

Lessons Learned in the PW-Sat Project

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The CubeSat standard is getting more and more popular in the world. In next few years, the number of CubeSats built and launched for educational, scientific and technological purposes will reach 100, and perhaps even more. Many thousands of students are involved in the development and operational phases of these projects.

PW-Sat was launched on 13 February 2012 on the Vega Maiden Flight as the first Polish satellite. Experiences and knowledge gained in this project as well as other CubeSats launched on the same launcher led to this complete lessons learned summary.

The example of the PW-Sat Project gives a list of issues related to software, hardware as well management which provides useful guidelines for any CubeSat project, especially when the CubeSat is the first CubeSat within their institution or country. The topic of lessons learned can be split into sections which cover the following parts

- Project management,
- System engineering,
- Mission design,
- Satellite development process,
- Post-launch operations.

The example of PW-Sat gives a comprehensive analysis of issues met during all project phases, for example, lack of automatic modes which caused a problem with meeting the mission goals, a test campaign which was too short and influenced the power budget, and so on. As a result, PW-Sat, which was intended to test a new de-orbiting system based on a drag augmentation device, could not reach all mission success levels.

The analysis of a 'lessons learned' exercise performed by the PW-Sat team implicated a need to provide guidelines for our next satellite project, the PW-Sat 2. PW-Sat 2 is intended to be 2U CubeSat, equipped with more devices and payloads than the first one, for example, a sail to de-orbit the satellite, and a new type of the Sun sensor which has never been tested in space. It also forces the definition of requirements at any level of the project to avoid circumstances which could be predicted as well as to minimize the risk of failure during the mission. These lessons can be shared with those organizations and institutions which are going to develop their first CubeSats, and to help them to reach their mission goals.