and educate young engineers to understand space technologies, especially in project management, space engineering (electronics, mechanics, software), spacecraft manufacturing and assembling. The second aim of the project is to test new technologies in space.

Space debris mitigation is the main aim of the group of people associated in PW-Sat and other similar projects in Poland. There are several thousand man-made debris objects which are still in orbit. Most of them (about 12,000 with a size larger than 10 cm) are located in LEO, mostly at altitudes between 800 and 1000 km. Because the number of space debris objects in LEO is so high and still increasing, the risk of collision in LEO is high and will become a serious problem in the near future.

The PW-Sat team is proposing to de-orbit PW-Sat using a drag augmentation device which is a special deployable tail about 1.2 m long. The tail has a square-shaped cross section with the dimensions of 80x80 mm. On the sides of this structure there are special solar cells which are flexible. These solar cells are placed on a thin foil which can be rolled or folded and stored in a small volume (about 80x80x30 mm). The drag area of the satellite ranges from 10 cm<sup>2</sup> (tail not released) to about 970 cm<sup>2</sup> (when the satellite with its tail fully deployed is perpendicular to the flight trajectory). It is estimated that the satellite will de-orbit in about one year after tail deployment.

An additional test on orbit is an experiment with new solar cells which have never been tested in space. When the tail is deployed the solar cells on the tail will generate electrical power. The currents and voltages generated by the solar cells will be measured and transmitted to the ground station. These results will allow assessing the application potential of these very light and small solar cells for use in future space missions.