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DELFI-PQ: THE FIRST POCKETQUBE OF DELFT UNIVERSITY OF TECHNOLOGY

Abstract

Delft University of Technology has embarked on PocketQubes to showcase as the next class of miniaturized satellites. In the past decade, CubeSats have grown towards a successful business with mature capabilities. PocketQubes, however, are still in their infancy. The small size of the PocketQubes will trigger innovations in miniaturization and will force one to think differently about space technology. It is not sufficient to simply down-scale existing concepts used in CubeSats, there is a necessity to develop and qualify completely new components through which new applications can be enabled in the future.

The new satellite platform, called Delfi-PQ, inspired by the success of previous Delfi satellite projects is seen as an opportunity for innovativeness and offers research challenges in the miniaturization field of systems and components. The focus of this paper is to highlight those innovations and challenges, and to communicate the progress that has been made with respect to building a core platform and standardized bus.

The mission of Delfi-PQ is to make a reliable core bus and outer structure for a three unit PocketQube that shall be tested in flight as a first iteration of a series of PocketQubes to be developed by Delft University of Technology. The core bus shall fit in one unit - 1P (50x50x50mm), having as aim that after further miniaturization and optimization, the second unit shall contain an advanced subsystem (e.g. advanced Attitude Determination and Control System - ADCS) and the third unit shall consist of a scientific payload (e.g. micro-propulsion, lensless camera). For the first Delfi-PQ, the team focused on the miniaturization process and on the structure of the PocketQube. The core platform of the first Delfi-PQ consists of the Electrical Power System (including two 3.7V batteries and solar panels with two cells/each X-Y face), On-board Computer, Communications System, ADCS (including two magnetorquers and two magnetometers), as well as: temperature sensors and two different sensors for assessing the rotational speed of the PocketQube.

The long-term goal of Delft University of Technology is to improve the capabilities and applications of PocketQubes with continuous progress and frequent launches. Once the hardware baseline is available, complete and in-flight tested, the aim is to have a launch-worthy version of the satellite with different scientific payloads. After the first successful launch, development iterations will continue and the frequency is expected to increase in order to support further scientific payloads or enable new applications.