IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track - Undergraduate Space Education (3)

Author: Mr. Andrea Gianfermo
Sapienza University of Rome, Italy

Dr. Giammarco Cialone
Sapienza University of Rome, Italy
Mr. Paolo Marzioli
Sapienza University of Rome, Italy

STUDENT CEF AT SAPIENZA - UNIVERSITY OF ROME: PRELIMINARY DESIGN OF SPEC CUBESAT WITH OPTICAL PAYLOAD

Abstract

Students attending the Spacecraft Design lectures in the framework of the Space and Astronautical Engineering MSc course at "La Sapienza" University of Rome have been involved in a Concurrent Engineering design for the CubeSat mission SPEC (Stellar Population and Evolution with Cubesat), conceived in collaboration with the Italian Space Agency. The SPEC mission is focused on the implementation of a small ad-hoc telescope and a sensor aimed at observing binary stellar systems in the near-infrared and infrared bands (i' and z' filters from the Sloan Digital Sky Survey) on-board a 6-Unit CubeSat. The mission is addressed to the observation of gravitationally bound groups (couples or more) of stars orbiting around a common center of mass. The observations goal is to resolve (i.e. visually discriminate) the system members and perform spectrometric measures of the stars electromagnetic emission. Therefore, the mission requirements are mainly related to the Attitude Determination and Control System (ADCS) and to the payload optical performances and pointing precision. The project gives the students the opportunity to apply and improve the theoretical knowledge acquired during the academic courses by practising in a team working and project leading context. The whole class was involved in the design activities performed in the Concurrent Engineering Facility (CEF) by being organised into subgroups. Each subgroup took care of a subsystem or a mission feature. The CEF activities duration was set to slightly less than three months. Once concluded the CEF activities, the finalised configuration, obtained with several iterations on the sub-systems design, was delivered to the Professor in charge of the course for verification and evaluation of the contributions. A short introduction on the SPEC preliminary design was also presented during the "4th Space Debris Student Opportunities Workshop" at Sapienza - University of Rome in December 2017. In such framework, the students gave a public presentation about their work and achieved results. This paper outlines the SPEC preliminary design and how the CEF experience allowed the students to understand and practice on how a satellite design process is usually approached and carried out. Finally, the educational return offered by the course and related activities is discussed, with examples from the Concurrent Engineering nano-satellites design from the present and the past years.