

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Design and Technology for Nano-Sats and Cube-Sats (6B)

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CUBESATS DEVELOPMENT AT POLITECNICO DI TORINO: THE E-ST@R PROGRAM

Abstract

The paper will describe into the details the e-st@r (Educational SaTellite @ politecnico di toRino) program, which is an educational project under development at the Department of Aerospace Engineering of Politecnico di Torino. The program has been funded by the Italian Ministry of University and Research and Politecnico di Torino. E-st@r is a cubesat, developed by students under the guide of researchers and professors, and it has been accepted by ESA to be launched by Vega LV during its maiden flight, planned to take place at the end of 2010. The CubeSat has been developed taking into account some drivers requirements and constraints. As a matter of fact, the use of Commercial-Off-The-Shelf (COTS) components, the adoption of simple technique and technologies as well as the constraints imposed by the available launcher (the mission orbit, as an example), stem directly from the consideration of the e-st@r program as an educational project. Notwithstanding the necessity of keeping things simple, e-st@r has also scientific objectives, which reflect real interests of the scientific, educational and industrial communities. The main scientific objective of e-st@r is the development and test of an active Attitude Determination and Control Subsystem (ADCS) based on magnetic actuators. The secondary objective is the testing of commercial components and materials into space. The active ADCS has been chosen as main payload for e-st@r mission because it represents a challenging experiment. The capability of actively control the attitude of a pico-satellite could give a boost to the proliferation of a so simple and low-cost technology, which can result in a great advance for the general target of reducing drastically the cost to access and exploit the space. Moreover, in the basic operative mode the satellite does not need high pointing accuracy to communicate with the ground station, so the failure of the ADCS shall not affect the mission success. E-st@r verification campaign is being completed in these days and the delivery to ESA/ESTEC is scheduled for April 2010. Many students have been and are now involved in the program for their final Master thesis, but the e-st@r project is also being very successful among undergraduate students and lot of them are working on it with enthusiasm during the class works in regular courses. PhD students also participate in the development of the satellite, for special investigations. The paper will also illustrate the educational approach to the development of the program and main achievements.